WYOMING STATE BOARD OF EDUCATION

Wyoming education partners support a student-centered learning system in which all Wyoming students graduate prepared and empowered to create and own their futures.

DRAFT

February 15, 2018 2300 Capitol Avenue Basement Conference Room Cheyenne		
11:30 a.m. - 12:30 p.m.	**State Board of Vocational Education** • Call to Order • Pledge of Allegiance • Minutes - January 18, 2018	Tab A
	Discussion/Action Items: • Career Technical Student Organizations • Perkins State Plan Changes and Confirming Letter	Tab B Tab C
	Adjourn the State Board of Vocational Education	
12:30 p.m. - 12:45 p.m.	**State Board of Education**	
	• Call to Order • Roll Call	
	• Approval of Agenda	Tab D
	• Minutes - January 18, 2018	Tab E
	• Treasurers Report	Tab F
12:45 p.m. - 1:30 p.m.	Coordinator's Report • SBE Operational Policies • Legislative Update • Process for selecting Professional Judgement Panel Facilitator • Chapter 31 Update	Tab G
1:30 p.m. - 6:00 p.m.	Board Reports and Updates- • Chapter 29 • Chapter 6 Update • Chapter 10 Update • Advisory Committee on Accountability • Technology – Paula Smith	Tab H Tab I Tab J Tab K
6:00 p.m.	**Recess the State Board of Education**	

February 16, 2018		
8:00 a.m. - 9:00 a.m.	Presentation from 2018 Milken Award Winner	
9:00 a.m.	Reconvene the State Board of Education	
9:00 a.m. - 10:30 a.m.	Continuation of Board Reports and Updates From Previous Day	
10:30 a.m. - 11:30 a.m.	SBE Committee Reports:	
	• Administrative Committee	Tab L
	• Communications Committee	Tab M
	• Nominations Committee	
	• NASBE Update	
11:30 a.m. - 12:00 p.m.	<u>Action Items:</u>	
	• Chapter 10	Tab N
	• Election of SBE Officers	Tab O
	• Communication Policy Adoption	Tab P
	Other issues, concerns, discussion, public comment:	
	Adjourn	

DRAFT

WYOMING
STATE BOARD
OF EDUCATION

ACTION SUMMARY SHEET

DATE: February 15, 2018

ISSUE: Approval of Minutes

BACKGROUND:

SUGGESTED MOTION/RECOMMENDATION:

To approve the minutes from the State Board of Vocational Education meeting on

January 18, 2018

SUPPORTING INFORMATION ATTACHED:

- Minutes of January 18, 2018

PREPARED BY: Kylie Taylor

Kylie Taylor, Executive Assistant

ACTION TAKEN BY STATE BOARD:__________________**DATE:**_________________

COMMENTS:

WYOMING STATE BOARD OF VOCATIONAL EDUCATION
January 18, 2018
970 N. Glenn Road
Casper

Wyoming State Board of Education members present: Sue Belish, Ken Rathbun, Megan Degenfelder proxy for State Superintendent Balow, Scotty Ratliff via Zoom, Ryan Fuhrman, Dean Ray Reutzel via Zoom, Dan McGLade, Max Mickelson, Belenda Willson via Zoom, Kathryn Sessions, and Robin Schamber via Zoom.

Members absent: Chairman Wilcox, Nate Breen, and Jim Rose.

Also present: Kylie Taylor, WDE; Julie Magee, WDE; Kari Eakins, WDE; Thomas Sachse, SBE Coordinator; and Mackenzie Williams, Attorney General's Office (AG).

January 18, 2018

CALL TO ORDER

Madam Chair Sue Belish called the State Board of Vocational Education to order at 8:00 a.m.

Kylie Taylor conducted roll call and established that a quorum was present.

Guy Jackson, WDE, presented to The Carl Perkins Act that provides federal support for rigorous career and technical education programs that provide students with knowledge and skills to keep the United States competitive.

Kathryn Sessions asked if computer science would be involved in schools, particularly secondary schools.

Guy Jackson said it would be and the CTE program was getting ready to do a presentation on the WyoSimple process that is very involved with computer science.

Sue Belish asked if there were three takeaways from this process what they would be.

Guy Jackson responded and said STEM and language arts are very important. Guy will come to the State Board of Vocational Education again in February with a letter to submit for the Federal Perkins funds.

The State Board of Vocational Education adjourned at 8:26 a.m.

DRAFT

2016- 2017 CTSO Info-Graph Data

1. 100% of CTSO participants participate in CTE

2. 94.01% Graduation rate of CTE concentrators

3. CTE concentrators who participated in a CTSO had a higher overall technical skill proficiency (83.1%) than those who did not participate in CTSO (71.8%)

4. 42% of CTSO CTE concentrators scored proficient or advanced on the ACT Math assessment

Non-CTSO Concentrators Math ACT - 36.6% proficient

5. 38.2% of CTSO CTE concentrators scored proficient or advanced on the ACT Reading assessment

Non-CTSO Concentrators Reading ACT - 30.6% proficient

6. 29.6% of CTE concentrators participated in a CTSO during the 2016-2017 school year

CTSO Participation Stats

57.3% FFA

14.1% FBLA

17.4% SkillsUSA

6.4% FCCLA

4.8% DECA

5 ORGANIZATIONS, 1 MISSION

Connecting Classrooms with Careers

Career and Technical Student Organizations (CTSOs) are an integral partner in Career Technical Education (CTE) programs throughout the state. Wyoming's five CTSOs are FFA, FBLA, DECA, FCCLA and SkillsUSA.

Wyoming Department of Education supported CTSOs:

- Provide Experiential Learning
- Offer Meaningful Competitive Events & Leadership Conferences
- Facilitate Citizenship & Service
- Develop Foundational Skills Aligned with Business/Industry Needs

2016 CTSOs in Numbers

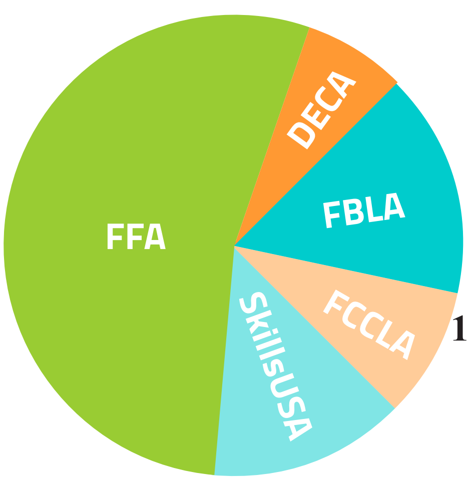
CTE concentrators who participated in a CTSO had a **higher overall technical skill proficiency**
(83.1%)
than those who did not participate in CTSO (71.8%)

100%
of all CTSO Participants Participate in CTE

94.01%
Graduation Rate for CTE Concentrators

29.6%
of CTE concentrators participated in a CTSO during the 2016-2017 school year

42%
of CTSO CTE concentrators scored **proficient or advanced** on the ACT Math assessment



57.3% FFA
14.1% FBLA
17.4% SkillsUSA
6.4% FCCLA
4.8% DECA

38.2%
of CTSO CTE concentrators scored **proficient or advanced** on the ACT Reading assessment

WYOMING
DEPARTMENT OF EDUCATION

Attachment A

FY 2019 PERKINS IV BUDGET FORMAT
(For Federal Funds that Become Available Beginning on July 1, 2018)

STATE NAME: Wyoming

Item ***(Note: Insert dollar amounts or values where requested with lines below)***	**Amount**
Title I-State Basic Grant	
Title I Allocation	**$ 4,214,921**
Title II Funds Consolidated with Title I Funds	
Total Title I Funds (Title I Allocation + Consolidated Title II Funds)	$**4,214,921**
Local Formula Distribution (not less than 85% of total Title I funds)	$**3,582,683**
Reserve (not more than 10% of the 85% of funds for local distribution)	$ N/A
Remainder for local distribution (85% of the funds for local distribution less any funds reserved)	$**3,582,683**
Secondary programs (60% of funds)	$ 2,149,610
Postsecondary programs (40% of funds)	$ 1,433,073
State Leadership	$ **382,238**
Nontraditional training and employment (between $60,000 and $150,000)	$ 80,000
Corrections or institutions (not more than 10%of state leadership funds)	$ 38,223
State Administration	$ **250,000**
State Administrative Match (from non-federal funds)[1]	$ **416,732**

[1] The eligible agency must provide non-federal funds for State administration of the Perkins IV, Title I grant in an amount not less than the amount it provided in the preceding year pursuant to section 323 of Perkins IV.

February 16, 2018

Edward R. Smith
Chief, Program Administration Branch
Division of Academic and Technical Education
Office of Vocational and Adult Education
U. S. Department of Education
Potomac Center Plaza
550 12th Street, SW, Room 11060
Washington, DC 20202-7241

Dear Mr. Smith:

On behalf of the Wyoming State Board of Vocational Education, I am pleased to submit the following items for approval to your agency to meet the requirements to receive fiscal year (FY19) Perkins IV grant awards.

Request to Extend State Plan

The State of Wyoming requests to extend its state plan for FY19.

Revision to the State Plan

The State of Wyoming has made revisions to its state plan for FY19. The option to use a State Reserve in Wyoming has never been utilized. Secondary and Post-Secondary funds not spent down by September 30 of each year will be added to the State Reserve.

Carl D. Perkins State Reserve – Workforce Discovery Grants

Section 112(c) of the Carl D. Perkins Career and Technical Education Act of 2006 allows a state to reserve up to 10% of the minimum 85% of funds that must flow to the local level to distribute to local eligible recipients for local uses of funds.

From the amounts made available under subsection (a)(1) to carry out this subsection, an eligible agency may award grants to eligible recipients for career and technical education activities described in section 135 in -
(1) rural areas;
(2) areas with high percentages of career and technical education students; and
(3) areas with high numbers of career and technical education students.

If any Basic Perkins Grant funds are not expended at the local level within the program year (July 1 to September 30 of the following year) for which they are provided, these funds must be returned to the state. Starting in the 2017-18 program year, these returned funds will no longer be re-allocated to eligible subrecipients using the allocation formula from previous years. Returned funds will be placed in a state reserve fund, and re-distributed to eligible sub-recipients utilizing a competitive Workforce Discovery Grant application process.

This competitive grant may be used to support innovative CTE initiatives at the secondary and post-secondary levels, specifically those that do the following: 1) develop more comprehensive and robust career pathways leading to viable career or post-secondary training options for students; 2) provide work-based learning experiences for students that are in industries closely related to CTE pathways; 3) develop meaningful partnerships between schools/institutions and business/industry representatives. In order to be eligible for the grant, both secondary and post-secondary applicants must have at least one formal partnership established with business or industry (this may include a registered apprenticeship). The grant may not be used to pay for food and/or beverages or any other unallowable uses of funds under the Carl D. Perkins Act of 2006. Applications will be reviewed and scored by a grant review committee at the WDE.

The grant application will be open for submission between mid-October and mid-December of each program year. Funds will be awarded in early January.

Updated Budget

The budget reflects the anticipated allotments from funds that will be available for program year twelve, beginning on July 1, 2018, for Title I of Perkins IV.

Thank you for your time and consideration. If you have questions or I can be of assistance, please don't hesitate to contact me at walt.wilcox@wyoboards.gov.

Sincerely,

Walt Wilcox, Chairman
Wyoming State Board of Vocational Education

ACTION SUMMARY SHEET

DATE: February 15, 2018

ISSUE: Approval of Agenda

BACKGROUND:

SUGGESTED MOTION/RECOMMENDATION:

To approve the Agenda for the February 15-16, 2018 State Board of Education meeting.

SUPPORTING INFORMATION ATTACHED:

- Agenda

PREPARED BY: **Kylie Taylor**
Executive Assistant

ACTION TAKEN BY STATE BOARD: ________________DATE:________________

COMMENTS:

WYOMING STATE BOARD OF EDUCATION

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DRAFT

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	Other issues, concerns, discussion, public comment:	
	Adjourn	

DRAFT

ACTION SUMMARY SHEET

DATE: February 15, 2018

ISSUE: Approval of Minutes

BACKGROUND:

SUGGESTED MOTION/RECOMMENDATION:

To approve the minutes from the State Board of Education meeting on January 18, 2018

SUPPORTING INFORMATION ATTACHED:

- Minutes of January 18, 2018

PREPARED BY: Kylie Taylor

Kylie Taylor, Executive Assistant

ACTION TAKEN BY STATE BOARD:___________________**DATE:**__________________

COMMENTS:

WYOMING STATE BOARD OF EDUCATION
January 18, 2018
970 N. Glenn Road
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Wyoming State Board of Education members present: Sue Belish, Ken Rathbun, Megan Degenfelder proxy for State Superintendent Balow, Scotty Ratliff via Zoom, Ryan Fuhrman, Dean Ray Reutzel via Zoom, Dan McGlade, Max Mickelson, Belenda Willson via Zoom, Kathryn Sessions, and Robin Schamber via Zoom.

Members absent: Chairman Wilcox, Nate Breen, and Jim Rose.

Also present: Kylie Taylor, WDE; Julie Magee, WDE; Kari Eakins, WDE; Thomas Sachse, SBE Coordinator; and Mackenzie Williams, Attorney General's Office (AG).

January 18, 2018

CALL TO ORDER

Madam Chair Sue Belish called the State Board of Education to order at 8:27 a.m.

APPROVAL OF AGENDA

Megan Degenfelder, proxy for Superintendent Balow, made a motion to amend the agenda and move Chapter 29 to Board Reports and Updates, rather than Action Item.

Madam Chair Belish added an additional amendment to include nominations for SBE officers, SBE policies, and funds for SBE gifts in "other issues."

Max Mickelson moved to approve the agenda with amendments, seconded by Ken Rathbun; the motion carried.

APPROVAL OF NOVEMBER 17 2017 MINUTES

Minutes from the November 17, 2017 State Board of Education meeting were presented for approval.

Max Mickelson moved to approve the minutes, seconded by Ryan Fuhrman; the motion carried.

APPROVAL OF DECEMBER 11 2017 MINUTES

Minutes from the December 11, 2017 State Board of Education meeting were presented for approval.

Max Mickelson moved to approve the minutes, seconded by Kathryn Sessions; the motion carried.

TREASURER'S REPORT

SBE Treasurer, Ken Rathbun, presented the summary review and expenditures report for the board's budgets, and went over the remaining balances and time left in the current biennium.

Kathryn Sessions moved to approve the presented Treasurer's Report, seconded by Dan McGlade; the motion carried.

SUPERINTENDENT'S UPDATE

Megan Degenfelder gave Superintendent Balow's update and informed the board that registration for S5S is now open. Governor Mead signed the Wyoming Computer Science Education Week Proclamation for the second year in a row and has recently joined the Governor's Partnership for K-12 Computer Science. The Chapter 41 rules are released for public comment through February 18. Math and Science Extended Standards are expected to be submitted to the SBE mid-January. This will provide for a 4-week review prior to the February meeting. Wyoming's consolidated state plan, in fulfillment of requirement under the Every Student Succeeds Act (ESSA), has been approved by the U.S. Department of Education.

COORDINATOR'S REPORT

Thomas Sachse, SBE Coordinator, updated the board on the current status of Chapter 31. Chairman Wilcox received a confidential opinion on the legal issues surrounding the board's inability to frame Chapter 31 Rules consistent with legislative intent. Representatives of the board met with staff from the Attorney General's Office as well as district leaders and WDE staff to make a new plan for promulgating new Chapter 31 Rules. With the AG's opinion, the same group will meet again on January 24 to determine a path forward.

Planning for the contract to facilitate the PJP process has begun, the board will have to conduct a Request for Proposals, rather than a bid waiver. There will likely be two independent PJPs; one for the WY-TOPP/ACT program for all schools and a distinct process for alternative high schools.

There are six pieces of draft legislation that the board might want to discuss. Two of those bills deal with military families, two are major fiscal bills addressing how much districts will receive, and two are bills addressing topics specifically within the purview of the state board.

BOARD REPORTS AND UPDATES

Accreditation Task Force Update

Julie Magee, WDE, gave an update on the accreditation task force that took place on January 9. The task force provided input on the following topics and discussed what the process would look like moving forward:

- The definition and purpose of accreditation
- Revisions to the Chapter 6 rules
- The annual accreditation report and required evidence
- Voluntary options for external reviews
- Effective practices and professional development

DRAFT

ESSA Update

Kari Eakins, WDE, described that with the feedback the U.S. Department of Education gave to the WDE, changes were made to the State's ESSA plan and the plan was approved by Secretary DeVos. The two most significant changes were around participation rate and the equity indicator. The bulk of the changes regarded clarification of the process for ranking and identifying schools for support, with other minor clarifications made in several sections.

Input for Advisory Committee on Accountability

Madam Chair Belish informed the board that the Advisory Committee on Accountability will be meeting to discuss the issue of participation rates for ESSA and WAEA. Since the SBE has responsibility for WAEA, Madam Chair Belish put together a list of questions regarding participation rates in school accountability for the board to consider.

Madam Chair Belish said she would like to add one other thing to the participation rate, not to punish districts because it does make a difference in schools.

Megan Degenfelder indicated that Superintendent Balow would like the State and Federal plan to be as close as possible. She said the WDE understands it's not possible to have them 100% aligned but Superintendent Balow would like to see them as aligned as possible.

Julie Magee gave a brief timeline for reports for school performance ratings. The September 1 report will be delayed because of the new statewide assessment system. In August is when the WDE will receive final cut scores and November 1 is when school performance ratings would be sent to LSO.

Formal Process for Communication

Megan Degenfelder explained that because there is so many different methods of communication from the SBE, she would like to have a discussion and possibly a motion to vote on surrounding SBE communications. Megan suggested that any board communication go through the entire board before going out, especially if its opinion based. Data or informational based should just be sent out but not necessarily voted on.

Kathryn Sessions agreed that the board should all look at something that goes out on behalf of the board.

Belenda Willson said if it's informational or official letter going out it should go through the whole board but maybe not approved or voted on. If there is a change in policy or opinion then it should be voted on and that is policy the board has followed.

Madam Chair Belish asked how the board would go about getting approval and what would need to be voted on (i.e. press releases, committee letters, etc.) and how does the board thread the needle for getting approval on things.

Ken Rathbun said it is not feasible to function if the board has to approve every communication that goes out on behalf of the board. He said he doesn't think that's what Megan is saying, but referring more to opinion based materials.

Megan Degenfelder agreed with Ken and said it would become unmanageable to do that but board members should be able to provide feedback on opinion based materials, especially on behalf of Superintendent Balow as a voting member.

Max Mickelson said the conversation is due to the letter that was received by the Joint Appropriations Committee on behalf of the SBE. The letter did not go out to the board as a whole which meant the WDE had not seen the letter. Because the letter did not go out to the whole board, it did not reflect well on the SBE as the WDE was unaware of it. If the board sends something, everyone should get a copy, it's in the board's interest that everyone is aware of positions taken.

Madam Chair Belish said having talked to Chairman Wilcox, he regretted not having sent the letter out to everyone. She also indicated that the administrative committee had been talking about it for several months and it was in the administrative committee meeting minutes.

Megan Degenfelder made a motion, based on what Max mentioned, if something is position based, the entire board should receive a copy.

Max Mickelson seconded.

Madam Chair Belish suggested that instead of making a motion, the board take a look at the policies instead.

Megan Degenfelder said she was comfortable rescinding her motion but indicated there still seems to be confusion on whether it should be a policy or vote.

Madam Chair Belish asked the board if everyone was comfortable putting this in board policy to be more specific. Board members agreed, Megan withdrew her motion.

Chapter 29 Update

Laurel Ballard, WDE, updated the board on the work the Certified Personnel Evaluation System (CPES) Advisory Panel has done surrounding Chapter 29. The CPES Advisory Panel has reviewed extensive research and proposed standards for education leaders and developed recommendations for changes to Chapter 29. To assist with providing support to districts, the advisory panel also created the glossary of terms and leader evaluation system components guidance documents. They have also worked with REL Central to create a crosswalk between the State Model standards and standards contained within several commonly used leader evaluation systems.

COMMITTEE REPORTS

Administrative Committee

Madam Chair Belish indicated that the biggest update from the administrative committee was the review of the SBE Coordinator contract and received feedback from the WDE.

Communications Committee

Ryan Fuhrman gave an overview of the work the communications committee is doing for stakeholder invitations to SBE meetings. Ryan asked if the board should focus on anyone that can come speak to the board or focus on individuals that can speak as it relates to the agenda.

Ken Rathbun said the board should find someone from the area where are holding the meeting. He said it's not in the cards to plan our business where we are holding our meetings, it's unlikely to be able to do that.

NASBE Update

Scotty Ratliff suggested that the board look into cutting back on sending people to NASBE conferences in an effort to cut back on travel expenses.

Kathryn Sessions said because Wyoming is such an isolated state, being a member of NASBE is a great opportunity for the SBE to have contacts with others states. The board should cut back on the number of people sent to conferences but shouldn't discontinue the membership with NASBE.

Madam Chair Belish said Chairman Wilcox said that he supports maintaining NASBE membership as it is a rich source of educational experience and collaboration with other states. The SBE has also received grants from NASBE in the past which has been a great resource.

ACTION ITEMS

Technology Options

Kylie Taylor gave an overview of the survey results from SBE members indicating if they would like a new technology device or not. Kylie proposed that the board vote to have SBE members let her know by a given deadline if they would like a new device and she will let Paula Smith know.

Max Mickelson moved to purchase technology devices if a board member needs, seconded by Kathryn; the motion carried.

Rescinding of December 1 Report

Max Mickelson proposed the SBE approve the January 19 report to replace the December 1 report, seconded by Kathryn; the motion carried.

Accreditation of Sweetwater 1

Max Mickelson will be abstaining from the vote

Ken Rathbun moved that the 2016-17 accreditation status for Sweetwater County School District #1 be amended from Accreditation with Follow Up to Full Accreditation, Dan McGlade seconded; the motion carried.

Legislative Priorities

Megan Degenfelder clarified the board cannot lobby on legislative issues and doesn't think the board should take a position and indicated she will vote no.

Max Mickelson said as a point of clarification he wanted the board to formally decide whether it would be a motion to be in support or just agree on the support of a fully funded Coordinator position and computer science.

DRAFT

Megan Degenfelder said in terms of computer science going forward the WDE can provide as much information as possible for board members to be fully equipped to answer any questions Legislators might have.

Kathryn Sessions said the board needs the legislative committee and Tom to explain to Legislators why the SBE needs a fully funded Coordinator.

Max Mickelson said in that particular area he would like someone to make a motion that the SBE would like a fully funded Coordinator.

Max Mickelson moved that the SBE support a fully funded Coordinator position in order to meet statutory requirements, seconded by Ken Rathbun.

Megan Degenfelder voted against on behalf of Superintendent Balow because she feels the position should not increase unless there is an emergency or it's in statute.

The motion carried.

OTHER ISSUES

Nominations for SBE Officers

Ken Rathbun won't be able to continue as SBE Treasurer, the board will be looking for a new Treasurer and if anyone is interested in being Board Chair or Vice Chair, let Chairman Wilcox know. Elections will take place in February.

SBE Policies

Tom Sachse and Kylie Taylor will make changes to the SBE policies, including formalizing the communication process and bring them to the next meeting in February.

Money Donations for SBE Gifts

There was an envelope passed around for donations for gifts from the SBE.

NEXT MEETING

The board's next meeting will take place in Cheyenne on February 15-16, 2018.

The State Board of Education adjourned at 2:55 p.m.

DRAFT

ACTION SUMMARY SHEET

DATE: **February 15, 2018**

ISSUE: Approval of Treasurer's Report

BACKGROUND: The State Board of Education budget summary.

SUGGESTED MOTION/RECOMMENDATION:

To approve the Treasurer's Reports as submitted.

SUPPORTING INFORMATION ATTACHED:

- State Board Budget Summary attached

PREPARED BY: Kylie Taylor
Kylie Taylor, Executive Assistant

ACTION TAKEN BY STATE BOARD: ________________DATE:_______________

COMMENTS:

WYOMING DEPARTMENT OF EDUCATION

SUMMARY REPORT

State Board of Education

FY17 Budget

30 June 2017 thru 06 February 2018

DESCRIPTION	BUDGETED	EXPENDED	ENCUMBERED	REMAINING BALANCE	Percentage
Personal Services (0100 series)					
[App Unit 001]	60,000.00	43,193.74		16,806.26	28.01%
Supportive Services (0200 series)					
[App Unit 001]	127,275.00	117,872.77		9,402.23	7.39%
Data Processing Charges (0400 series)					
[App Unit 001]	5,737.00	4,076.88		1,660.12	28.94%
Professional Services (0900 series)					
[App Unit 001]	50,794.00	4,930.00	10,125.00	35,739.00	70.36%
	243,806.00	170,073.39	10,125.00	63,607.61	26.09%

DESCRIPTION	BUDGETED	EXPENDED	ENCUMBERED	REMAINING BALANCE	Percentage
Professional Services (0900 series)					
[App Unit 009]	145,848.00	21,747.91	0.00	124,100.09	85.09%
[App Unit 001]	84,500.00	45,499.27	0.00	39,000.73	46.15%
TOTAL	**230,348.00**	**41,166.16**	**3,153.46**	**186,028.41**	79.98%

February 7, 2018

To: State Board Members

From: Tom Sachse, Ph.D.

RE: Coordinator's Report

This month, I'll be commenting on four topics topics: SBE Operational Procedures, Education Legislation Update, Chapter 31 Update, and Professional Judgement Panel Facilitation RFP. Dr. Julie Magee and I will co-present on the last two. There are cover memos for all four.

February 7, 2018

To: State Board Members

From: Tom Sachse, Ph.D.

RE: SBE Operational Policies

Last month, I was directed to begin crafting language regarding state board communications. It was undetermined whether this might be a new policy or something like a Standard Operating Procedure (SOP). Once I reviewed the latest version of state board policies, I noticed that the way that document is crafted, makes it almost inevitable that changes in statute are not immediately updated in this document on state board governance policy.

Attached are two versions of that document. The second one has four exemplars of a different format for that document, including the communication policy. I am hoping the state board can choose between these two formats. Then Kelly Pascal and I will update the entire manuscript in whichever format the board prefers. I also hope the board will discuss the communication policy and provide input on the breadth and scope of this draft policy and determine whether it should be board policy or an SOP.

BOARD LEGAL STATUS

Constitutional and Statutory Provisions:

§21-2-301. Appointment; qualifications, terms and removal of members; meetings; chairman.

(a) There is created a state board of education composed of ~~twelve~~ thirteen (13~~12~~) voting members, eleven (11) of whom shall be appointed members with at least one (1) member appointed from each appointment district pursuant to W.S. 9-1-218. The remaining voting member of the board shall be the state superintendent of public instruction. The executive director of the Wyoming community college commission shall be an ex-officio member and shall not have the right to vote. One (1) appointed member shall be appointed at large and shall be a certified classroom teacher at the time of appointment. One (1) appointed member shall also be appointed at large and shall be a certified school administrator at the time of appointment. Two (2) appointed members shall be appointed at large and shall be representative of private business or industry in Wyoming. The remaining seven (7) appointed members of the board shall be appointed from among the lay citizens of the state who are electors of the state, known for their public spirit, business or professional ability and interest in education. Not more than six (6) appointed members of the board shall be from one (1) political party. Members shall be appointed for six (6) year terms, except those who may be appointed to fill unexpired terms. Members shall be appointed by the governor with the approval of the senate. Vacancies shall be filled by the governor without senate approval until the next session of the legislature. No member is eligible to reappointment, except any member appointed to fill an unexpired term of less than six (6) years and the term expires on or after January 1, 1996, may be reappointed for one (1) additional six (6) year term. Appointed members of the board may be removed by the governor as provided in W.S. 9-1-202.

(b) During the first quarter of the calendar year a meeting shall be held at which a chairman shall be elected. Meetings may be held at regular intervals as often as the duties of the board require and the board shall meet at the call of the state superintendent of public instruction or the governor or the chairman whenever in the opinion of these officials, or any of them, the need for such meeting exists.

(c) Notwithstanding subsection (a) of this section, the superintendent of public instruction shall not participate in board deliberations on or vote on any matter relating to a contested case involving actions of the department of education.

State Board Policy:

All board members will take The Oath of Office. Board members will be sworn in prior to taking office by the Chair.

Oath of Members of the Board

I, (name) do solemnly swear that I will uphold the duties and the laws of the state of Wyoming based on statutes governing operations of the Wyoming State Board of Education~~.~~

POWERS AND DUTIES

Constitutional and Statutory Provisions:

§21-2-304. Duties of the state board of education.

(a) The state board of education shall:

(i) Establish policies for public education in this state consistent with the Wyoming Constitution and statutes and may promulgate rules necessary or desirable for the proper and effective implementation of this title and its responsibilities under this title. Nothing in this section shall give the state board rulemaking authority in any area specifically delegated to the state superintendent;

(ii) Through the evaluation and accreditation of school districts, implement and enforce the uniform standards for educational programs prescribed under W.S. 21-9-101 and 21-9-102 in the public schools of this state, including any educational institution receiving any state funds except for the University of Wyoming and Wyoming community colleges, and implement and enforce the statewide education accountability system pursuant to W.S. 21-2-204. The board shall ensure that educational programs offered by public schools in accordance with these standards provide students an opportunity to acquire sufficient knowledge and skills, at a minimum, to enter the University of Wyoming and Wyoming community colleges, to prepare students for the job market or postsecondary vocational and technical training and to achieve the general purposes of education that equips students for their role as a citizen and participant in the political system and to have the opportunity to compete both intellectually and economically in society. In addition, the board shall require school district adherence to the statewide education accountability system;

(iii) By rule and regulation and in consultation and coordination with local school districts, prescribe uniform student content and performance standards for the common core of knowledge and the common core of skills specified under W.S. 21-9-101(b), and promulgate uniform standards for programs addressing the special needs of student populations specified under W.S. 21-9-101(c) that ensure these student populations are provided the opportunity to learn the common core of knowledge and skills as prescribed by the uniform student content and performance standards pursuant to this paragraph. Student content and performance standards prescribed under this paragraph shall include standards for graduation from any high school within any school district of this state. The ability to prescribe content and performance standards shall not be construed to give the state board of education the authority to prescribe textbooks or curriculum which the state board is hereby forbidden to do. Graduation standards imposed under this paragraph shall require the successful completion of the following components, as evidenced by passing grades or by the successful performance on competency based equivalency examinations:

(A) Four (4) school years of English;

(B) Three (3) school years of mathematics;

(C) Three (3) school years of science; and

(D) Three (3) school years of social studies, including history, American government and economic systems and institutions, provided business instructors may instruct classes on economic systems and institutions.

(iv) Effective school year 2013-2014, and each school year thereafter, require district administration of common benchmark adaptive assessments statewide in reading and mathematics for grades one (1) through eight (8) in accordance with W.S. 21-3-110(a)(xxiv). The board shall also establish, in consultation with local school districts, requirements for students to earn a high school diploma as evidenced by course completion and as measured by each district's assessment system prescribed by rule and regulation of the state board and required under W.S. 21-3-110(a)(xxiv). Once every five (5) years and on a staggered basis, the state board shall through the department, review and approve each district's assessment system designed to determine the various levels of student performance as aligned with the uniform state standards and the attainment of high school graduation requirements as evidenced by course completion. In addition and following review, refinement and revision of student content and performance standards adopted under paragraph (a)(iii) of this section and reviewed under subsection (c) of this section, the board shall establish a process to ensure district assessment systems are aligned with the refined and revised standards within three (3) full school years following adoption of revised standards;

(A) through (C) Repealed by Laws 2015, ch. 179, § 3.

(v) Through the state superintendent and in consultation and coordination with local school districts, implement a statewide assessment system comprised of a coherent system of measures that when combined, provide a reliable and valid measure of individual student achievement for each public school and school district within the state, and the performance of the state as a whole. Statewide assessment system components shall be in accordance with requirements of the statewide education accountability system pursuant to W.S. 21-2-204. Improvement of teaching and learning in schools, attaining student achievement targets for performance indicators established under W.S. 21-2-204 and fostering school program improvement shall be the primary purposes of statewide assessment of student performance in Wyoming. The statewide assessment system shall:

(A) Measure individual student performance and progress in a manner substantially aligned with the uniform educational program and student content and performance standards imposed by law and by board rule and regulation;

(B) Effective school year 2012-2013, and each school year thereafter, be administered in specified grades aligned to the student content and performance standards, specifically assessing student performance in reading and mathematics at grades three (3) through eight (8). In addition, the statewide assessment system shall assess student performance in science in grades four (4) and eight (8);

(C) In addition to subparagraph (a)(v)(B) of this section, measure student performance in Wyoming on a comparative basis with student performance nationally;

(D) Measure year-to-year changes in student performance and progress in the subjects specified under subparagraph (a)(v)(B) of this section and by school year 2015-2016, link student performance and progress to school and district leaders, including superintendents, principals and other district or school leaders serving in a similar capacity. The assessment system shall ensure the student performance measurements used at each grade level are valid for the purposes for which they are being used, including valid year-to-year comparisons of student and school level results, and shall be sufficient to produce necessary data to enable application of measures of performance indicators as required under W.S. 21-2-204;

(E) Use only multiple choice items to ensure alignment to the statewide content and performance standards;

(F) Provide a fair and unbiased assessment of student performance without regard to race, ethnicity, limited English proficiency and socioeconomic status;

(G) Provide appropriate accommodations or alternative assessments to enable the assessment of students with disabilities as specified under W.S. 21-9-101(c)(i) and students with limited English proficiency;

(H) Provide a measure of accountability to enhance learning in Wyoming and in combination with other measures and information, assist school districts in determining individual student progress as well as school level achievement, growth and readiness targets. In addition to reporting requirements imposed under W.S. 21-2-204, the assessment results shall be reported to students, parents, schools, school districts and the public in an accurate, complete and timely manner. Assessment results shall be used in conjunction with each school district's assessments to design educational strategies for improvement and enhancement of student performance required under W.S. 21-2-204. Assessment results shall also be used to guide actions by the state board and the department in providing and directing a progressive multi-tiered system of support, intervention and consequences to districts in developing school improvement plans in response to student performance to attain target levels measured and established under W.S. 21-2-204. In consultation and coordination with school districts, the board shall subject to W.S. 21-2-204, review and evaluate the assessment system regularly and based upon uniform statewide reports, annually report to the legislature as required under W.S. 21-2-204.

(vi) Subject to and in accordance with W.S. 21-2-204, through the state superintendent and in consultation and coordination with local school districts, by rule and regulation implement a statewide accountability system. The accountability system shall include a technically defensible approach to calculate achievement, growth, readiness and equity as required by W.S. 21-2-204. The state board shall establish performance targets as required by W.S. 21-2-204(e), establish a progressive multi tiered system of supports, interventions and consequences as required by W.S. 21-2-204(f) and shall establish a statewide reporting system pursuant to W.S. 21-2-204(h). The system created shall conform to the January 2012 education accountability report as defined by W.S. 21-2-204(k). In addition and for purposes of complying with requirements under the federal No Child Left Behind Act of 2001, the board shall by rule and regulation provide for annual accountability determinations based upon adequate yearly progress measures imposed by federal law for all schools and school districts imposing a range of educational consequences and supports resulting from accountability determinations;

(vii) Repealed by Laws 2012, ch. 101, § 2.

(b) In addition to subsection (a) of this section and any other duties assigned to it by law, the state board shall:

(i) Repealed by Laws 1997 Special Session, ch. 3, § 302; 1994, ch. 17, § 2.

(ii) Enforce the uniform state educational program standards imposed by W.S. 21-9-101 and 21-9-102 and the uniform student content and performance standards established by rules and regulations adopted under subsection (a) of this section, together with student performance indicators established and measured pursuant to W.S. 21-2-204, by taking appropriate administrative action with the state superintendent, including but not limited to the changing of accreditation status;

(iii) Repealed by Laws 1993, ch. 217, § 3.

(iv) Repealed by Laws 1987, ch. 190, §§ 2, 5.

(v) Initiate or facilitate discussions regarding the needs of and the means for improving education;

(vi) Repealed by Laws 1987, ch. 190, §§ 2, 5.

(vii) Repealed by Laws 1994, ch. 17, § 2.

(viii) Approve or disapprove alternative scheduling for school districts requesting to operate for fewer than one hundred seventy-five (175) days in school year, but no schedule shall be approved which reduces the pupil-teacher contact time defined by the state board;

(ix) Repealed by Laws 1994, ch. 17, § 2.

(x) Repealed by Laws 2006, ch. 34, § 2.

(xi) through (xiii) Repealed by Laws 1994, ch. 17, § 2.

(xiv) Based upon student performance levels determined under W.S. 21-2-204, establish improvement goals for public schools for assessment of student progress based upon the national assessment of educational progress testing program and the statewide assessment system established under paragraph (a)(v) of this section;

(xv) Not later than July 1, 2019, promulgate rules and regulations for the implementation and administration of a comprehensive school district teacher performance evaluation system based in part upon defined student academic performance measures as prescribed by law, upon longitudinal data systems and upon measures of professional practice according to standards for professional practice prescribed by board rule and regulation. The evaluation system shall clearly prescribe standards for highly effective performance, effective performance, performance in need of improvement and ineffective performance. Rules and regulations adopted under this paragraph shall to the extent the statewide accountability system is not compromised, allow districts the opportunity to refine the system to meet the individual needs of the district. The performance evaluation system shall also include reasonable opportunity for state and district provision of mentoring and other professional development activities made available to teachers performing unsatisfactorily, which are designed to improve instruction and student achievement;

(xvi) Not later than July 1, 2018, promulgate rules and regulations for implementation and administration of a comprehensive performance evaluation system for school and district leadership, including superintendents, principals and other district or school leaders serving in a similar capacity. The performance evaluation system shall be based in part upon defined student academic performance measures as prescribed by law, upon longitudinal data systems and upon measures of professional practice according to standards prescribed by board rule and regulation. The system shall also allow districts opportunity to refine the system to meet the individual needs of the district and shall include reasonable opportunity for state and district provision of mentoring and other professional development activities made available to district administrative personnel performing unsatisfactorily, designed to improve leadership, management and student achievement;

(xvii) Through the state superintendent, implement, administer and supervise education programs and services for adult visually handicapped and adult hearing impaired persons within the state.

(c) The state board shall perform an ongoing review of state board duties prescribed by law and may make recommendations to the legislature on board duties. In addition and not less than once every nine (9) years, the board shall evaluate and review the uniformity and quality of the educational program standards imposed under W.S. 21-9-101 and 21-9-102 and the student content and performance standards promulgated under paragraph (a)(iii) of this section. The state board, in consultation with the state superintendent, shall establish a process to receive input or concerns related to the student content and performance standards from stakeholders, including but not limited to parents, teachers, school and district administrators and members of the public at large, at any time prior to the formal review by the state board. The state board shall report findings and recommendations to the joint education interim committee of the legislature on or before December 1 of the year in which the formal review and evaluation of the student content and performance standards was undertaken. The joint education interim committee shall report its recommendations, based upon findings and recommendations of the state board, to the legislature during the immediately following legislative session.

(d) Repealed by Laws 1994, ch. 17, § 2.

(e) In addition to subsections (a) and (b) of this section, the state board shall establish statewide goals for Wyoming public education. ~~(a) The state board of education shall:~~

~~(i) Establish policies for public education in this state consistent with the Wyoming Constitution and statutes and may promulgate policies necessary or desirable for the proper and effective implementation of this title and its responsibilities under this title. Nothing in this section shall give the state board rulemaking authority in any area specifically delegated to the state superintendent;~~

~~(ii) Through the evaluation and accreditation of school districts, implement and enforce the uniform standards for educational programs prescribed under W.S. 21-9-101 and 21-9-102 in the public schools of this state, including any educational institution receiving any state funds except for the University of Wyoming and Wyoming community colleges. The board shall ensure that educational programs offered by public schools in accordance with these standards provide students an opportunity to acquire sufficient knowledge and skills, at a minimum, to enter the University of Wyoming and Wyoming community colleges, to prepare students for the job market or postsecondary vocational and technical training and to achieve the general purposes of education that equips students for their role as a citizen and participant in the political system and to have the opportunity to compete both intellectually and economically in society;~~

~~(iii) By policy and regulation and in consultation and coordination with local school districts, prescribe uniform student content and performance standards for the common core of knowledge and the common core of skills specified under W.S. 21-9-101(b), and promulgate uniform standards for programs addressing the special needs of student~~

~~populations specified under W.S. 21-9-101(c) that ensure these student populations are provided the opportunity to learn the common core knowledge and skills as prescribed by the uniform student content and performance standards pursuant to this paragraph. Student content and performance standards prescribed under this paragraph shall include standards for graduation from any high school within any school district of this state and shall describe required performance levels in order to achieve proficiency of the common core of knowledge and common core of skills prescribed under W.S. 21-9-101(b). The ability to prescribe content and performance standards shall not be construed to give the state board of education the authority to prescribe textbooks or curriculum which the state board is hereby forbidden to do. Graduation standards imposed under this paragraph shall require the successful completion of the following components, as evidenced by passing grades or by the successful performance on competency-based equivalency examinations:~~

~~(A) Four (4) school years of English;~~

~~(B) Three (3) school years of mathematics;~~

~~(C) Three (3) school years of science; and~~

~~(D) Three (3) school years of social studies, including history, American government and economic systems and institutions, provided business instructors may instruct classes on economic systems and institutions.~~

~~(iv) Establish, in consultation with local school districts, requirements for students to earn a high school diploma as measured by each district's body of evidence assessment system prescribed by policy and regulation of the state board and required under W.S. 21-3-110(a)(xxiv). A high school diploma shall provide for one (1) of the following endorsements which shall be stated on the transcript of each student:~~

~~(A) Advanced endorsement which requires a student to demonstrate advanced performance in a majority of the areas of the common core of knowledge and skills specified under W.S. 21-9-101(b) and proficient performance in the remaining areas of the specified common core of knowledge and skills, as defined by the uniform student content and performance standards promulgated by the state board pursuant to paragraph (a)(iii) of this section;~~

~~(B) Comprehensive endorsement which requires a student to demonstrate proficient performance in all areas of the common core of knowledge and skills specified under W.S. 21-9-101(b) as defined by the uniform student content and performance standards promulgated by the state board pursuant to paragraph (a)(iii) of this section;~~

~~(C) General endorsement which requires a student to demonstrate proficient performance in a majority of the areas of the common core of knowledge and skills specified under W.S. 21-9-101(b) as defined by the uniform student content and performance standards promulgated by the state board pursuant to paragraph (a)(iii) of this section.~~

~~(v) Through the state superintendent and in consultation and coordination with local school districts, implement a statewide assessment system comprised of a coherent~~

~~system of measures that when combined, provide a reliable and valid measure of individual student achievement for each public school and school district within the state, and the performance of the state as a whole. Improvement of teaching and learning in schools and fostering school program improvement shall be the primary purposes of statewide assessment of student performance in Wyoming. The statewide assessment system shall:~~

~~(A) Measure individual student performance and progress in a manner substantially aligned with the uniform educational program and student content and performance standards imposed by law and by board policy and regulation;~~

~~(B) Be administered at appropriate levels at specified grades and at appropriate intervals aligned to the standards, specifically assessing student performance in reading, writing and mathematics at grades four (4), eight (8) and eleven (11), and effective school year 2005-2006, and each school year thereafter, assessing student performance in reading, writing and mathematics at grades three (3) through eight (8) and at grade eleven (11). In addition and commencing school year 2007-2008 and each school year thereafter, the statewide assessment system shall assess student performance in science not less than once within each grade band for grades three (3) through five (5), grades six (6) through eight (8) and grades ten (10) through twelve (12). The structure and design of the assessment system shall allow for the comprehensive measurement of student performance through assessments that are administered each school year simultaneously on a statewide basis and through assessments administered periodically over the course of the school year which are designed to provide a more comprehensive and in-depth measurement of subject areas aligned to the state content and performance standards. The assessment system may also measure the other common core of knowledge and skills established under W.S. 21-9-101(b) which can be quantified;~~

~~(C) In addition to subparagraph (a)(v)(B) of this section, measure student performance in Wyoming on a comparative basis with student performance nationally;~~

~~(D) Measure year-to-year changes in student performance and progress in the subjects specified under subparagraph (a)(v)(B) of this section and compare and evaluate student achievement during the process of student advancement through grade levels. The assessment system shall ensure the integrity of student performance measurements used at each grade level to enable valid year-to-year comparisons;~~

~~(E) Include multiple measures and item types including grade appropriate multiple choice and open-ended testing such as constructed-response, extended-response and performance-based tasks, to ensure alignment to the statewide student content and performance standards;~~

~~(F) Provide a fair and unbiased assessment of student performance without regard to race, ethnicity, limited English proficiency and socioeconomic status;~~

~~(G) Provide appropriate accommodations or alternative assessments to enable the assessment of students with disabilities as specified under W.S. 21-9-101(c)(i) and students with limited English proficiency;~~

~~(H) Provide a measure of accountability to enhance teaching and learning in Wyoming and in combination with other measures and information, assist school districts in determining individual student progress. The assessment results shall be reported to students, parents, schools, school districts and the public in an accurate, complete and timely manner and shall be used in conjunction with a school district's annual assessment to design educational strategies for improvement and enhancement of student performance. This design for improvement shall be part of each district's school improvement plan. In consultation and coordination with school districts, the board shall review and evaluate the assessment system regularly and based upon uniform statewide reports from each district, annually report to the legislature on student performance at specified grade levels and on school improvement plans.~~

~~(vi) Effective school year 2005-2006 and each school year thereafter, through the state superintendent and in consultation and coordination with local school districts, by policy and regulation establish a statewide accountability system providing annual accountability determinations for all schools and school districts imposing a range of educational consequences resulting from accountability determinations whereby:~~

~~(A) The continuous improvement of student achievement at all schools and appropriate educational interventions fostering continuous improvement serve as the basis for statewide accountability system design;~~

~~(B) Annual accountability determinations within the system are made for each school based upon adequate yearly progress measures defined by the federal No Child Left Behind Act of 2001, as may be subsequently amended, and the school's progress in improving student achievement as measured by adequate yearly progress data and by data from the district's body of evidence assessment system required under W.S. 21-3-110(a)(xxiv) and from other related sources which improve the reliability of accountability determinations as prescribed by policy and regulation of the board;~~

~~(C) To the extent possible, appropriate consequences resulting from accountability determinations are made subject to the discretion of school districts. The system shall establish a range of consequences which increase in the degree of intensity over time, with significant interventions imposed only upon repeated failure to meet school improvement and performance criteria over a consecutive period of time;~~

~~(D) Teacher and administrator quality and student remediation are the focus of consequences imposed upon schools failing to meet school improvement and performance criteria and target levels;~~

~~(E) A range of rewards is provided to schools meeting school improvement and performance criteria at levels set by the state board.~~

~~(b) In addition to subsection (a) of this section and any other duties assigned to it by law, the state board shall:~~

~~(i) Repealed By Laws 1997 Special Session, ch. 3, 302; 1994, ch. 17, 2.~~

~~(ii) Enforce the uniform state educational program standards imposed by W.S. 21-9-101 and 21-9-102 and the uniform student content and performance standards established by policies and regulations adopted under subsection (a) of this section by taking appropriate administrative action with the state superintendent, including but not limited to the changing of accreditation status;~~

~~(iii) Repealed by Laws 1993, ch. 217, 3.~~

~~(iv) Repealed by Laws 1987, ch. 190, 2, 5.~~

~~(v) Initiate or facilitate discussions regarding the needs of and the means for improving education;~~

~~(vi) Repealed by Laws 1987, ch. 190, 2, 5.~~

~~(vii) Repealed by Laws 1994, ch. 17, 2.~~

~~(viii) Approve or disapprove alternative scheduling for school districts requesting to operate for fewer than one hundred seventy-five (175) days in school year, but no schedule shall be approved which reduces the pupil-teacher contact time defined by the state board;~~

~~(ix) Repealed by Laws 1994, ch. 17, 2.~~

~~(x) Repealed by Laws 2006, Chapter 34, 2.~~

~~(xi) Repealed by Laws 1994, ch. 17, 2.~~

~~(xii) Repealed by Laws 1994, ch. 17, 2.~~

~~(xiii) Repealed by Laws 1994, ch. 17, 2.~~

~~(xiv) Establish improvement goals for public schools for assessment of student progress based upon the national assessment of educational progress testing program and the statewide assessment system established under paragraph (a)(v) of this section;~~

~~(xv) Promulgate policies and regulations for the development, assessment and approval of school district teacher performance evaluation systems. Policies and regulations adopted under this paragraph shall allow each district flexibility in developing an evaluation system which meets the individual needs of the district;~~

~~(xvi) Through the state superintendent, implement, administer and supervise education programs and services for adult visually handicapped and adult hearing impaired persons within the state.~~

~~(c) The state board shall perform an ongoing review of state board duties prescribed by law and may make recommendations to the legislature on board duties. In addition and not less than once every five (5) years, the board shall evaluate and review the uniformity and quality of the educational program standards imposed under W.S. 21-9-101 and 21-9-102 and the student content and performance standards promulgated under paragraph (a)(iii) of this section, and shall report findings and recommendations to the joint education interim committee of the legislature on or before December 1 of the year in which the review and evaluation was undertaken. The joint education interim committee shall report its recommendations, based upon findings and recommendations of the state board, to the legislature during the immediately following legislative session.~~

~~(d) Repealed by Laws 1994, ch. 17, 2.~~

~~(e) In addition to subsections (a) and (b) of this section, the state board shall establish statewide goals for Wyoming public education.~~

State Board Policy:

The Board will annually review the established goals at its September meeting. At the meeting following the legislature, the Board Attorney and Board Coordinator will update the Board on any legislative changes that affect the power and duties of the Board.

BOARD MEMBER METHOD OF SELECTION (INCLUDING VACANCY)

Constitutional and Statutory Provisions:

§ 21-2-301. Appointment, qualifications, terms and removal of members, meetings; chairman.

(a) There is created a state board of education composed of thirteen ~~twelve~~ (~~1~~2) voting members, eleven (11) of whom shall be appointed members with at least one (1) member appointed from each appointment district pursuant to W.S. 9-1-218. The remaining voting member of the board shall be the state superintendent of public instruction. The executive director of the Wyoming community college commission shall be an ex-officio member and shall not have the right to vote. One (1) appointed member shall be appointed at large and shall be a certified classroom teacher at the time of appointment. One (1) appointed member shall also be appointed at large and shall be a certified school administrator at the time of appointment. Two (2) appointed members shall be appointed at large and shall be representative of private business or industry in Wyoming. The remaining seven (7) appointed members of the board shall be appointed from among the lay citizens of the state who are electors of the state, known for their public spirit, business or professional ability and interest in education. Not more than six (6) appointed members of the board shall be from one (1) political party. Members shall be appointed for six (6) year terms, except those who may be appointed to fill unexpired terms. Members shall be appointed by the governor with the approval of the senate. Vacancies shall be filled by the governor without senate approval until the next session of the legislature. No member is eligible to reappointment, except any member appointed to fill an unexpired term of less than six (6) years and the term expires on or after January 1, 1996, may be reappointed for one (1) additional six (6) year term. Appointed members of the board may be removed by the governor as provided in W.S. 9-1-202.

(b) During the first quarter of the calendar year a meeting shall be held at which a chairman shall be elected. Meetings may be held at regular intervals as often as the duties of the board require and the board shall meet at the call of the state superintendent of public instruction or the governor or the chairman whenever in the opinion of these officials, or any of them, the need for such meeting exists.

(c) Notwithstanding subsection (a) of this section, the superintendent of public instruction shall not participate in board deliberations on or vote on any matter relating to a contested case involving actions of the department of education.

VACANCY - *Any vacancy shall be filled in the same manner as the original appointment for the unexpired portion of the term*.

State Board Policy:

The Vice-Chair shall report to the board on current status of board members and continue to monitor vacancies and appointments.

BOARD MEMBER RESIGNATION

Constitutional and Statutory Provisions:

Interim Executive Order 1997-4 adopting the Executive Branch Code of Ethics

State Board Policy:

Resignation from the State Board of Education by a Member:

Once a board member accepts public office, he/she may resign at will by submitting a letter of resignation with an effective date to the Governor and a copy to the Chair.

Until a resignation becomes effective or is acted upon by the Governor, it may be withdrawn. Unless otherwise prohibited by law, the board member will continue in office until a successor is qualified.

REMOVAL FROM OFFICE OF A BOARD MEMBER

Constitutional and Statutory Provisions:

§9-1-202. Removal of appointive officers and commissioners; reason for removal to be filed.

(a) Notwithstanding any other provision of law and except as otherwise provided in this section, any person may be removed by the governor, at the governor's pleasure, if appointed by the governor to serve as head of a state agency, department or division, or as a member of a state board or commission. The governor may only remove a member of the Wyoming business council as provided in W.S. 9-12-103.

(b) Any person who holds a state office or commission by appointment of the members of a state board, commission or administrator may be removed by:

(i) The board, commission or administrator which appointed him where provided by law; or

(ii) The governor, for malfeasance or misconduct in office.

(c) Reason for removal of appointed officers or commissioners shall be mailed or delivered to the person to be removed.

State Board Policy:

A board member may be excused from attending a board meeting by the Chair. The Chair's decision not to excuse a board member from attendance at a board meeting may be appealed to the entire Board.

If a board member misses three meetings in a calendar year without an excused absence, the Chair shall request his/her resignation and notify the Governor that such action has been taken.

OFFICERS OF THE BOARD

Constitutional and Statutory Provisions:

§21-2-301. Appointment, qualifications, terms and removal of members, meetings; chairman.

(b) During the first quarter of the calendar year a meeting shall be held at which a chairman shall be elected. Meetings may be held at regular intervals as often as the duties of the board require and the board shall meet at the call of the state superintendent of public instruction or the governor or the chairman whenever in the opinion of these officials, or any of them, the need for such meeting exists.

State Board Policy:

Officers of the State Board of Education shall consist of Chair, Vice-Chair, and the Treasurer.

METHOD OF ELECTION OF OFFICERS

Constitutional and Statutory Provisions:

State Board Policy:

At its first regular meeting of each fiscal year, the Board shall elect from its membership a Chair, Vice-Chair and Treasurer. To facilitate this election, the following process shall be followed:

1. At the November meeting, if agreed upon by majority vote, the current Board Chair shall appoint a three member ad hoc nominating committee for the purpose of bringing forward nominations for Chair, Vice-Chair and Treasurer to the first meeting of the fiscal year.
2. The Board Chair shall designate one of the three appointed members as chair of the nominating committee.
3. The nominating committee shall solicit comments from other board members regarding the characteristics needed by the next Chair, Vice-Chair and Treasurer and on possible nominations for the three offices. Nomination Committee will thoroughly interview any member who shows interest in any of the three offices.
4. At the first meeting of the calendar year, the chair of the nominating committee shall report the recommendations of the committee as to the nominations for the Board's Chair, Vice-Chair and Treasurer.
5. After the nominating committee's report is received, the Board Chair shall open the floor for additional nominations, if there are any.
6. A motion, second and a majority of the membership voting "aye" shall occur for a member to be elected Chair, Vice-Chair and Treasurer.
7. In the event that a vacancy occurs prior to the end of the term of the Board Chair, the Vice-Chair will become Chair and complete the rest of the previous chair's term.
8. If there is a vacancy of Treasurer or Vice-Chair, the Board Chair will appoint a member to serve.
9. To be eligible for election for Chair, Vice-Chair and Treasurer, a member shall currently have served at four quarterly meetings on the Board.
10. The Chair, Vice-Chair and Treasurer shall be elected annually and can only serve three consecutive one-year terms. After serving three consecutive one-year terms as Chair, Vice-Chair and Treasurer, a member shall go out of office for one year before being eligible to serve in that same position again.
11. The current Board Chair will swear in and administer the Oath of Officers of the Board to the newly elected board members immediately following the election but only if the elected member has not held an office before.

The officer's oath will be as set forth below:

Oath of Officers of the Board

OATH: *I, (name) do solemnly swear that I will uphold the duties and the laws of the State of Wyoming based on statutes governing operations of the Wyoming State Board of Education.*

DUTIES OF THE BOARD CHAIR

Constitutional and Statutory Provisions:

§21-2-301 Appointment; qualifications, terms and removal of members; meetings; chairman.

(b) During the first quarter of the calendar year a meeting shall be held at which a chairman shall be elected. Meetings may be held at regular intervals as often as the duties of the board require and the board shall meet at the call of the state superintendent of public instruction or the governor or the chairman whenever in the opinion of these officials, or any of them, the need for such meeting exists.

State Board Policy:

The Chair shall preside at all meetings of the Board and shall be the Board's official representative at all times unless otherwise provided by the Board.

The Chair may appoint members to represent the Board at legislative and legal hearings, conferences, and other meetings deemed appropriate by the Board.

Special meetings may be called by the Chair.

The Chair may appoint special or ad hoc committees as needed.

The chair of a special or ad hoc committee shall be designated by the Board Chair.

The Chair shall, comply with Section 19 of Wyoming State Board of Education policy manual on the development of agendas. ~~in consultation with the State Superintendent, Department Liaison, and Board Attorney develop and recommend approval of the agenda for the regular meeting of the Board at a pre-brief at least two weeks prior to the meeting of the Board. The Board shall approve the agenda at the commencement of each meeting.~~

The Chair shall,at his/her discretion hold a debrief meeting with ~~in consultation~~ with the State Superintendent or designee, Department Liaison, State Board Coordinator, and Board staff ~~Attorney~~ hold a debrief within a month following the meeting of the Board.

The Chair shall sign all contracts that the Board is authorized to execute.

The Chair is responsible for immediate interpretation, application and enforcement of policies related to board membership. All complaints concerning a possible ethical violation shall be made to the Chair who shall make an initial determination of the issue. If further action is warranted, the Chair will pursue an appropriate course of action.

DUTIES OF THE BOARD VICE-CHAIR

Constitutional and Statutory Provisions:

State Board Policy:

In the event the Chair is absent or otherwise unable to perform the duties of that office, the Vice-Chair shall carry out the duties prescribed thereto.

The Vice-Chair shall report to the board on current status of board members and continue to monitor vacancies and appointments.

DUTIES OF THE BOARD TREASURER

Constitutional and Statutory Provisions:

State Board Policy:

The Board Treasurer will review the expenditure reports and report to the Board at each meeting. The Treasurer will be responsible for monitoring the budget and bring concerns to the Board as necessary. The Treasurer's report will be approved at each meeting.

DUTIES OF BOARD MEMBERS

Constitutional and Statutory Provisions:

§21-2-302 Quorum; majority vote.

A majority of the number of voting members of the state board shall constitute a quorum for the transaction of business. A majority vote of the entire state board shall be required for official action.

§16-4-403 Meetings to be open; participation by public; minutes.

(a) All meetings of the governing body of an agency are public meetings, open to the public at all times, except as otherwise provided. No action of a governing body of an agency shall be taken except during a public meeting following notice of the meeting in accordance with this act. Action taken at a meeting not in conformity with this act is null and void and not merely voidable.

(b) A member of the public is not required as a condition of attendance at any meeting to register his name, to supply information, to complete a questionnaire, or fulfill any other condition precedent to his attendance. A person seeking recognition at the meeting may be required to give his name and affiliation.

(c) Minutes of a meeting:

(i) Are required to be recorded but not published from meetings when no action is taken by the governing body;

(ii) Are not required to be recorded or published for day-to-day administrative activities of an agency.

(d) No meeting shall be conducted by electronic means or any other form of communication that does not permit the public to hear, read or otherwise discern meeting discussion contemporaneously. Communications outside a meeting, including, but not limited to, sequential communications among members of an agency, shall not be used to circumvent the purpose of this act.

§21-2-304 Duties of the state board of education.

(a) The state board of education shall:

(i) Establish policies for public education in this state consistent with the Wyoming Constitution and statutes and may promulgate rules necessary or desirable for the proper and effective implementation of this title and its responsibilities under this title. Nothing in this section shall give the state board rulemaking authority in any area specifically delegated to the state superintendent;

(ii) Through the evaluation and accreditation of school districts, implement and enforce the uniform standards for educational programs prescribed under W.S. 21-9-101 and 21-9-

102 in the public schools of this state, including any educational institution receiving any state funds except for the University of Wyoming and Wyoming community colleges, and implement and enforce the statewide education accountability system pursuant to W.S. 21-2-204. The board shall ensure that educational programs offered by public schools in accordance with these standards provide students an opportunity to acquire sufficient knowledge and skills, at a minimum, to enter the University of Wyoming and Wyoming community colleges, to prepare students for the job market or postsecondary vocational and technical training and to achieve the general purposes of education that equips students for their role as a citizen and participant in the political system and to have the opportunity to compete both intellectually and economically in society. In addition, the board shall require school district adherence to the statewide education accountability system;

(iii) By rule and regulation and in consultation and coordination with local school districts, prescribe uniform student content and performance standards for the common core of knowledge and the common core of skills specified under W.S. 21-9-101(b), and promulgate uniform standards for programs addressing the special needs of student populations specified under W.S. 21-9-101(c) that ensure these student populations are provided the opportunity to learn the common core of knowledge and skills as prescribed by the uniform student content and performance standards pursuant to this paragraph. Student content and performance standards prescribed under this paragraph shall include standards for graduation from any high school within any school district of this state. The ability to prescribe content and performance standards shall not be construed to give the state board of education the authority to prescribe textbooks or curriculum which the state board is hereby forbidden to do. Graduation standards imposed under this paragraph shall require the successful completion of the following components, as evidenced by passing grades or by the successful performance on competency based equivalency examinations:

(A) Four (4) school years of English;

(B) Three (3) school years of mathematics;

(C) Three (3) school years of science; and

(D) Three (3) school years of social studies, including history, American government and economic systems and institutions, provided business instructors may instruct classes on economic systems and institutions.

(iv) Effective school year 2013-2014, and each school year thereafter, require district administration of common benchmark adaptive assessments statewide in reading and mathematics for grades one (1) through eight (8) in accordance with W.S. 21-3-110(a)(xxiv). The board shall also establish, in consultation with local school districts, requirements for students to earn a high school diploma as evidenced by course completion and as measured by each district's assessment system prescribed by rule and regulation of the state board and required under W.S. 21-3-110(a)(xxiv). Once every five (5) years and on a staggered basis, the state board shall through the department, review and approve each district's assessment system designed to determine the various levels of student performance as aligned with the uniform state standards and the attainment of high school graduation requirements as evidenced by course completion. In addition and following review, refinement and revision of student content and performance standards adopted under paragraph (a)(iii) of this section and reviewed under subsection (c) of this section, the board shall establish a process to ensure district assessment systems are aligned with the refined and revised standards within three (3) full school years following adoption of revised standards;

(A) through (C) Repealed by Laws 2015, ch. 179, § 3.

(v) Through the state superintendent and in consultation and coordination with local school districts, implement a statewide assessment system comprised of a coherent system of measures that when combined, provide a reliable and valid measure of individual student achievement for each public school and school district within the state, and the performance of the state as a whole. Statewide assessment system components shall be in accordance with requirements of the statewide education accountability system pursuant to W.S. 21-2-204. Improvement of teaching and learning in schools, attaining student achievement targets for performance indicators established under W.S. 21-2-204 and fostering school program improvement shall be the primary purposes of statewide assessment of student performance in Wyoming. The statewide assessment system shall:

(A) Measure individual student performance and progress in a manner substantially aligned with the uniform educational program and student content and performance standards imposed by law and by board rule and regulation;

(B) Effective school year 2012-2013, and each school year thereafter, be administered in specified grades aligned to the student content and performance standards, specifically assessing student performance in reading and mathematics at grades three (3) through eight (8). In addition, the statewide assessment system shall assess student performance in science in grades four (4) and eight (8);

(C) In addition to subparagraph (a)(v)(B) of this section, measure student performance in Wyoming on a comparative basis with student performance nationally;

(D) Measure year-to-year changes in student performance and progress in the subjects specified under subparagraph (a)(v)(B) of this section and by school year 2015-2016, link student performance and progress to school and district leaders, including superintendents, principals and other district or school leaders serving in a similar capacity. The assessment system shall ensure the student performance measurements used at each grade level are valid for the purposes for which they are being used, including valid year-to-year comparisons of student and school level results, and shall be sufficient to produce necessary data to enable application of measures of performance indicators as required under W.S. 21-2-204;

(E) Use only multiple choice items to ensure alignment to the statewide content and performance standards;

(F) Provide a fair and unbiased assessment of student performance without regard to race, ethnicity, limited English proficiency and socioeconomic status;

(G) Provide appropriate accommodations or alternative assessments to enable the assessment of students with disabilities as specified under W.S. 21-9-101(c)(i) and students with limited English proficiency;

(H) Provide a measure of accountability to enhance learning in Wyoming and in combination with other measures and information, assist school districts in determining individual student progress as well as school level achievement, growth and readiness targets. In addition to reporting requirements imposed under W.S. 21-2-204, the assessment results shall be reported to students, parents, schools, school districts and the public in an accurate, complete and timely manner. Assessment results shall be used in conjunction with each school district's assessments to design educational strategies for improvement and enhancement of student performance required under W.S. 21-2-204. Assessment results shall also be used to guide actions by the state board and the department in providing and directing a progressive multi-tiered system of support, intervention and consequences to districts in developing school improvement plans in response to student performance to attain target levels measured and established under W.S. 21-2-204. In consultation and coordination with school districts, the board shall subject to W.S. 21-2-204, review and evaluate the assessment system regularly and based upon uniform statewide reports, annually report to the legislature as required under W.S. 21-2-204.

(vi) Subject to and in accordance with W.S. 21-2-204, through the state superintendent and in consultation and coordination with local school districts, by rule and regulation implement a statewide accountability system. The accountability system shall include a technically defensible approach to calculate achievement, growth, readiness and equity as required by W.S. 21-2-204. The state board shall establish performance targets as required by W.S. 21-2-204(e), establish a progressive multi tiered system of supports, interventions and consequences as required by W.S. 21-2-204(f) and shall establish a statewide reporting system pursuant to W.S. 21-2-204(h). The system created shall conform to the January 2012 education accountability report as defined by W.S. 21-2-204(k). In addition and for purposes of complying with requirements under the federal No Child Left Behind Act of 2001, the board shall by rule and regulation provide for annual accountability determinations based upon adequate yearly progress measures imposed by federal law for all schools and school districts imposing a range of educational consequences and supports resulting from accountability determinations;

(vii) Repealed by Laws 2012, ch. 101, § 2.

(b) In addition to subsection (a) of this section and any other duties assigned to it by law, the state board shall:

(i) Repealed by Laws 1997 Special Session, ch. 3, § 302; 1994, ch. 17, § 2.

(ii) Enforce the uniform state educational program standards imposed by W.S. 21-9-101 and 21-9-102 and the uniform student content and performance standards established by rules and regulations adopted under subsection (a) of this section, together with student performance indicators established and measured pursuant to W.S. 21-2-204, by taking appropriate administrative action with the state superintendent, including but not limited to the changing of accreditation status;

(iii) Repealed by Laws 1993, ch. 217, § 3.

(iv) Repealed by Laws 1987, ch. 190, §§ 2, 5.

(v) Initiate or facilitate discussions regarding the needs of and the means for improving education;

(vi) Repealed by Laws 1987, ch. 190, §§ 2, 5.

(vii) Repealed by Laws 1994, ch. 17, § 2.

(viii) Approve or disapprove alternative scheduling for school districts requesting to operate for fewer than one hundred seventy-five (175) days in school year, but no schedule shall be approved which reduces the pupil-teacher contact time defined by the state board;

(ix) Repealed by Laws 1994, ch. 17, § 2.

(x) Repealed by Laws 2006, ch. 34, § 2.

(xi) through (xiii) Repealed by Laws 1994, ch. 17, § 2.

(xiv) Based upon student performance levels determined under W.S. 21-2-204, establish improvement goals for public schools for assessment of student progress based upon the national assessment of educational progress testing program and the statewide assessment system established under paragraph (a)(v) of this section;

(xv) Not later than July 1, 2019, promulgate rules and regulations for the implementation and administration of a comprehensive school district teacher performance evaluation system based in part upon defined student academic performance measures as prescribed by law, upon longitudinal data systems and upon measures of professional practice according to standards for professional practice prescribed by board rule and regulation. The evaluation system shall clearly prescribe standards for highly effective performance, effective performance, performance in need of improvement and ineffective performance. Rules and regulations adopted under this paragraph shall to the extent the statewide accountability system is not compromised, allow districts the opportunity to refine the system to meet the individual needs of the district. The performance evaluation system shall also include reasonable opportunity for state and district provision of mentoring and other professional development activities made available to teachers performing unsatisfactorily, which are designed to improve instruction and student achievement;

(xvi) Not later than July 1, 2018, promulgate rules and regulations for implementation and administration of a comprehensive performance evaluation system for school and district leadership, including superintendents, principals and other district or school leaders serving in a similar capacity. The performance evaluation system shall be based in part upon defined student academic performance measures as prescribed by law, upon longitudinal data systems and upon measures of professional practice according to standards prescribed by board rule and regulation. The system shall also allow districts opportunity to refine the system to meet the individual needs of the district and shall include reasonable opportunity for state and district provision of mentoring and other professional development activities made available to district administrative personnel performing unsatisfactorily, designed to improve leadership, management and student achievement;

(xvii) Through the state superintendent, implement, administer and supervise education programs and services for adult visually handicapped and adult hearing impaired persons within the state.

(c) The state board shall perform an ongoing review of state board duties prescribed by law and may make recommendations to the legislature on board duties. In addition and not less than once every nine (9) years, the board shall evaluate and review the uniformity and quality of the educational program standards imposed under W.S. 21-9-101 and 21-9-102 and the student content and performance standards promulgated under paragraph (a)(iii) of this section. The state board, in consultation with the state superintendent, shall establish a process to receive input or concerns related to the student content and performance standards from stakeholders, including but not limited to parents, teachers, school and district administrators and members of the public at large, at any time prior to the formal review by the state board. The state board shall report findings and recommendations to the joint education interim committee of the legislature on or before December 1 of the year in which the formal review and evaluation of the student content and performance standards was undertaken. The joint education interim committee shall report its recommendations, based upon findings and recommendations of the state board, to the legislature during the immediately following legislative session.

(d) Repealed by Laws 1994, ch. 17, § 2.

(e) In addition to subsections (a) and (b) of this section, the state board shall establish statewide goals for Wyoming public education.

~~(a) The state board of education shall:~~

~~(i) Establish policies for public education in this state consistent with the Wyoming Constitution and statutes and may promulgate policies necessary or desirable for the proper and effective implementation of this title and its responsibilities under this title. Nothing in this section shall give the state board policymaking authority in any area specifically delegated to the state superintendent;~~

~~(ii) Through the evaluation and accreditation of school districts, implement and enforce the uniform standards for educational programs prescribed under W.S. 21-9-101 and 21-9-102 in the public schools of this state, including any educational institution receiving any state funds except for the University of Wyoming and Wyoming community colleges. The board shall ensure that educational programs offered by public schools in accordance with these standards provide students an opportunity to acquire sufficient knowledge and skills, at a minimum, to enter the University of Wyoming and Wyoming community colleges, to prepare students for the job market or postsecondary vocational and technical training and to achieve the general purposes of education that equips students for their role as a citizen and participant in the political system and to have the opportunity to compete both intellectually and economically in society;~~

~~(iii) By policy and regulation and in consultation and coordination with local school districts, prescribe uniform student content and performance standards for the common core of knowledge and the common core of skills specified under W.S. 21-9-101(b), and promulgate uniform standards for programs addressing the special needs of student populations specified under W.S. 21-9-101(c) that ensure these student populations are provided the opportunity to learn the common core knowledge and skills as prescribed by the uniform student content and performance standards pursuant to this paragraph. Student content and performance standards prescribed under this paragraph shall include standards for graduation from any high school within any school district of this state and shall describe required performance levels in order to achieve proficiency of the common core of knowledge and common core of skills prescribed under W.S. 21-9-101(b). The ability to prescribe content and performance standards shall not be construed to give the state board of education the authority to prescribe textbooks or curriculum which the state board is hereby forbidden to do. Graduation standards imposed under this paragraph shall require the successful completion of the following components, as evidenced by passing grades or by the successful performance on competency-based equivalency examinations:~~

~~(A) Four (4) school years of English;~~

~~(B) Three (3) school years of mathematics;~~

~~(C) Three (3) school years of science; and~~

~~(D) Three (3) school years of social studies, including history, American government and economic systems and institutions, provided business instructors may instruct classes on economic systems and institutions.~~

~~(iv) Establish, in consultation with local school districts, requirements for students to earn a high school diploma as measured by each district's body of evidence assessment system prescribed by policy and regulation of the state board and required under W.S. 21-3-110(a)(xxiv). A high school diploma shall provide for one (1) of the following endorsements which shall be stated on the transcript of each student:~~

~~(A) Advanced endorsement which requires a student to demonstrate advanced performance in a majority of the areas of the common core of knowledge and skills specified under W.S. 21-9-101(b) and proficient performance in the remaining areas of the specified common core of knowledge and skills, as defined by the uniform student content and performance standards promulgated by the state board pursuant to paragraph (a)(iii) of this section;~~

~~(B) Comprehensive endorsement which requires a student to demonstrate proficient performance in all areas of the common core of knowledge and skills specified under W.S. 21-9-101(b) as defined by the uniform student content and performance standards promulgated by the state board pursuant to paragraph (a)(iii) of this section;~~

~~(C) General endorsement which requires a student to demonstrate proficient performance in a majority of the areas of the common core of knowledge and skills specified under W.S. 21-9-101(b) as defined by the uniform student content and performance standards promulgated by the state board pursuant to paragraph (a)(iii) of this section.~~

~~(v) Through the state superintendent and in consultation and coordination with local school districts, implement a statewide assessment system comprised of a coherent system of measures that when combined, provide a reliable and valid measure of individual student achievement for each public school and school district within the state, and the performance of the state as a whole. Improvement of teaching and learning in schools and fostering school program improvement shall be the primary purposes of statewide assessment of student performance in Wyoming. The statewide assessment system shall:~~

~~(A) Measure individual student performance and progress in a manner substantially aligned with the uniform educational program and student content and performance standards imposed by law and by board policy and regulation;~~

~~(B) Be administered at appropriate levels at specified grades and at appropriate intervals aligned to the standards, specifically assessing student performance in reading, writing and mathematics at grades four (4), eight (8) and eleven (11), and effective school year 2005-2006, and each school year thereafter, assessing~~

~~student performance in reading, writing and mathematics at grades three (3) through eight (8) and at grade eleven (11). In addition and commencing school year 2007-2008 and each school year thereafter, the statewide assessment system shall assess student performance in science not less than once within each grade band for grades three (3) through five (5), grades six (6) through eight (8) and grades ten (10) through twelve (12). The structure and design of the assessment system shall allow for the comprehensive measurement of student performance through assessments that are administered each school year simultaneously on a statewide basis and through assessments administered periodically over the course of the school year which are designed to provide a more comprehensive and in-depth measurement of subject areas aligned to the state content and performance standards. The assessment system may also measure the other common core of knowledge and skills established under W.S. 21-9-101(b) which can be quantified;~~

~~(C) In addition to subparagraph (a)(v)(B) of this section, measure student performance in Wyoming on a comparative basis with student performance nationally;~~

~~(D) Measure year-to-year changes in student performance and progress in the subjects specified under subparagraph (a)(v)(B) of this section and compare and evaluate student achievement during the process of student advancement through grade levels. The assessment system shall ensure the integrity of student performance measurements used at each grade level to enable valid year-to-year comparisons;~~

~~(E) Include multiple measures and item types including grade appropriate multiple choice and open-ended testing such as constructed-response, extended-response and performance-based tasks, to ensure alignment to the statewide student content and performance standards;~~

~~(F) Provide a fair and unbiased assessment of student performance without regard to race, ethnicity, limited English proficiency and socioeconomic status;~~

~~(G) Provide appropriate accommodations or alternative assessments to enable the assessment of students with disabilities as specified under W.S. 21-9-101(c)(i) and students with limited English proficiency;~~

~~(H) Provide a measure of accountability to enhance teaching and learning in Wyoming and in combination with other measures and information, assist school districts in determining individual student progress. The assessment results shall be reported to students, parents, schools, school districts and the public in an accurate, complete and timely manner and shall be used in conjunction with a school district's annual assessment to design educational strategies for improvement and enhancement of student performance. This design for improvement shall be part of each district's school improvement plan. In consultation and coordination with school districts, the board shall review and evaluate the assessment system regularly and based upon uniform statewide reports from each district, annually report to the legislature on student performance at specified grade levels and on school improvement plans.~~

~~(vi) Effective school year 2005-2006 and each school year thereafter, through the state superintendent and in consultation and coordination with local school districts, by policy and regulation establish a statewide accountability system providing annual accountability determinations for all schools and school districts imposing a range of educational consequences resulting from accountability determinations whereby:~~

~~(A) The continuous improvement of student achievement at all schools and appropriate educational interventions fostering continuous improvement serve as the basis for statewide accountability system design;~~

~~(B) Annual accountability determinations within the system are made for each school based upon adequate yearly progress measures defined by the federal No Child Left Behind Act of 2001, as may be subsequently amended, and the school's progress in improving student achievement as measured by adequate yearly progress data and by data from the district's body of evidence assessment system required under W.S. 21-3-110(a)(xxiv) and from other related sources which improve the reliability of accountability determinations as prescribed by policy and regulation of the board;~~

~~(C) To the extent possible, appropriate consequences resulting from accountability determinations are made subject to the discretion of school districts. The system shall establish a range of consequences which increase in the degree of intensity over time, with significant interventions imposed only upon repeated failure to meet school improvement and performance criteria over a consecutive period of time;~~

~~(D) Teacher and administrator quality and student remediation are the focus of consequences imposed upon schools failing to meet school improvement and performance criteria and target levels;~~

~~(E) A range of rewards is provided to schools meeting school improvement and performance criteria at levels set by the state board.~~

~~(b) In addition to subsection (a) of this section and any other duties assigned to it by law, the state board shall:~~

~~(i) Repealed By Laws 1997 Special Session, ch. 3, 302; 1994, ch. 17, 2.~~

~~(ii) Enforce the uniform state educational program standards imposed by W.S. 21-9-101 and 21-9-102 and the uniform student content and performance standards established by policies and regulations adopted under subsection (a) of this section by taking appropriate administrative action with the state superintendent, including but not limited to the changing of accreditation status;~~

~~(iii) Repealed by Laws 1993, ch. 217, 3.~~

~~(iv) Repealed by Laws 1987, ch. 190, 2, 5.~~

~~(v) Initiate or facilitate discussions regarding the needs of and the means for improving education;~~

~~(vi) Repealed by Laws 1987, ch. 190, 2, 5.~~

~~(vii) Repealed by Laws 1994, ch. 17, 2.~~

~~(viii) Approve or disapprove alternative scheduling for school districts requesting to operate for fewer than one hundred seventy-five (175) days in school year, but no schedule shall be approved which reduces the pupil-teacher contact time defined by the state board;~~

~~(ix) Repealed by Laws 1994, ch. 17, 2.~~

~~(x) Repealed by Laws 2006, Chapter 34, 2.~~

~~(xi) Repealed by Laws 1994, ch. 17, 2.~~

~~(xii) Repealed by Laws 1994, ch. 17, 2.~~

~~(xiii) Repealed by Laws 1994, ch. 17, 2.~~

~~(xiv) Establish improvement goals for public schools for assessment of student progress based upon the national assessment of educational progress testing program and the statewide assessment system established under paragraph (a)(v) of this section;~~

~~(xv) Promulgate policies and regulations for the development, assessment and approval of school district teacher performance evaluation systems. Policies and regulations adopted under this paragraph shall allow each district flexibility in developing an evaluation system which meets the individual needs of the district;~~

~~(xvi) Through the state superintendent, implement, administer and supervise education programs and services for adult visually handicapped and adult hearing impaired persons within the state.~~

~~(c) The state board shall perform an ongoing review of state board duties prescribed by law and may make recommendations to the legislature on board duties. In addition and not less than once every five (5) years, the board shall evaluate and review the uniformity and quality of the educational program standards imposed under W.S. 21-9-101 and 21-9-102 and the student content and performance standards promulgated under paragraph (a)(iii) of this section, and shall report findings and recommendations to the joint education interim committee of the legislature on or before December 1 of the year in which the review and evaluation was undertaken. The joint education interim committee shall report its recommendations, based upon findings and recommendations of the state board, to the legislature during the immediately following legislative session.~~

~~(d) Repealed by Laws 1994, ch. 17, 2.~~

~~(e) In addition to subsections (a) and (b) of this section, the state board shall establish statewide goals for Wyoming public education.~~

§21-2-306 Reports of the state superintendent and state board.

The state superintendent and the state board shall, in accordance with W.S. 9-2-1014, report to the governor and recommend such legislation concerning education and appropriations for educational activities as they may deem appropriate.

State Board Policy:

Duties of members of the State Board of Education shall include but not be limited to the following:

1. Regularly attend meetings of the Board, enter into discussions, and participate in decision-making on items coming before the Board.

2. Study and be familiar with agenda items sent to board members prior to each meeting.

3. Serve on committees when requested to do so by the Chair.

4. Refer problems brought to the attention of the individual board member to the Chair and if necessary engage the Board for review, action, or submission to the Board.

5. Recognize that each individual board member has no authority to act for the entire Board except at the request of the Board.

6. Provide information on Board activities to the Chair and Superintendent of each school district (s)he represents.

7. Board members who need specific information from the Wyoming State Department staff can contact the Board Assistant ~~Secretary~~, the Board Coordinator, the Deputy Superintendent, or the Department Liaison~~, or the Division Director~~. If the Board member feels the response is not satisfactory, he/she will then contact the Chair for assistance.

NEW BOARD MEMBER ORIENTATION

Constitutional and Statutory Provisions:

State Board Policy:

The Chair, with the assistance of the Board staff, ~~State Superintendent and~~ Department Liaison, Board Attorney and at least one sitting Board member shall provide an orientation for new board members before their first board meeting.

BOARD MEMBERS COMPENSATION AND EXPENSES

Constitutional and Statutory Provisions:

§21-2-303. Expenses & Compensation.

All appointed members of the state board shall receive compensation, per diem, and mileage for actual time spent in performance of their duties and traveling expenses while in attendance, and going to and from board meetings in the same manner and amount as members of the Wyoming legislature.

State Board Policy: As defined in the Wyoming State Board of Education Travel Regulations adopted May 2013

BUDGET GUIDELINES AND GENERAL POLICIES FOR REIMBURSEMENT

~~**Printing**~~

~~Agenda guides (colored tabs sent with packets) are to be recycled by returning them to the State Board of Education's executive assistant.~~

Budget Authority

The first level of $750 is at the department discretion to spend on behalf of the Board. The second level requires approval from the Board Officers to spend between $750 and $2,000. Any amount above $2,000 would need approval from majority of the Board

Adopted 1-9-13

Room Rental

Meeting rooms are to be obtained without cost whenever possible.

Travel Reimbursement

All Board Member shall be reimbursed in accordance of **§ 21-2-303.** All overnight travel, other than regular Board meetings or hearings must be pre-approved by the Board Chair. All convention expenses must receive prior approval of the Board Chair.

Explanation: *When planning on attending a conference or meeting other than a regularly scheduled Board meeting or hearing, contact the executive assistant for the State Board and explain the proposed travel arrangements. The executive assistant will then figure the appropriate cost of the conference or meeting and contact the Board Chair for approval. The executive assistant will then notify the Board member of the approval.*

When claiming actual expenses the below guidelines will be used:

~~**Meals**~~

~~Meals may be reimbursed as to the State's meal allowance when traveling on official State Board of Education business.~~

Mileage

State Board of Education members are reimbursed in accordance with the state approved mileage rate.

Lodging

Lodging shall be reimbursed for actual expenses incurred upon presentation of a paid receipt. The government rate should be obtained at all hotels, when available.

Per Diem

Per Diem will be paid at the state approved rate.

BOARD-STATE SUPERINTENDENT RELATIONS

Constitutional and Statutory Provisions:

State Board Policy:

The Board and State Superintendent shall "*cooperate fully at all times to the end that the State system of public education may constantly be improved*."

The Chair will be contacted promptly on any correspondence and or meetings that involve the Wyoming State Board of Education.

ATTORNEY

Constitutional and Statutory Provisions:

§9-1-608 (b). Assistant attorneys general.

The State Attorney General represents the State Board and the State Board cannot retain other counsel without the Attorney General's approval.

> With the approval of the governor the attorney general may appoint special assistant attorneys general for any purposes. A person shall not be employed as an attorney or legal counsel by any department, board, agency, commission or institution of the state, or represent the state in that capacity, except by the written appointment of the attorney general. Written appointment of the attorney general shall not be required for the employment of legal counsel by elected state officials.

State Board Policy:

Any board member may directly contact the Attorney for assistance.

BOARD MEETINGS

Constitutional and Statutory Provisions:

§16-4-403 Meetings to be open; participation by public; minutes.

(a) All meetings of the governing body of an agency are public meetings, open to the public at all times, except as otherwise provided. No action of a governing body of an agency shall be taken except during a public meeting following notice of the meeting in accordance with this act. Action taken at a meeting not in conformity with this act is null and void and not merely voidable.

(b) A member of the public is not required as a condition of attendance at any meeting to register his name, to supply information, to complete a questionnaire, or fulfill any other condition precedent to his attendance. A person seeking recognition at the meeting may be required to give his name and affiliation.

(c) Minutes of a meeting:

(i) Are required to be recorded but not published from meetings when no action is taken by the governing body;

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State Board Policy:

Types of State Board Meetings

Meetings of the Board may include regular meetings, special meetings, emergency meetings, committee meetings, and public hearings.

Annual Organizational Meeting

The January/February meeting will be considered an annual meeting for purposes of the election of officers.

Regular Board Meetings

Regular meetings of the Board shall be held in January/February and then may be held in~~,~~ March, April, May, June, August, September, October and November, so long as the Board meets at least four ~~of every~~times every year. The Board will be in consensus on the locations. ~~The April meeting coincides with the Teacher of the Year Banquet.~~

Regular Board meetings will be held in conjunction with the State Board of Vocational Education. When appropriate, the State Board of Education will adjourn and immediately reconvene as the State Board of Vocational Education.

Special Board Meetings

Special meetings of the Board may be called by the Chair or a majority of board members.

There are certain items that are discussed at the same time every year.

State Board of Education Meetings

January/February

- Legislature
- Review BOCES/BOCHES Agreements
- Election of Officers and review of duties
- Invitation to the Governor to attend

April

- Charter Schools Update
- ~~Accreditation Update~~
- Set annual meeting schedule
- Review of strategic plan

June

- Accreditation
- Alternative School Schedules
- Budget
- Select committee to review policy manual

September Retreat (Chair's choice of location)

- Board training and self-evaluation (NASBE is recommended)
- Review and update Wyoming Education Goals and Strategic Plan
- Review recommendations from policy manual committee
- Review of legislative issues

November

- Review the recommendations of the self-evaluation
- Nominating Committee appointed if needed
- Adopt any policies of governance changes

Other topics

- Restructuring
- ~~Common Core State Standards~~ Wyoming Content and Performance Standards
- ~~Common Core Skill~~
- ~~Body of Evidence/Assessment~~ District Assessment System and Statewide Assessment Issues

- Court Ordered Placement-Residential Treatment Center Approval
- Charter School
- District and School Accountability
- Boundary Changes

BOARD PUBLIC HEARINGS

Constitutional and Statutory Provisions:

§16-4-403. Meetings to be open; participation by public; minutes.

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State Board Policy:

BOARD MEETING AGENDAS

Constitutional and Statutory Provisions:

§16-4-403. Meetings to be open; participation by public; minutes.

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State Board Policy:

The Chair shall call for agenda items at least two weeks prior to a scheduled meeting. Any member of the Board, as well as the WDE Board liaison and SBE Coordinator may submit agenda items that are linked to SBE work, legislative or statutory mandates, or strategic priorities. The Executive Assistant will distribute draft copies of the agenda to all SBE members and solicit suggestions for revisions. The Chair, Vice-Chair, and Chair of the Supervisory Committee will finalize the agenda by determining the items and the order in which the items will be placed on the agenda. The State Director of Vocational Education will provide items for the State Board of Vocational Education meeting agenda. The Executive A~~a~~ssistant will determine a deadline for submission of supporting items for the board meeting packet. Supporting information shall be provided by the deadline or the item may be removed from the agenda. The Board understands that emergencies arise and some items may occasionally need to be added. A complete Board packet will be distributed to Board members one week prior to the meeting. Board members who have questions or want additional information should submit those requests to the Executive Assistant prior to the meeting so she can communicate with the presenter.

The Board will approve the agenda at the beginning of each meeting. Members may request clarification or explanation on any item. The Chair will entertain one motion and a second to approve all items on the agenda as a whole. Any item may be removed from the ~~working agenda~~work or business session by consensus of the Board.

The agenda for the working session of the meeting will contain items of a routine nature and to the extent possible include items such as:

- Written reports from the WDE on compliance issues, rule and regulations efforts, progress on statewide testing development, work on content standards, and WDE initiatives
- Written reports from the SBE Coordinator
- SBE Committee reports
- Monitoring of SBE strategic goals
- Visits to schools
- Professional learning and growth for SBE members

The agenda for the business session of the meeting will contain items that will need discussion and action. Previous board meeting minutes and the treasurer's report shall be presented and approved. Discussion items that may require action to be taken at a subsequent meeting will be presented during the business meeting. Every effort should be made to have items appear as a discussion issues prior to taking action at a later meeting. Public comments will be addressed during the business session.

The agenda for the State Board of Vocational Education will contain items relevant to career technical education.

The meeting agenda may be amended at the beginning of each meeting by motion and subsequent majority vote.

There are certain items that are discussed at the same time every year. Below is a timeline outlining these items:

State Board of Education Meetings

January/February

- Legislature
- Review BOCES/BOCHES Agreements
- Election of Officers and review of duties
- Invitation to the Governor to attend

April

- Charter Schools Update
- ~~Accreditation Update~~

- Set annual meeting schedule
- Review of strategic plan

June
- Accreditation
- Alternative School Schedules
- Budget
- Select committee to review policy manual

September Retreat (Chair's choice of location)
- Board training and self-evaluation (NASBE is recommended)
- Review and update Wyoming Education Goals and Strategic Plan
- Review recommendations from policy manual committee
- Review of legislative issues

November
- Review the recommendations of the self-evaluation
- Nominating Committee appointed if needed
- Adopt any policies of governance changes

Other topics
- Restructuring
- ~~Common Core State Standards~~ Wyoming Content and Performance Standards
- ~~Common Core Skill~~
- ~~Body of Evidence/Assessment~~ District Assessment System and Statewide Assessment Issues
- Court Ordered Placement-Residential Treatment Center Approval
- Charter School
- District and School Accountability
- Boundary Changes

~~**State Board of Education Timeline**~~

~~**January/February**~~
- ~~Legislature~~
- ~~Review BOCES/BOCHES Agreements~~
- ~~Election of Officers~~
- ~~Invitation to the Governor to attend~~

~~**April**~~
- ~~Charter Schools Update~~
- ~~Accreditation Update~~
- ~~Set annual meeting schedule~~
- ~~Review of strategic plan~~

~~**June**~~
- ~~Accreditation~~
- ~~Alternative School Schedules~~
- ~~Budget~~
- ~~Select committee to review policy manual~~

~~September Retreat (Chair's choice of location)~~

- ~~Board training and self-evaluation (NASBE is recommended)~~
- ~~Review and update Wyoming Education Goals and Strategic Plan~~
- ~~Review recommendations from policy manual committee~~
- ~~Review of legislative issues~~

~~November (usually held in Casper with WSBA)~~

- ~~Review the recommendations of the self-evaluation~~
- ~~Nominating Committee appointed~~
- ~~Adopt any policies of governance changes~~

~~Other topics~~

- ~~Restructuring~~
- ~~Common Core State Standards~~
- ~~Common Core Skills~~
- ~~Body of Evidence/Assessment~~
- ~~Court Ordered Placement-Residential Treatment Center Approval~~
- ~~Policies~~
- ~~Boundary Changes~~

BOARD MEETING MINUTES

Constitutional and Statutory Provisions:

§16-4-403. Meetings to be open; participation by public; minutes.

(a) All meetings of the governing body of an agency are public meetings, open to the public at all times, except as otherwise provided. No action of a governing body of an agency shall be taken except during a public meeting following notice of the meeting in accordance with this act. Action taken at a meeting not in conformity with this act is null and void and not merely voidable.

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State Board Policy:

The Executive Assistant shall have recorded the minutes of the proceedings of the Board. The official minutes of the State Board of Education shall be kept in the State Board of Education's office located at the Wyoming Department of Education ~~Office of the State Superintendent~~ and shall be open to inspection by the public.

A copy of the minutes of a meeting of the Board shall be e-mailed to each board member and the minutes shall be approved at the succeeding meeting. The minutes shall not be considered official unless and until approved by the Board.

Recording Public Speakers Comments during Public Comment Period

The minutes will reflect only the speaker's name, organization and topic of discussion. A copy of any preprinted public speaker's comments handed out at the meeting shall be attached to the minutes.

EXECUTIVE SESSIONS

Constitutional and Statutory Provisions:

§16-4-405. Executive sessions.

(a) A governing body of an agency may hold executive sessions not open to the public:

(i) With the attorney general, county attorney, district attorney, city attorney, sheriff, chief of police or their respective deputies, or other officers of the law, on matters posing a threat to the security of public or private property, or a threat to the public's right of access;

(ii) To consider the appointment, employment, right to practice or dismissal of a public officer, professional person or employee, or to hear complaints or charges brought against an employee, professional person or officer, unless the employee, professional person or officer requests a public hearing. The governing body may exclude from any public or private hearing during the examination of a witness, any or all other witnesses in the matter being investigated. Following the hearing or executive session, the governing body may deliberate on its decision in executive sessions;

(iii) On matters concerning litigation to which the governing body is a party or proposed litigation to which the governing body may be a party;

(iv) On matters of national security;

(v) When the agency is a licensing agency while preparing, administering or grading examinations;

(vi) When considering and acting upon the determination of the term, parole or release of an individual from a correctional or penal institution;

(vii) To consider the selection of a site or the purchase of real estate when the publicity regarding the consideration would cause a likelihood of an increase in price;

(viii) To consider acceptance of gifts, donations and bequests which the donor has requested in writing be kept confidential;

(ix) To consider or receive any information classified as confidential by law;

(x) To consider accepting or tendering offers concerning wages, salaries, benefits and terms of employment during all negotiations;

(xi) To consider suspensions, expulsions or other disciplinary action in connection with any student as provided by law.

(b) Minutes shall be maintained of any executive session. Except for those parts of minutes of an executive session reflecting a members' objection to the executive session as being in violation of this act, minutes and proceedings of executive sessions shall be confidential and produced only in response to a valid court order.

(c) Unless a different procedure or vote is otherwise specified by law, an executive session may be held only pursuant to a motion that is duly seconded and carried by majority vote of the members of the governing body in attendance when the motion is made. A motion to hold an executive session which specifies any of the reasons set forth in paragraphs (a)(i) through (xi) of this section shall be sufficient notice of the issue to be considered in an executive session. ~~(a) A governing body of an agency may hold executive sessions not open to the public:~~

~~(i) With the attorney general, county attorney, district attorney, city attorney, sheriff, chief of police or their respective deputies, or other officers of the law, on matters posing a threat to the security of public or private property, or a threat to the public's right of access;~~

~~(ii) To consider the appointment, employment, right to practice or dismissal of a public officer, professional person or employee, or to hear complaints or charges brought against an employee, professional person or officer, unless the employee, professional person or officer requests a public hearing. The governing body may exclude from any public or private hearing during the examination of a witness, any or all other witnesses in the matter being investigated. Following the hearing or executive session, the governing body may deliberate on its decision in executive sessions;~~

~~(iii) On matters concerning litigation to which the governing body is a party or proposed litigation to which the governing body may be a party;~~

~~(iv) On matters of national security;~~

~~(v) When the agency is a licensing agency while preparing, administering or grading examinations;~~

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~~(xi) To consider suspensions, expulsions or other disciplinary action in connection with any student as provided by law.~~

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~~(c) Unless a different procedure or vote is otherwise specified by law, an executive session may be held only pursuant to a motion that is duly seconded and carried by majority vote of the members of the governing body in attendance when the motion is made.~~

State Board Policy:

The Board, by majority vote of the membership present, may go into executive session for the reasons specified by law. (See Statute as printed above.) An executive session is commonly attended by members of the board, ~~Department Liaison~~, Board Attorney, Executive Assistant ~~Recording Secretary~~, and staff identified by the Chair as necessary to contribute to items under consideration; and, if applicable, parties being heard on appropriate executive sessions matters.

Before going into executive session, the Chair shall put the question of whether to meet in executive session to vote. If such vote is favorable, the Chair will then announce the *specific* purpose of the executive session, identify the reason for going into an executive session.

No vote will be taken in executive session. A vote may be taken on any action discussed in executive session only after the Board returns to open session. No notes will be taken in executive session except for the Recording Secretary, and everything is confidential.

Minutes will be taken in executive session; however, the minutes shall be confidential and produced only in response to a valid court order.

VOTING METHOD

Constitutional and Statutory Provisions:

State Board Policy:

Votes of the Board shall be by voice vote. The Chair may call for a show of hands in cases where it cannot be determined whether a motion has carried. Any member of the Board may request a verification of the voice vote by requesting a roll call vote. Votes may be cast by board members in person only.

ETHICS

Constitutional and Statutory Provisions:

<u>Interim Executive Order 1997-4 adopting the Executive Branch Code of Ethics</u>

State Board Policy:

Each board member is responsible for both integrity and the consequences of his/her own actions. Each and every board member must follow the highest standards of honesty, integrity, and fairness when engaging in any activity particularly with customers, the public, and other board members.

No member of the Board is entitled, nor should s/he expect to receive any preferential treatment in service or status beyond that of any taxpayer in Wyoming.

Board members may not knowingly take advantage or benefit from information obtained from their official duties and responsibilities as a member of the Board of Education.

The Chair of the Board of Education is responsible for immediate interpretation, application and enforcement of policies related to Board membership. All complaints concerning a possible ethical violation shall be made to the Chair who shall make an initial determination of the issue. If further action is warranted, the Chair will pursue an appropriate course of action.

ANNUAL OPERATING BUDGET OF THE BOARD

Constitutional and Statutory Provisions:

State Board Policy:

The fiscal year for the State Board of Education begins each year on the first day of July and ends on the thirtieth day of June.

The Superintendent/Department Liaison, will share with the Board Coordinator, Treasurer, Chairman and Executive Assistant all applicable work sheets and budget information to plan the biennial Board budget. With assistance from the Department the Board will develop a draft biennial budget.~~after developing a budget for the operation of the Board for the next fiscal year, shall submit the document to the Board.~~ The Board will review the budget and recommend revisions, if necessary before final approval and submission of the budget.

The Board Coordinator will be present in the meeting in which the proposed budget is presented to the Joint Appropriations Committee.

Robert's Rules of Order - Summary Version

For Fair and Orderly Meetings & Conventions

Provides common rules and procedures for deliberation and debate in order to place the whole membership on the same footing and speaking the same language. The conduct of ALL business is controlled by the general will of the whole membership - the right of the deliberate majority to decide. Complementary is the right of at least a strong minority to require the majority to be deliberate - to act according to its considered judgment AFTER a full and fair "working through" of the issues involved. Robert's Rules provides for constructive and democratic meetings, to help, not hinder, the business of the assembly. Under no circumstances should "undue strictness" be allowed to intimidate members or limit full participation.

The fundamental right of deliberative assemblies require all questions to be thoroughly discussed before taking action!

The assembly rules - they have the final say on everything!
Silence means consent!

- Obtain the floor (the right to speak) by being the first to stand when the person speaking has finished; state Mr./Madam Chairman. Raising your hand means nothing, and standing while another has the floor is out of order! Must be recognized by the Chair before speaking!
- Debate can not begin until the Chair has stated the motion or resolution and asked "are you ready for the question?" If no one rises, the chair calls for the vote!
- Before the motion is stated by the Chair (the question) members may suggest modification of the motion; the mover can modify as he pleases, or even withdraw the motion without consent of the seconder; if mover modifies, the seconder can withdraw the second.
- The "immediately pending question" is the last question stated by the Chair! Motion/Resolution - Amendment - Motion to Postpone
- The member moving the "immediately pending question" is entitled to preference to the floor!
- No member can speak twice to the same issue until everyone else wishing to speak has spoken to it once!
- All remarks must be directed to the Chair. Remarks must be courteous in language and deportment - avoid all personalities, never allude to others by name or to motives!
- The agenda and all committee reports are merely recommendations! When presented to the assembly and the question is stated, debate begins and changes occur!

The Rules

- **Point of Privilege:** Pertains to noise, personal comfort, etc. - may interrupt only if necessary!
- **Parliamentary Inquiry:** Inquire as to the correct motion - to accomplish a desired result, or raise a point of order

- **Point of Information:** Generally applies to information desired from the speaker: "I should like to ask the (speaker) a question."
- **Orders of the Day** (Agenda): A call to adhere to the agenda (a deviation from the agenda requires Suspending the Rules)
- **Point of Order:** Infraction of the rules, or improper decorum in speaking. Must be raised immediately after the error is made
- **Main Motion:** Brings new business (the next item on the agenda) before the assembly
- **Divide the Question:** Divides a motion into two or more separate motions (must be able to stand on their own)
- **Consider by Paragraph:** Adoption of paper is held until all paragraphs are debated and amended and entire paper is satisfactory; after all paragraphs are considered, the entire paper is then open to amendment, and paragraphs may be further amended. Any Preamble can not be considered until debate on the body of the paper has ceased.
- **Amend:** Inserting or striking out words or paragraphs, or substituting whole paragraphs or resolutions
- **Withdraw/Modify Motion:** Applies only after question is stated; mover can accept an amendment without obtaining the floor
- **Commit /Refer/Recommit to Committee:** State the committee to receive the question or resolution; if no committee exists include size of committee desired and method of selecting the members (election or appointment).
- **Extend Debate:** Applies only to the immediately pending question; extends until a certain time or for a certain period of time
- **Limit Debate:** Closing debate at a certain time, or limiting to a certain period of time
- **Postpone to a Certain Time:** State the time the motion or agenda item will be resumed
- **Object to Consideration:** Objection must be stated before discussion or another motion is stated
- **Lay on the Table:** Temporarily suspends further consideration/action on pending question; may be made after motion to close debate has carried or is pending
- **Take from the Table:** Resumes consideration of item previously "laid on the table" - state the motion to take from the table
- **Reconsider:** Can be made only by one on the prevailing side who has changed position or view
- **Postpone Indefinitely:** Kills the question/resolution for this session - exception: the motion to reconsider can be made this session
- **Previous Question:** Closes debate if successful - may be moved to **"Close Debate"** if preferred
- **Informal Consideration:** Move that the assembly go into **"Committee of the Whole"** - informal debate as if in committee; this committee may limit number or length of speeches or close debate by other means by a 2/3 vote. All votes, however, are formal.
- **Appeal Decision of the Chair:** Appeal for the assembly to decide - must be made before other business is resumed; NOT debatable if relates to decorum, violation of rules or order of business
- **Suspend the Rules:** Allows a violation of the assembly's own rules (except Constitution); the object of the suspension must be specified

February 7, 2018

To: State Board Members

From: Tom Sachse, Ph.D.

RE: Education Legislation Update

Last year during the legislative session, I participated in a weekly discussion group organized by the Wyoming Education Association (WEA). I typically go to the WEA building in Cheyenne to participate in those discussions. This year, the group elected to meet twice a week and I will again participate as much as I can. I also asked WEA staff to add Max Mickelson and Kylie Taylor to the "coalition."

Evidently, LSO has about 400 proposed bills in this four-week budget session. It is likely many of these will not pass the required two-thirds passage in the house of origin. Still, there may be more education bills than I had originally thought.

At your February meeting, I hope you can discuss House Bill 53. This is another bill addressing computer science from the recalibration committee. It differs from the one we reviewed last month (Senate File 29 from JEIC) in that this one adds computer science to the Common Core of Skills, while the earlier one adds computer science to the Common Core of Knowledge. If computer science is added to the Common Core of Knowledge that would mandate computer science as a tenth content area for district implementation (with a five-year phase in). The state board would have to adopt Uniform Student Content and Performance Standards in this subject.

WYOMING STATE BOARD OF EDUCATION

February 7, 2018

To: State Board Members

From: Tom Sachse, Ph.D.

RE: PJP Facilitation Request for Proposals (RFP) Update

On January 29th, the state board administrative committee gave conditional approval to move forward with the draft RFP created by Dr. Julie Magee and me (with minor editorial improvements).

At your meeting, Dr. Julie Magee and I will update the board on the timeline and progress for proceeding with the entire RFP process. As you are aware, we are attempting to complete the selection and contracting process by early April to ensure the board can encumber funds from this biennium and use them for funding some or all of the Professional Judgement Panel process required to set targets for the Wyoming Accountability in Education Act (WAEA). I hope you will consider naming a subcommittee of the board to help in the selection process. You may also want to request additional reviewers, such as staff from WDE, representatives of district staff (possibly including staff from alternative schools) etc.

WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

Jillian Balow
Superintendent of Public Instruction

Dicky Shanor
Chief of Staff

Brent Bacon
Chief Academic Officer

Megan Degenfelder
Chief Policy Officer

Dianne Bailey
Chief Operations Officer

Cheyenne Office
Hathaway Building, 2nd Floor
2300 Capitol Avenue
Cheyenne WY 82002-2060
Phone: (307) 777-7675
Fax: (307) 777-6234

Riverton Office
320 West Main
Riverton, WY 82501
Phone: (307) 857-9250
Fax: (307) 857-9256

On the Web
edu.wyoming.gov
wyomingmeasuresup.com
twitter.com/WYOEducation
facebook.com/WYOEducation

MEMORANDUM

To: State Board of Education
From: Megan Degenfelder, Chief Policy Officer
Julie Magee, Accountability Director
Date: February 8, 2018
Subject: RFP Update for PJP Consultant

Meeting Date: February 15, 2018

Item Type: Action: _____ Informational: _xx_

Background:
The State Board of Education (SBE) is seeking proposals for a technical expert to facilitate the work of the Professional Judgement Panel (PJP), which will take place in fall 2018. A request for proposals (RFP) was released on February 2nd, and bids will be accepted through March 7th.

A subcommittee from the SBE will read and score each proposal and make a recommendation to the SBE during the March meeting. The WDE will work with the SBE coordinator to produce a contract for the winning bidder no later than April 1, 2018.

Statutory Reference:
- W.S. 21-2-204(f)

Supporting Documents/Attachments:
- 0212-C: RFP for PJP Consultant
- 0212-C: RFP rubric

Proposed Motions:
None

For questions or additional information:
Contact Julie Magee at julie.magee@wyo.gov or (307)777-8740.

STATE OF WYOMING
DEPARTMENT OF ADMINISTRATION AND INFORMATION
PROCUREMENT SECTION
2800 CENTRAL AVENUE
CHEYENNE, WY 82002

REQUEST FOR PROPOSAL NO. 0212-C

DEPARTMENT OF EDUCATION
STATE BOARD OF EDUCATION

PROFESSIONAL JUDGMENT PANEL CONSULTANT

CLOSING DATE AND TIME
MARCH 7, 2018 – 2:00 P.M. Mountain Time

PURCHASING REPRESENTATIVE: DEBI WALKER
TELEPHONE NO.: (307) 777- 6707

DEPARTMENT OF EDUCATION
STATE BOARD OF EDUCATION
AGENCY REPRESENTATIVE: JULIE MAGEE

DEPARTMENT OF EDUCATION
STATE BOARD OF EDUCATION
R.F.P. NO. 0212-C
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REQUEST FOR PROPOSAL

1. SUBMISSION OF PROPOSALS:

Sealed Proposals, for a Professional Judgment panel (PJP) for the Department of Education, State Board of Education will be received through the Public Purchase on-line bidding system until **2:00 p.m., March 7, 2018.**

1.1. No proposal will be considered which is not accompanied by the attached Proposal Price Sheet and signed by the proper official of the firm. All proposals must be uploaded on the Public Purchase on-line bidding system. Paper copies will not be accepted.

1.2. Proposals must be received by the time and date specified. Proposals received after the time and date specified will not be considered.

1.3 Proposal information is restricted and not publicly available until after the award of the Contract by the Procurement Section. Once a contract has been fully signed and submitted to the A & I Procurement Office the award process will be complete.

2. MODIFICATIONS OR WITHDRAWAL OF PROPOSALS:

2.1. A proposal may be altered prior to the specified date and time of the opening contained in the proposal documents.

2.2. A proposal that is in the possession of the Procurement Section may be withdrawn by the proposer up to the time of the opening. Failure of the successful proposer to furnish the service awarded as a result of this advertisement shall eliminate the proposer from the active proposers list for a period of time as determined by the Procurement Section.

3. PREPARATION OF PROPOSALS:

3.1. No proposal will be considered which modifies, in any manner, any of the provisions, specifications, or minimum requirements of the Request for Proposal.

3.2. In case of error in the extension of prices in the proposal, unit prices will govern.

3.3. Proposers are expected to examine special provisions, specifications, schedules, and instructions included in this Request. Failure to do so will be at the proposer's risk.

4. AWARD AND CONTRACT INFORMATION:

4.1. The State of Wyoming hereby notifies all proposers that it will affirmatively ensure that minority business enterprises will be afforded full opportunity to submit proposals in response to this invitation and will not be discriminated against on the grounds of age, race, color, sex, creed, national origin, or disability.

4.2. The proposer also, agrees that should this firm be awarded a Contract that the firm will not discriminate against any person who performs work there under because of age, race, color, sex, creed, national origin, or disability.

4.3. The proposer expressly warrants to the State that it has the ability and expertise to perform its responsibilities hereunder and in doing so shall use the highest standards of professional workmanship.

4.4. The State of Wyoming reserves the right to reject any or all proposals, to waive any informality or technical defect in the proposals, or to award the contract in whole or in part, if deemed to be in the best interest of the State to do so. The Department of Administration and Information, Procurement Section, will award this contract to the firm, determined by the Department of Education, the most responsive and responsible offer based on criteria specified herein.

4.5. This Request for Proposal shall become part of the Contract and will be in effect for the duration of the Contract period.

4.6 The successful proposer will be required to enter into and sign a formal Contract with the State containing terms required by the Attorney General, with reasonable adjustments acceptable to the State. The proposer will bear all risks associated with any injury arising out of the event. The contract language will control over any language contained within this RFP that conflicts with the signed and fully executed Contract.

4.7 Successful proposer shall comply with the Americans with Disabilities Act and Wyoming Fair Employment Practices Act. (W. S. 27-9-105 *et. seq*.).

DATED THIS 30th DAY OF JANUARY, 2018.

STATE OF WYOMING

Procurement Section

Assigned Buyer: DEBI WALKER

GENERAL PROVISIONS

1. INDEPENDENT CONTRACTOR

1.1. The contractor shall function as an independent contractor for the purposes of the Contract and shall not be considered an employee of the State of Wyoming for any purpose. The contractor shall assume sole responsibility for any debts or liabilities that may be incurred by the contractor in fulfilling the terms of the Contract and shall be solely responsible for the payment of all federal, state, and local taxes which may accrue because of this Contract. Nothing in the Contract shall be interpreted as authorizing the contractor or its agents and/or employees to act as an agent or representative for or on behalf of the State of Wyoming or the Agency, or to incur any obligation of any kind on the behalf of the State of Wyoming or the Agency. The contractor agrees that no health/hospitalization benefits, workers' compensation and/or similar benefits available to State of Wyoming employees will inure to the benefit of the contractor or the contractor's agents and/or employees as a result of this Contract.

2. INSURANCE:

2.1 All insurance policies required by this Contract, except workers' compensation and unemployment compensation policies, shall contain a waiver of subrogation against the Agency and the State, its agents and employees. The contractor agrees it will carry the insurance which is applicable to this RFP. Contractor shall provide a copy of an endorsement providing this coverage.

3. LAWS TO BE OBSERVED:

3.1. The contractor shall keep fully informed of all federal and state laws, all local bylaws, regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority which in any manner affect those engaged or employed on the work or which in any way affect the conduct of the work. The contractor shall at all times observe and comply with all such laws, bylaws, ordinances, regulations, orders and decrees in force at the time of award. The contractor shall protect and indemnify the State and its representatives against any claim or liability arising from or based on the violation of any such law, bylaw, ordinance, regulation, order, or decree whether by himself or his/their employees. No extension of time or additional payment will be made for loss of time or disruption of work caused by any actions against the provider for any of the above reasons.

4. TAXES:

4.1. The contractor shall pay all taxes and other such amounts required by federal, state, and local law, including, but not limited to, federal and Social Security taxes, workers' compensation, unemployment insurance, and sales taxes.

5. ASSIGNMENT/CONTRACTOR:

5.1. The Contract shall not be assigned by the contractor. Third party participation is authorized only as a joint venture which must be clearly stated with details on the original proposal, signed by all parties participating. Any alterations, variations, modifications, or waivers of the provisions of this Contract shall be valid only if they have been reduced to writing, duly signed by the parties hereto, and attached to the original Contract agreement.

5.2. The contractor shall not enter into any subcontracts for any of the work contemplated under this Contract without prior written authorization of the State.

5.3. Claims for money due, or to become due to contractor from the State under the Contract may, be assigned to a bank, trust company, or other financial institution, or to a trustee in bankruptcy, without approval by the State. Notice of any assignment or transfer shall be furnished to the State.

5.4. The contractor shall not use the Contract, or any portion thereof, for collateral for any financial obligation without the prior written permission of the Agency.

6. TERMINATION OF CONTRACT:

6.1. Termination of the Contract may be made by any party at any time with or without cause, upon no less than thirty (30) days written notice to the other parties. The Contract shall remain in full force and effect until terminated as provided herein.

6.2. The State may, upon ten (10) days written notice to the contractor, terminate the Contract, in whole or in part, for just cause, which shall include failure of the Contractor to fulfill in a timely and proper manner the obligations under the Contract. In such event, all finished documents, data, models and reports prepared under this Contract shall, at the option of the State, become its property upon payment for services rendered through the termination of the Contract.

6.3. Should the contractor fail to comply with the provisions of the Contract, payment for portions of the Contract will be withheld until such time as the Contract terms have been implemented. Administrative, contractual, and/or legal remedies as determined by the Wyoming Attorney General will be implemented if it appears the contractor has breached or defaulted on the Contract.

7. ACCOUNT REPRESENTATIVE:

7.1. The successful proposer(s) shall appoint, by name, a company representative who shall be responsible for servicing this account. The appointed representative shall be responsible to provide the services required to insure that the account will be administered in an organized systematic manner.

8. RESPONSIVENESS:

8.1. Proposers are expected to examine specifications, schedules, and instructions included in this package. Failure to do so will be at the proposer's risk.

9. EXTENSION AND AMENDMENT:

9.1. The proposer and the State covenant and agree that this proposal or subsequent Contract may, with the mutual approval of the proposer and the State, be extended under the same terms and conditions of this proposal or Contract for a period of one (1) year, and said option to extend this proposal or Contract for a one year period shall be in effect for each year thereafter for a total period not to exceed two (2) additional years.

10. COMPLIANCE WITH LAWS:

10.1. In performing the Contract, both parties agree to comply with all applicable state, federal and local laws, rules, and regulations.

11. AUDIT:

11.1. The State or any of their duly authorized representatives shall have access to any books, documents, papers, and records of contractor which are directly pertinent to the Contract for the purpose of making audit, examination, excerpts, and transactions.

12. CONFLICT OF INTEREST:

12.1. The parties warrant that no kickbacks, gratuities, or contingency fees have been paid in connection with the Contract and none has been promised contingent upon the award of the Contract. Proposer warrants that no one being paid pursuant to the Contract is engaged in any activities which would constitute a conflict of interest with respect to the purposes of the Contract.

13. NO FINDERS FEE:

13.1. No finder's fee, employment agency fee, or other such fee related to the procurement of this Contract shall be paid by either party.

14. OWNERSHIP OF DOCUMENTS/WORK PRODUCT:

14.1. It is agreed that all finished or unfinished documents, data, or reports, prepared by contractor under the Contract shall be considered the property of the State, and upon completion of the services to be performed, or upon termination of the Contract for cause, or for the convenience of the State, will be turned over to the State.

15. CONFIDENTIALITY OF INFORMATION:

15.1. All documents, data compilations, reports, computer programs, photographs, and any other work provided to or produced by the contractor in the performance of the Contract shall be kept confidential by the contractor unless written permission is granted by the State for its release.

16. SOVEREIGN IMMUNITY:

16.1. Pursuant to Wyo. Stat. § 1-39-104(a), the State of Wyoming and Agency expressly reserve sovereign immunity by entering into this Contract and specifically retain all immunities and defenses available to them as sovereigns. The parties acknowledge that the State of Wyoming has sovereign immunity and only the Wyoming Legislature has the power to waive sovereign immunity. The parties further acknowledge that there are constitutional and statutory limitations on the authority of the State of Wyoming and its agencies or instrumentalities to enter into certain terms and conditions supplied by the Contractor, including, but not limited to, the following: liability for damages; choice of law; conflicts of law; venue and forum-selection clauses; defense or control of litigation or settlement; liability for acts or omissions of third parties; payment of attorneys' fees or costs; additional insured provisions; dispute resolution, including, but not limited to, arbitration; indemnification of another party; and confidentiality. Any such provisions in the Contract, or in any attachments or documents incorporated by reference, will not be binding on the State of Wyoming except to the extent authorized by the laws and Constitution of the State of Wyoming. Designations of venue, choice of law, enforcement actions, and similar provisions shall not be construed as a waiver of sovereign immunity. The parties agree that any ambiguity in this Contract shall not be strictly construed, either against or for either party, except that any ambiguity as to sovereign immunity shall be construed in favor of sovereign immunity.

17. INDEMNIFICATION:

17.1 The Contractor shall release, indemnify, and hold harmless the State, the Agency, and their officers, agents, and employees from any and all claims, suits, liabilities, court awards, damages, costs, attorneys' fees, and expenses arising out of Contractor's failure to perform any of Contractor's duties and obligations hereunder or in connection with the negligent performance of Contractor's duties or obligations, including, but not limited to, any claims, suits, liabilities, court awards, damages, costs, attorneys' fees, and expenses arising out of Contractor's negligence or other tortious conduct.

SPECIAL PROVISIONS

PROPOSALS MUST BE RECEIVED BY THE TIME AND DATE SPECIFIED. PROPOSALS RECEIVED AFTER THE TIME AND DATE SPECIFIED WILL NOT BE CONSIDERED.

It is the responsibility of the proposer to clearly identify all information that is considered confidential in accordance with the Wyoming Public Records Act, W.S. 16-4-201 through 16-4-205. Please identify each confidential page with the word "CONFIDENTIAL" in capital, bold letters centered at the bottom of each page. Information not clearly marked may be considered public.

A. BACKGROUND INFORMATION

The Professional Judgment Panel (PJP) is a "standard-setting" panel. Standard-setting panels are employed most commonly for state assessments in order to establish cut scores to define the achievement levels (e.g., proficient, advanced). Similarly, the PJP is employed to establish cut scores for ***school-level*** accountability. The purpose of the PJP is to establish target levels for each indicator-level performance and overall school performance rating under the Wyoming Accountability in Education Act (WAEA). The work undertaken by the PJP is aligned to the recommendations of the Advisory Committee, a group established by the state legislature to provide direction for the accountability system.

There are three accountability models under WAEA: one for grades 3 through 8, one for traditional high schools, and one for alternative high schools. The accountability model for grades 3 through 8 is comprised of the following performance indicators:

- Achievement (based on student performance on the new WY-TOPP statewide assessment in math, English/language arts, and science)
- Growth (based on mean growth percentiles)
- Equity (based on mean growth percentiles of the bottom quartile in the school)
- English Language Proficiency (based on the percent of students making significant progress on the WIDA ACCESS 2.0 test for English Language Learners); student-level exit criteria is an overall composite score of 4.6 based on reading, writing, listening, and speaking)

The accountability model for traditional high schools is comprised of the following performance indicators:

- Achievement (based on student performance on the new WY-TOPP statewide assessment in math, English/language arts, and science)
- Growth (based on mean growth percentiles from WY-TOPP grades 9 and 10, plus ACT in grade 11)
- Equity (based on mean growth percentiles of the bottom quartile in the school)
- Readiness
    - Graduation (4-year on-time and extended)
    - 9th grade credits earned
    - Post-Secondary Readiness
- English Language Proficiency (based on the percent of students making significant progress on the WIDA ACCESS 2.0 test; student-level exit criteria is 4.6)

The accountability model for alternative high schools is comprised of the following performance indicators:

- Academic Performance (based on Achievement and Growth on the new WY-TOPP state assessment)
- Readiness (as measured by college and career readiness)
- Climate (based on student climate survey)
- Engagement (based on completion of a student success plan)

B. DESCRIPTION OF PROFESSIONAL Judgment PANEL (PJP)

The PJP was established in 2012 by the Wyoming legislature and is comprised of about 27 members who represent the following groups:

- State Board of Education
- Public school teachers
- Public school principals
- School district superintendents
- Business community and community at-large
- Parents
- School district central office administrators
- Local school board members
- Post-secondary institutions

C. PURPOSE OF RFP

From time-to time, the PJP needs to be reconvened by the State Board to address new or changed facets of the Wyoming Accountability in Education Act (WAEA). This school year, 2017-18, Wyoming has changed its state assessment to the Wyoming Test of Proficiency and Progress (WY-TOPP). This test is offered in grades 3-10, with voluntary interim assessments for Grades K-10. The state also requires students to take the ACT in grade 11, with the option of taking WorkKeys (or other career certification test) to demonstrate career readiness or ASVAB for military readiness.

After a two-year pilot, the state has now enhanced the WAEA with a different, but parallel system of accountability for alternative high schools. Thus, a separate alternative high school PJP committee will be convened the same week as the 3-8 and high school accountability PJP. It is contemplated that the first PJP will complete its work in two-to-three days and the alternative high school PJP would complete its work in two days.

In addition to the facilitation of those two PJP events (which would likely take place in late September), the contractor may also propose to consult with state employees and their contractors working on other aspects of the accountability system.

The purpose of this RFP is to solicit proposals from vendors that have a demonstrated expertise in standard-setting and group facilitation.

Proposals are required to address all components within **Section D. SCOPE OF WORK.**

This RFP is designed to provide interested vendors with sufficient information to submit proposals meeting minimum requirements, but is not intended to limit a proposal's content. Vendors are at liberty and encouraged to expand upon specifications to evidence standard-setting capability under any resulting contract.

D. SCOPE OF WORK

I. The PJP consultant will facilitate the work of the PJP in determining:

- performance levels for each indicator as prescribed by state statute, and
- overall school performance levels for Wyoming schools.

II. The PJP consultant will write a report on the process and final results of the PJP work related to performance levels for each indicator and overall school performance.

III. Present final results to the State Board of Education.

The work undertaken by the PJP consultant as described in this section will apply to all three accountability models under WAEA as described in **Section A. BACKGROUND INFORMATION.**

E. APPLICATION REQUIREMENTS and PROPOSAL EVALUATION CRITERIA

Point values have been assigned to the criteria in the application requirement of the proposal. Upon receipt, each proposal will be evaluated by the selection committee consisting of the State Board of Education and Wyoming Department of Education program managers, and a score will be recorded. The following is a description of required application contents:

- **Cover sheet –** 5 points
  The cover sheet must include:
    - Project title
    - Company/applicant name
    - Full address
    - Telephone number and email address
    - Name and title of the designated contact person

- **Content of the proposal –** 40 points
  The proposal shall include information on the **Section D. SCOPE OF WORK**
    - Each section, I, II, and III must be clearly identified
    - Information on how each of the requirements will be met must be included

- **Biography and Experience –** 35 points
  Provide information related to:
    - Level of expertise related to standard-setting for school-level accountability
    - Relevant experience with other companies/organizations
    - Any recent work provided in Wyoming

- **Previous evaluations and a reference list that includes companies/organizations for which you/your company provided similar work –** 10 points

- **Budget and narrative –** 10 points
  Complete the budget by proposing costs for the following:
    - Travel, including transportation, lodging, and per diem
    - Day or hourly rate for meeting facilitation
    - Day or hourly rate for report writing
    - Day or hourly rate for consultation with state agencies

The State of Wyoming reserves the right to conduct a cost analysis of the Proposer's budget proposal. The analysis will include a review of the associated costs based on the technical content of their submission.

Additional information

In addition to the information outlined above, the applicant may include any other relevant information that may be useful in the review and rating of the proposal.

The State of Wyoming will be the sole judge with respect to the evaluation of proposals. The firm which best meets the conditions of each of the individual criterion will be awarded the highest (not necessarily maximum) points for that specific criterion. The balance of the proposing contractors will be rated based on their evaluated points. After each criterion is evaluated, the contractor(s) with the highest number of points will be awarded the contract(s).

F. TENTATIVE TIMELINE FOR COMPLETION

The following tentative timeline for completion is subject to change at the sole discretion of the State Board of Education/Department of Education.

Event	**Deadline**
▪Facilitation of PJP meeting for grades 3-8	9/15/18 - 10/5/18
▪Facilitation of PJP meeting for traditional high schools	9/15/18 - 10/5/18
▪Facilitation of PJP meeting for alternative high schools	9/15/18 - 10/5/18
▪Final Report to State Board of Education	10/5/18 - 10/12/18
▪Presentation of final report to State Board of Education	10/18/18 – 10/19/18

Written questions regarding this Request for Proposal (RFP) or the procurement process will be submitted through the Public Purchase on-line bidding system until **2:00 p.m., February 14, 2018.** Any questions received after the deadline will not be accepted or considered. **Each question should be submitted individually.** It is the proposer's responsibility to check Public Purchase for answers to questions, addenda, or bid tabulations.

The State of Wyoming will be the sole judge with respect to the evaluation of proposals. The firm which best meets the conditions of each of the individual criterion will be awarded the highest (not necessarily maximum) points for that specific criterion. The balance of the proposing contractors will be rated based on their evaluated points. After each criterion is evaluated, the contractor(s) with the highest number of points will be awarded the contract(s).

The State of Wyoming reserves the right to conduct a cost analysis of the Proposer's budget proposal. The analysis will include a review of the associated costs based on the technical content of their submission.

PROPOSAL PRICE SHEET

The undersigned agrees to provide Professional Judgment Panel (PJP) Consultant to the Department of Education, State Board of Education in accordance with the Request for Proposal, General Provisions, Special Provisions and Proposal Price Sheet for Request for Proposal No. 0212-C.

DESCRIPTION	LUMP SUM PRICE (Written in Words and Number)
Travel, including transportation, lodging, and per diem	$________________per day
Day or hourly rate for meeting facilitation	$________________per hour/day
Day or hourly rate for report writing	$________________per hour/day
Day or hourly rate for consultation with state agencies, including presentation to State Board of Education	$________________per hour/day
TOTAL	$________________total cost

1. BY SUBMISSION OF A PROPOSAL, THE PROPOSER CERTIFIES:

    1.1 Prices in this proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.

    1.2 No attempt has been made nor will be by the proposer to induce any other person or firm to submit a proposal for the purpose of restricting competition.

    1.3 The person signing this proposal certifies that he/she is authorized to represent the company and is legally responsible for the decision as to the price and supporting documentation provided as a result of this advertisement.

    1.4 Proposer will comply with all Federal regulations, policies, guidelines and requirements.

    1.5 Prices in this proposal have not been knowingly disclosed by the proposer and will not be prior to award to any other proposer.

2. GENERAL INFORMATION:

    Proposer Name______________________________ Phone (   )___________________

    Email Address ______________________________ FAX (   )_____________________

    Mailing Address____

    City________________________ State__________________ Zip_____________

    Employer Identification Number_______________________________________

3. OWNERSHIP AND CONTROL:

Proposer's Legal Structure:

______Sole Proprietorship ______General Partnership

______Corporation ______Limited Partnership

______Limited Liability ______Other______________

If Proposer is a sole proprietorship, list:

Owner Name_____________________________ Phone ( )_____________________

Mailing Address____________________________________

City________________________ State___________________ Zip________________

Employer Identification Number____

Beginning date as owner of sole proprietorship____________________________________

Provide the names of all individuals authorized to sign for the Proposer:

NAME (printed or typed)	TITLE
________________________________	_________________________________
________________________________	_________________________________
________________________________	_________________________________

__________________________All awards contingent upon verification of Resident Number (if applicable)
(Resident #)

Please contact the Department of Workforce Services, Division of Labor Standards at (307) 777-7261 for assistance in obtaining a resident certification number.

<u>VERIFICATION</u>

I certify under penalty of perjury, that I am a responsible official (as identified above) for the business entity described above as Proposer, that I have personally examined and am familiar with the information submitted in this disclosure and all attachments, and that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including criminal sanctions which can lead to imposition of a fine and/or imprisonment.

____
(Signature)

____ __________________
(Name and Title) (Typed or Printed) (Date)

Bid RFP #0212 - C: Professional Judgement Panel Consultant
RFP Published February 2, 2018
Deadline for submission March 7, 2018

SUMMARY SCORING SHEET

Vendor	Total Score
Company #1	0
Company #2	0
Company #3	0

Concerns

Bid RFP #0212 - C: Professional Judgement Panel Consultant
RFP Published February 2, 2018
Deadline for submission March 7, 2018

Proposal Scoring Rubric

Committee member signature ____________________

Application Requirements	Information provided, fully consistent with requirements;or	Information provided, partially consistent with requirements; or	Information not provided or not consistent with requirements	Points awarded	Comments
Cover Sheet (5 points possible)					
Project title Company/applicant name Full address, telephone number, email address Name/title of designated contact person					

Content of the proposal (40 points possible)					
The proposal shall include clear information on the Scope of Work, including how the vendor will meet each deliverable described below for ***each*** *accountability model.*					
I. The PJP consultant will facilitate the work of the PJP in determining (a) performance levels for each indicator as prescribed by state statute, and (b) overall school performance levels for Wyoming schools					
II. The PJP consultant will write a report on the process and final results of the PJP work related to performance levels for each indicator and overall school performance.					
III. The PJP consultant will present final results to the State Board of Education					

Experience and biography (35 points possible)					
Provide information related to level of expertise related to standard-setting for school-level accountability					
Provide information about relevant experience with other companies/organizations					
List of recent work in Wyoming (5 preference points)					

Previous evaluations and reference list that includes companies/organizations for which you/your company provided similar work (10 points possible)					

Budget and narrative (10 points possible)					
Budget includes proposed costs for the following:					

Travel, including transportation, lodging, and per diem					
Day or hourly rate for meeting facilitation					
Day or hourly rate for report writing					
Day or hourly rate for consultation with state agencies					

In addition to the information outlined above, the applicant may include any other relevant information that may be useful in the review and rating of the proposal.			

Total Points Awarded **0**

Bid RFP #0212 - C: Professional Judgement Panel Consultant
RFP Published February 2, 2018
Deadline for submission March 7, 2018

Proposal Scoring Rubric

Committee member signature ____________________

Application Requirements	Information provided, fully consistent with requirements;or	Information provided, partially consistent with requirements; or	Information not provided or not consistent with requirements	Points awarded	Comments
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II. The PJP consultant will write a report on the process and final results of the PJP work related to performance levels for each indicator and overall school performance.					
III. The PJP consultant will present final results to the State Board of Education					
Experience and biography (35 points possible)					
Provide information related to level of expertise related to standard-setting for school-level accountability					
Provide information about relevant experience with other companies/organizations					
List of recent work in Wyoming (5 preference points)					
Previous evaluations and reference list that includes companies/organizations for which you/your company provided similar work (10 points possible)					
Budget and narrative (10 points possible)					
Budget includes proposed costs for the following:					

Travel, including transportation, lodging, and per diem					
Day or hourly rate for meeting facilitation					
Day or hourly rate for report writing					
Day or hourly rate for consultation with state agencies					

In addition to the information outlined above, the applicant may include any other relevant information that may be useful in the review and rating of the proposal.			

Total Points Awarded **0**

Bid RFP #0212 - C: Professional Judgement Panel Consultant
RFP Published February 2, 2018
Deadline for submission March 7, 2018

Proposal Scoring Rubric

Committee member signature ____________________

Application Requirements	Information provided, fully consistent with requirements;or	Information provided, partially consistent with requirements; or	Information not provided or not consistent with requirements	Points awarded	Comments
Cover Sheet (5 points possible)					
Project title Company/applicant name Full address, telephone number, email address Name/title of designated contact person					
Content of the proposal (40 points possible)					
*The proposal shall include clear information on the Scope of Work, including how the vendor will meet each deliverable described below for **each** accountability model.*					
I. The PJP consultant will facilitate the work of the PJP in determining (a) performance levels for each indicator as prescribed by state statute, and (b) overall school performance levels for Wyoming schools					
II. The PJP consultant will write a report on the process and final results of the PJP work related to performance levels for each indicator and overall school performance.					
III. The PJP consultant will present final results to the State Board of Education					
Experience and biography (35 points possible)					
Provide information related to level of expertise related to standard-setting for school-level accountability					
Provide information about relevant experience with other companies/organizations					
List of recent work in Wyoming (5 preference points)					
Previous evaluations and reference list that includes companies/organizations for which you/your company provided similar work (10 points possible)					
Budget and narrative (10 points possible)					
Budget includes proposed costs for the following:					

Travel, including transportation, lodging, and per diem					
Day or hourly rate for meeting facilitation					
Day or hourly rate for report writing					
Day or hourly rate for consultation with state agencies					

In addition to the information outlined above, the applicant may include any other relevant information that may be useful in the review and rating of the proposal.			

Total Points Awarded **0**

WYOMING STATE BOARD OF EDUCATION

February 7, 2018

To: State Board Members

From: Tom Sachse, Ph.D.

RE: Chapter 31 Update

On January 24th, Mike O'Donnell and Chairman Wilcox convened a meeting of the same group that met on October 26th to discuss the implications of the Attorney General's opinion on statutory obligations of the state board to promulgate rules regarding "standards for graduation."

At your meeting, I hope Mackenzie Williams can reprise his review of this opinion. Dr. Julie Magee will update the board on her early thinking on draft rules (that she was asked to draft). Then, I will discuss the pros and cons of considering rules placement in either Chapter 6, 10, or 31.

WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

Jillian Balow
Superintendent of Public Instruction

Dicky Shanor
Chief of Staff

Brent Bacon
Chief Academic Officer

Megan Degenfelder
Chief Policy Officer

Dianne Bailey
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Fax: (307) 857-9256

On the Web
edu.wyoming.gov
wyomingmeasuresup.com
twitter.com/WYOEducation
facebook.com/WYOEducation

MEMORANDUM

To:	State Board of Education
From:	Shelley Hamel, School Support Division Director Laurel Ballard, Student and Teacher Resources Team Supervisor
Date:	February 8, 2018
Subject:	Leader Accountability and Chapter 29 Rules

Meeting Date: February 15-16, 2018

Item Type: Action: ____ Informational: __X__

Background:
The Wyoming Department of Education (WDE) is continuing to work with the Certified Personnel Evaluation System (CPES) Advisory Panel and Regional Educational Laboratory (REL) Central to make recommendations on the leadership evaluation system and Chapter 29 to the State Board of Education.

The CPES Advisory Panel met February 6 to review feedback from the State Board and Attorney General's Office. More time is needed to review the feedback and ensure alignment with statutory requirements. The CPES Advisory Panel will put forward another version of Chapter 29 Rules after they have taken sufficient time to fully vet the changes.

With this change to the timeline, regular Chapter 29 Rules will not be promulgated by July 1, 2018. Instead, emergency Chapter 29 Rules can be promulgated. This will allow additional time to receive public comment and develop a set of very solid Chapter 29 Rules around leader evaluations systems in Wyoming.

Statutory Reference (if applicable):
- W.S. 21-2-304(b)(xvi)
- Board Rules, Chapter 29: Certified Personnel Evaluation Systems

Supporting Documents/Attachments:
- None

Proposed Motions:
No Motions

For questions or additional information:
Contact Laurel Ballad at laurel.ballard@wyo.gov or (307)777-8715, or Shelley Hamel at shelley.hamel@wyo.gov or (307)777-6132.

WYOMING
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MEMORANDUM

To: State Board of Education
From: Megan Degenfelder, Chief Policy Officer
Julie Magee, Accountability Director
Date: February 7, 2018
Subject: Accreditation Task Force & Chapter 6 Update

Meeting Date: February 15, 2018

Item Type: Action: _____ Informational: __xx__

Introduction: A task force comprised of educators from all five regions in the state has been created to make recommendations for the state-led process. The accreditation task force met on January 9th and February 7th to provide input on the following topics:

- The definition and purpose of accreditation
- Revisions to the Chapter 6 rules
- The annual accreditation report and required evidence
- Options for external reviews

The WDE will present the outcome of this work, including proposed revisions to the Chapter 6 rules, during the February 2018 State Board of Education (SBE) meeting. The purpose of this discussion is to solicit input from the SBE regarding these rules, particulary the sections that are highlighted in the draft. The WDE anticipates a final draft of the Chapter 6 rules will be presented to the SBE in March.

Note: The rules are not yet formatted for promulgation.

Statutory References:

- W.S. 21-2-202(a)(viii) - State superintendent shall prepare and maintain a list of accredited schools in Wyoming.
- W.S. 21-2-202(a)(xxxvi) - State superintendent shall review each school district's assessment system every 5 years in conjunction with district accreditation and as a component of accountability.
- W.S. 21-2-202(c) - State superintendent may change accreditation status of any district or state institution for failing to adhere to all applicable laws and regulations.
- W.S. 21-2-204(h)(iv) - State Board shall administer a progressive multi-tiered system of support as part of district accreditation.
- W.S. 21-2-304(a)(ii) - State Board shall, through district accreditation, implement and enforce uniform standards; implement and enforce statewide accountability system; and require district adherence to WAEA.
- W.S. 21-2-304(b)(ii) - State Board may change accreditation status of any district failing to implement uniform standards or as a result of low performance as measured under WAEA.

- W.S. 21-3-110(a)(xxxiv) - The board of trustees, in conjunction with district accreditation, shall implement a standards-aligned district assessment system.
- W.S. 21-13-310(a) - Use of district funds to offer the educational basket of goods and services.

Supporting Documents/Attachments:

- DRAFT Chapter 6 Rules
- Task Force Member List

Proposed Motions:

None

For questions or additional information:

Contact Bill Pannell at bill.pannell@wyo.gov or (307)777-7322.

CHAPTER 6 DRAFT
DISTRICT AND SCHOOL ACCREDITATION

Section 1. Authority. These rules are promulgated by the Wyoming State Board of Education and the Wyoming Department of Education under the authority of W.S. § 21-2-304(a)(i); W.S. § 21-2-202(a)(i) and W.S. § 21-2-202(c).

Section 2. Definitions.

(a) **Accountability.** The system of school performance ratings established by the Wyoming Accountability in Education Act. W.S. § 21-2-204

(b) **Accountability Framework.** The Wyoming Comprehensive Accountability Framework: Phase 1. National Center for the Improvement of Educational Assessment. (January 31, 2012) Incorporated by reference into Wyoming statute per W.S.§ 21-2-304(a)(vi), W.S.§ 21-2-204(f), W.S.§ 21-2-204(k)

(c) **Accreditation.** A process by which each district and each school within the district evaluates itself and is monitored by the state in order to assure compliance with statutes that are intended to improve student learning and ensure equity of opportunity to learn. W.S. § 21-2-202(a)(i); W.S. § 21-2-202(c); W.S. 21-2-304(a)(ii); W.S. 21-13-310(a)

(d) **Accreditation Criteria.** The requirements established in this Chapter that all districts and the schools governed by these districts must meet as applicable to be accredited by the State Board.

(e) **Annual Accreditation Report.** A required document with attestations and links to documents submitted annually to the Department by districts that verifies adherence to the accreditation criteria.

(f) **Compliance.** Meeting or adhering to the requirements of statutes and regulations.

(g) **Department.** The Wyoming Department of Education.

(h) **District.** A governmental entity whose function is to provide for the education of persons in grades K-12 (or as otherwise legally authorized) in a geographic area defined by the Wyoming State Committee on School District Organization. W.S. § 21-13-101(a)(iii)

(i) **Document.** A piece of written, printed, or electronic matter that provides information or evidence or that serves as an official record.

(j) **Evidence.** Annual reports, documents, web sites, data, surveys, and other artifacts used to verify adherence to the accreditation criteria.

(k) **Resources.** Time, personnel, and finances

(l) **Instructional Core.** An education model that contends increased learning is the result of improving the relationship between the teacher, the content, and active learning or student engagement. The instructional core is the first guiding principle of the Wyoming Accountability Framework.

(m) **Improvement Plan.** A document that includes goals and strategies to meet student performance objectives.

(n) **Stakeholders.** Board members, leadership, teachers, students, staff, families and community members.

(o) **State Board.** The Wyoming State Board of Education.

(p) **Statewide System of Support.** State and district representative assistance intended to increase school performance in accordance with W.S. § 21-2-204(h).

(q) **Verification.** Confirmation that all Wyoming districts and the schools governed by these districts have met the Wyoming accreditation criteria.

(r) **Wyoming Accountability in Education Act (WAEA).** The Wyoming school accountability system established by W.S. § 21-2-204.

(s) **Wyoming High School Activities Association (WHSAA).** An organization that promotes, coordinates, and controls interscholastic activities in Wyoming.

Section 3. Accreditation in General. The Department shall implement and maintain a process to evaluate and accredit Wyoming districts and the schools governed by these districts based on adherence to all applicable laws, rules, and regulations, including the Wyoming Accountability Framework. W.S. § 21-2-202(a)(i); W.S. § 21-2-304(a)(i); W.S. § 21–2-202(a)(iv); W.S. § 21-2-202(c); and W.S. § 21-2-202(a)(xxxi)(C)

(a) The process for accreditation of Wyoming districts and the schools governed by these districts shall include:

(i) Attestation through an accreditation report submitted to the Department by November 1 annually by the district superintendent that the district and all schools governed by the district meet the accreditation criteria.

(ii) Annual verification of district compliance with all applicable laws, rules, and regulations through review of documents, data and other evidence by the Department aligned to the accreditation criteria.

(iii) A review of the District Assessment System (DAS) at least once every five (5) years in accordance with W.S. § 21-2-304(a)(iv) and Section 4(z) of these rules.

The DAS review may include other accreditation criteria deemed necessary by the Department.

(iv) The accreditation status of the district or individual schools may be lowered by the State Board based on school performance as measured by the Wyoming Accountability in Education Act in accordance with Section 6 of this Chapter. W.S. § 21-2-304(a)(ii)

(b) All documents and data submitted to the Department, as well as other Department verification processes, shall be considered as evidence for accreditation to reduce duplicative reporting requirements. W.S. § 21-2-204(h)(viii)

(c) Findings of noncompliance shall be reviewed with district superintendents annually by March 1. District superintendents shall be given until May 1 to satisfactorily address the findings without negatively impacting the accreditation level of the district or any school governed by the district.

(d) The Department shall annually make an accreditation recommendation to the State Board for all Wyoming districts and the schools governed by these districts.

(e) The duration of accreditation shall be for one year, from July 1 to the following year on June 30.

(f) While the State Board may make an exception, the accreditation level shall be the accreditation level for the next year.

(g) The Department shall maintain a list of accredited Wyoming schools on the Department website. W.S. § 21-2-202(a)(iii)

(h) No Wyoming district or the schools governed by a district shall, as a condition for state accreditation, be required to participate in any continuous improvement or school improvement process provided by the Department beyond that required by the System of Support per W.S. § 21-2-204(h) and through Federal regulations.

Section 4. Accreditation Criteria. The accreditation criteria and the aligned indicators summarize the requirements for Wyoming districts and schools governed by Wyoming districts.

(a) **District Board.** Oversight and governance for the district is provided by an elected board of trustees that determines the district vision, mission, and goals, operates in an ethical manner, maintains up-to-date, publicly available policies and documents, and employs and evaluates a superintendent who serves as the chief administrator for the district.

(i) **Board Members and Operations.** An elected board provides oversight and governance for the district, establishes district policy, operates within established board duties, and adheres to a code of conduct and a code of ethics. This includes:

(1) Districts in General. W.S. § 21-3-101-132
(2) Adherence to the Wyoming Administrative Procedures Act W.S. § 16-3-101-115
(3) Adherence to Uniform Fiscal Procedures W.S. § 16-4-101-125
(4) Maintaining Public Records W.S. § 16-4-201-205
(5) Public Meetings W.S. § 16-4-401-408
(6) Public Property W.S. § 16-6-101-120
(7) Ethics and Disclosures Act W.S. § 9-13-101-109

(ii) **District Vision, Mission and Goals.** The board develops a widely shared vision, mission, and goals, or strategic plan for the district that conveys high expectations for learning for all staff and students and is focused on improving the instructional core. W.S. § 21-2-204(b), Accountability Framework, pg. 16

(iii) **District Superintendent.** A hired superintendent serves as the chief administrative officer, and implements district procedures in a cohesive manner consistent with statute, board policies, and the district strategic plan. The superintendent is evaluated by the District Board. W.S. § 21-3-111(a)(vi)(A)

(b) **District Leadership.** District administrators, including principals, work together to manage district operations and provide instructional guidance. District administrators are evaluated in a manner consistent with Wyoming statute and regulations. The district superintendent or his/her representative provides assistance with school improvement planning and resource allocation for schools that need improvement.

(i) **District and School Accreditation.** District and school leaders annually self-evaluate to ensure the district and all schools within the district meet all applicable Wyoming accreditation criteria and the aligned requirements of statute. W.S. § 21-13-310(a); W.S. § 21-2-304(a)(ii); W.S. § 21-2-202(a)(viii)

(ii) **District Leader Evaluation.** District and school leaders are evaluated by the district superintendent in a manner consistent with statute and board policy. W.S. 21-2-304(b)(xvi); W.S. § 21-3-110 (a)(xxx) This includes annual submission of a review of the district leader evaluation system for districts with schools that are partially meeting and not meeting expectations per W.S. § 21-2-204(h)(v&vi)

(iii) **School Improvement Representative.** The district superintendent or a designated representative provides assistance with improvement planning and resource allocation for schools identified as in need of improvement through the Wyoming accountability system. W.S. § 21-2-204(h)(vii)

(c) **School Leadership.** Principals provide administrative management and instructional leadership, including the evaluation of teachers and other instructional staff in accordance with Wyoming regulations, for the school(s) to which they are assigned.

(i) **Principal Roles and Responsibilities.** The district defines the roles and responsibilities of principals, including establishing a positive culture, instructional leadership, and school administration. W.S. § 21-3-111(a)(vi)(B)

(ii) **Teacher Evaluation.** Teachers are evaluated by principals in a manner consistent with statute and board policy. W.S. § 21-3-110(a)(xvii-xix)

(d) **Stakeholder Communication and Input.** The district and all schools within the district communicate with and solicit input and feedback from stakeholders, and use the input to improve district and school processes. W.S. § 21-2-202(a)(ii)

(e) **Employment and Certification.** All personnel are hired and evaluated in accordance with Wyoming statute and district policies.

(i) **Teacher Employment.** District employment policies and practices ensure that quality applicants are hired for all instructional positions. W.S. § 21-7-101-113

(ii) **Teacher Certification and Assignment.** All certified staff have a current or pending certificate issued by the Wyoming Professional Teaching Standards Board, and their assignment is consistent with their area of endorsement. W.S. § 21-7-303(a); W.S. § 21-7-304; W.S. § 21-2-802

(iii) **Education Support Personnel.** Education support personnel are employed in a manner consistent with district policy that ensures qualified support staff. W.S. § 21-3-111(vi)(D-E) W.S. § 21.3-110(a)(ii)(A)

(iv) **Compliance Training.** District personnel receive compliance training as required by statute. 29 CFR 1910 and 1030; W.S. § 21-4-314(e); W.S. § 21-3-110 (a)(xxxiii); W.S. § 21-3-110 (a)(xxxi) Chapter 42 Rules

(f) **Professional Development.** The district professional development plan is designed to increase the capacity, collaboration, and collective efficacy of instructional staff and leaders to improve the instructional core. Professional development is regularly conducted, is relevant to daily work and content areas, and involves active work among colleagues. Accountability Framework, pg.16

(g) **State Assessment and Accountability.** All schools in the district administer Wyoming statewide assessments and receive a school performance rating annually in accordance with the Wyoming Accountability in Education Act (WAEA). W.S. § 21-2-304(a)(v); W.S. § 21-2-204(c-d); W.S. § 21-2-304(a)(ii)

(h) **School Improvement.** Schools identified as partially meeting or not meeting expectations assess needs using WAEA data, write improvement goals, develop improvement plans that are annually approved by the district and submitted to the Department, and participate in the Statewide System of Support if requested to do so by the Department.

(i) **Data Review/Needs Assessment.** Results from the Wyoming accountability system as well as other data are used to identify school improvement goals and priorities. W.S. § 21-2-204(h)(v) and (vi)

(ii) **School Improvement Plans.** School improvement plans are written, submitted to the district and the Department, implemented, and routinely updated by school leaders and staff for schools designated as in need of improvement. W.S. § 21-2-204(h)(v) and (vi)

(iii) **Small School Improvement Plans.** Schools that do not have at least ten students on at least two WAEA indicators will annually submit an improvement plan to the Department that includes strategies to improve student achievement, growth, and equity.

(iv) **Statewide System of Support.** Leadership teams for schools designated as priority schools by the Department participate in the system of support. W.S. § 21-2-204(h)

(i) **Educational Programs, Standards, and Curriculum.** Educational programs in the district are sufficient for all students to meet the uniform Wyoming Content and Performance Standards in all content areas.

(i) **Education Programs and Standards.** The curriculum in all content areas is aligned to and inclusive of the Wyoming Content and Performance Standards. W.S. § 21-9-101-102 and Chapter 10 Rules and Regulations.

(ii) **Math and Literacy Focus.** Math and literacy are a high priority in the elementary grades. W.S. § 21-9 -101(b)(ii)

(iii) **College and Career Preparation.** Coursework and guidance provided is sufficient to prepare students for college, careers and successful citizenship. W.S. § 21-16-1307; W.S. § 21-16-308(b)(i)(C); W.S. § 21-13-309(m)(v)(D)(II); W.S. § 21-20-201

(iv) **Other Curricular Requirements.** The district curriculum addresses other curricular requirements included in Wyoming statute. W.S. § 21-9-102; W.S. § 21-9-101(c)(ii); W.S. § 21-4-602

(j) **District Assessment System.** Through a balanced student assessment system, the district verifies that Wyoming Content and Performance Standards are taught and assessed in all content areas. Assessment results are used to set goals, make instructional decisions, and monitor student progress. The assessment system is continuously refined and updated by the district, and is formally reviewed every five (5) years by the Department. W.S. § 21-2-304(a)(iv); W.S. § 21-3-110(a)(xxxiv); Chapter 31 Rules and Regulations

(k) **Instructional Methods.** The district has implemented a coherent instructional system and a shared instructional process or framework that defines high leverage teaching methods instructional staff use to engage students in the subject matter in all content areas across the district.

(i) **District Instructional System.** The district has a coherent approach, model, or system for aligning curriculum, assessment, instruction, learning support and other aspects of the instructional program. Accountability Framework, Pg. 71

(ii) **Instructional Framework.** The district has identified high leverage instructional strategies, intended to increase student engagement and active learning which should be observed in all classrooms across the district. W.S. § 21-3-110(a)(xvii-xix)

(iii) **Teacher Expertise.** Individual teacher professional growth is focused on the development of instructional expertise specific to the grade level or content area. W.S. § 21-3-111(vi)(C); W.S. § 21-2-304(b)(xv)

(l) **Learning Supports.** Assessment results are used to monitor student progress and assign students in need of intervention to multi-tiered supports. The district is in compliance with all State and Federal Special Education laws. The district addresses the individual learning needs of English learners.

(i) **Student Learning Support.** Individual student needs are addressed through a structured process that includes interventions and enrichment for all students. (i.e. Response to Intervention or Multi-Tiered System of Support). Accountability Framework, pg. 68

(ii) **Reading Assessment and Intervention Plan.** The district reading assessment and intervention plan includes multi-tiered supports, a screening program, progress monitoring, individual student reading plans, and individual school plans in accordance with W.S. § 21-3-401.

(iii) **Students with Disabilities.** Specialized staff, differentiated instruction, and evidence-based interventions are provided for Students with Disabilities in accordance with Wyoming and Federal statute. Chapter 7 Rules and Regulations, W.S. § 21-2-202(a)(xviii) W.S. § 21-9-101(c)(i); W.S. § 21-2-501-502; W/S/21-2-701-706

(iv) **English Learners.** The district provides support by qualified staff to address language barriers for English learners. W.S. § 21-13-309(v)(A); Accountability Framework, pg. 67

(v) **Gifted and Talented.** The district offers instruction that addresses the individual learning needs of gifted students. W.S. § 21-9-101(c)(ii)

(vi) **Student Support Services.** The district offers additional student supports including guidance counseling and social services, and instruction for hospitalized and homebound students. W.S. § 21-9-101(d); W.S. § 21-4-402 (a-b); W.S. § 21-4-301; W.S. § 21-9-201(a)

(vii) **Family Engagement.** The district has adopted and implemented strategies to engage families in their children's learning. Accountability Framework, Pg. 23

(m) **At-Risk and Dropout Prevention.** The district has an early warning system to identify at-risk students, and has implemented dropout prevention strategies.

(i) **Early Warning Systems.** The district has data systems in place to monitor factors that are early predictors of dropout. W.S. § 21-13-309(m)(v)(B)(IV)(1)(a-d)

(ii) **Compulsory Attendance.** The district and all schools monitor student absenteeism and intervene as soon as a student becomes chronically absent. W.S. § 21-4-101-107

(iii) **Dropout Prevention Strategies.** The district has implemented dropout prevention strategies.

(n) **High School Graduation.** High school graduates satisfactorily complete coursework that meets or exceeds the minimum requirements established by the State Board. Chapter 31 Rules and Regulations. W.S. § 21-2-304 (a)(iii); W.S. § 21-9-102

(o) **School Culture, Climate, and Safety.** The district has a plan for promoting positive school culture and learning environments that are safe, orderly, and conducive to learning for all students.

(i) **School Culture and Climate.** The culture and climate in all schools is designed to ensure positive relationships and decrease harassment, intimidation, and bullying. W.S. § 21-4-311-315

(ii) **School Safety.** All schools use multiple strategies to ensure the physical safety of students. These are defined in a district crisis management plan. W.S. § 9-1-603 (a)(ix) and (e), W.S. § 21-4-314(a)(iv); W.S. § 35-9-505(a-b); W.S. § 21-4-305-308; W.S. § 35-7-1036

(p) **Student Activities.** Students are encouraged to participate in activities, clubs, organizations, field trips, and school-sponsored events that extend learning beyond the classroom. WHSAA sanctioned activities and athletics are made available to all high school-age individuals that reside in the district. W.S. § 21-4-506(a); W.S. § 21-9-101(e)

(q) **Technology and Media.** District technology includes internet connectivity. Technology, library, and media services meet the research, learning, and information management needs of students and staff. W.S. § 21-15-115(a)(vii)

(r) **Virtual Education.** If virtual education is provided by the district, the virtual program and courses meet all other state requirements in accordance with Chapter 41 education rules and state statute. W.S. § 21-2-202, W.S. § 21-13-330

(s) **Buildings and Facilities.** All schools and other district buildings are constructed and maintained in accordance with Wyoming School Facilities Department guidelines and other regulations that govern the safety and security of Wyoming public buildings. W.S. § 21-15-115(a)(i); W.S. § 35-1-102; W.S. § 35-1-701; W.S. § 21-3-110(a)(xii); W.S. § 35-7-375; W.S. § 21-15-109 (c)(i)(B) and W.S. § 21-15-116 (a)(vi); W.S. § 21-3-110 (a)(xxii) and W.S. § 21-2-202 (a)(xxii); W.S. § 35-9-107(a)(iii)(B)

(t) **Student Health.** Personnel and processes, including prevention programs, are in place to address the physical and mental health needs of all students enrolled in the district. W.S. § 21-4-309; W.S. § 21-4-310; W.S. § 21-4-316; W.S. § 21-9-203(a-b); W.S. § 21-3-110(a)(xxxii)

(u) **Calendars and Schedules.** The number of school days, hours of student-teacher contact, alternative calendars, days of observance and mourning, scheduled holidays, and reports of school closure are in accordance with Wyoming statute, rules, and regulations. W.S. § 21-4-301; W.S. § 21-13-307(a)(ii); W.S. § 21-4-301 and 21-13-307(a)(ii); W.S. § 8-4-101;W.S. § 21-13-307(a)(ii); Chapter 21 and 22 Rules

(v) **Transportation.** The district provides student transportation to and from school and provides student transportation for interscholastic activities in accordance with applicable laws, rules, and regulations. W.S. § 21-3-131; Chapter 2 and Chapter 20 Rules and Regulations

(w) **Food Services.** The district adheres to Wyoming and Federal regulations and guidelines related to the sanitation of food service facilities and the quality and nutritional value of food provided to students. Free and reduced cost meals are provided based on the income of parents or guardians. 7 CFR Part 210, W.S21-2-202 (a)(x) and Chapter 4 Rules and Regulations

(x) **Finance.** District finances are managed and routinely audited in accordance with state and federal regulations, and accurate data are collected and reported to the Department in a timely manner. W.S. § 16-4-101-125; W.S. § 21-2-203(c)(i-ix); W.S. § 21- 2-305(a)(ii); Chapter 8 Rules and Regulations

(y) **Student Information Management.** Student information, records, identification, attendance calculations, enrollment and transfers are conducted in accordance with statute. W.S. 21-2-202(a)(xxxiv)

(z) **External Review.** The district hosts an on-site external review of the district and schools within the district at least once every five years with the purpose of reviewing selected accreditation criteria, including the district assessment system.

Section 5. Accreditation Status. All public school districts and schools within those districts shall be granted accreditation levels by the State Board. W.S. § 21-2-202(c), W.S. § 21-2-203(e)(ii), W.S. § 21-2-304(b)(ii), and W.S. § 21- 2-305(a)(ii)

(a) One of the following accreditation levels shall be granted by the State Board on an annual basis:

(i) **Accredited.** The district and schools within the district have met the state accreditation criteria in a fully satisfactory manner.

(ii) **Accredited With Follow-up.** The district or schools within the district has failed to meet one or more of the criteria, but the deficiency does not seriously distract from the quality of the educational program. Correctives are required but could reasonably be completed within a school year. The district has submitted an acceptable plan for taking corrective action indicating completion within a one-year timetable following the review year. Districts that complete all corrective actions by the end of the school year during which they are reviewed will be recommended for full accreditation upon Department verification of satisfactory completion.

(iii) **Accredited With Support.** The district or schools within the district has failed to take corrective actions required and/or deficiencies persist over more than one year.

(iv) **Conditionally Accredited.** The district or schools within the district has met the state accreditation criteria in less than a fully satisfactory manner on half or more of the accreditation standards. Corrective actions cannot reasonably be completed within a school year.

(v) **Non-Accredited.** The district or schools within the district has not met the state accreditation criteria. The State Board may attach penalties on an individual basis. The district has:

(1) Consistently failed to complete or make substantial progress towards completing corrective actions on the schedule proposed by the district and accepted by the State Board at the time of citing;

(2) Consistently violated regulations; or

(3) Consistently filed delinquent reports required by statute or regulation.

(vi) **Emergency Change of Accreditation Status.** If the district or schools within the district violates state law and/or regulations which are detrimental to the health, welfare, or safety of students, and the conditions are not immediately corrected upon notice of their existence to local officials, the State Board may place the school district or school on Non-Accredited status until these conditions are corrected. Upon correction of these conditions and submission and approval of a plan to prevent a recurrence, the State Board may revise the district or school's accreditation status to Conditional for a period of time sufficient to verify implementation of the plan to prevent recurrences of the conditions.

(b) A school district may appeal a status of Non-Accredited awarded it by the State Board. A district may appeal for a reconsideration of that status to the State Board of Education within 30 days of the receipt of written notice of Non- Accredited status.

Section 6. School Accreditation Status.

(a) The State Board shall lower the annual accreditation status for an individual school for low student performance as measured through the statewide accountability system per W.S. § 21-2-304(b)(ii). This shall include:

(i) An accreditation status of "accredited with support" for any school that is not meeting expectations for three or more consecutive more years. The first year of identification will be 2020-21 with the initial accountability level derived from the spring 2018 state assessment.

(ii) An accreditation status of "accredited with support" for any district in which every school in the district is not meeting expectations for three or more consecutive years. The first year of identification will be 2020-21 with the initial accountability level derived from the spring 2018 state assessment.

Section 7. Consequences for Non-Accreditation

(a) The State Board and State Superintendent shall take appropriate administrative action with the Wyoming Legislature against any Wyoming district or any school governed by the district for non-accreditation. W.S. § 21-2-202(c)

FIRST	LAST	ORGANIZATION	ROLE
Nancy	Nelson	Big Horn 3	Title I Reading, Greybull Elementary
Brian	Brandon	Campbell 1	Instructional Facilitator
WesAnn	Brown	Campbell 1	Professional Development Director
Mike	Hamel	Carbon 1	Superintendent
Nancy	Torstenbo	Carbon 1	Special Education Coordinator
Andrea	Gilbertson	Fremont 24	Curriculum Director
Bruce	Thoren	Fremont 24	Superintendent
Steve	Newton	Laramie 1	Assistant Superintendent
Charlotte	Gilbar	Natrona 1	Director of Standards and Assessment
Marty	Wood	Niobrara 1	Lusk High School Principal
Ray	Schulte	Park 6	Superintendent
James	Kapptie	Platte 1	Technology Director
Tracy	DeRyk	Platte 1	Teacher and Former H.S. Principal
Mitch	Craft	Sheridan 2	Assistant Superintendent
Jennifer	Martin-Palacios	Sweetwater 1	Principal
Pier	Trudelle	Teton 1	Curriculum Director
Jody	Rakness	Washakie 1	Curriculum Director
Jack	Mueller		WDE accreditation supervisor prior to AdvancED
Kathryn	Sessions		State Board Member
Bill	Pannell	WDE	Accreditation Supervisor
Julie	Magee	WDE	Accountability Director
Joe	Simpson		Facilitator

WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

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MEMORANDUM

To:	State Board of Education
From:	Megan Degenfelder, Chief Policy Officer Laurie Hernandez, Standards/Assessment Director
Date:	September 13, 2017
Subject:	Standards Review (Math, Science Extended, and Social Studies)

Meeting Date: February 15, 2018

Item Type: Action: __X___ Informational: ____

Background:
The Board is charged with evaluating and reviewing the uniformity and quality of the educational standards imposed under W.S. 21-9-101 including the student content and performance standards. The Wyoming Department of Education (WDE) Standards Team has been charged with convening three Standards Review Committees to review the standards and make a recommendation to the state board in the content areas of Mathematics, Science Extended, and Social Studies Standards. The Standards Team started the review process by conducting Regional Community Input Meetings across Wyoming in early May to inform the public of the standards review process and to gather public input for the Review Commitees' consideration.

The Math Standards Review Committee (MSRC) reviewed the current 2012 Mathematics Standards and identified areas to revise and enhance the current standards. This committee met, face-to-face over nine days as well as through video conference, from May – November 2017.

The Science Extended Standards Review Committee (SESRC) reviewed and extended the current 2016 Science Standards, making them accessible to students with the most significant cognitive disabilities. This committee met, face-to-face over five days as well as through video conference, from July – December 2017.

The Social Studies Standards Review Committee (SSSRC) reviewed the current 2014 Social Studies Standards and identified areas to revise and enhance the current standards in order to add in Indian Education for All, per HEA 119. This committee met, face-to-face over four days as well as through video conference, from November 2017 – February 2018.

Statutory Reference (if applicable):

- W.S. 21-2-304(c)
- Education Rules, Chapter 10: Wyoming Content and
  Performance Standards

Supporting Documents/Attachments:
PPT: Standards Update for SBE 02.15.18
2018 Proposed Mathematics Standards
2018 Proposed Science Extended Standards
2018 Revisions to the 2014 Social Studies Standards

Proposed Motions:
I ask the Wyoming Department of Education to move forward with the next phase in the State Board of Education's adopted process, to share these three standards documents, which include Mathematics, Science Extended, and Social Studies, with the public and collect input electronically, as well as through four Public Input Meetings around the state. This input is to be brought back to this Board at their April meeting.

For questions or additional information:
Contact Laurie Hernandez at Laurie.Hernandez@wyo.gov or (307) 777-3469.

ACTION SUMMARY SHEET
STATE BOARD OF EDUCATION

DATE: February 16, 2018

ISSUE: Proposed 2018 Wyoming Content & Performance Standards

AUTHORITY: W.S. 21-2-304(c)

BACKGROUND/HISTORY: The Board is charged with evaluating and reviewing the uniformity and quality of the educational standards imposed under W.S. 21-9-101 including the student content and performance standards. The Wyoming Department of Education (WDE) convened three Standards Review Committees to review the standards and make a recommendation to the state board in the content areas of Mathematics, Science Extended, and Social Studies Standards.

FUNDING: N/A

IMPLEMENTATION AND SUSTAINABILITY: Once these standards are adopted and Ch. 10 Rules are promulgated, the standards will remain in effect until the next review cycle or until directed by the Board to open the review process, whichever comes first. Upon adoption of these standards, the Board will determine dates for implementation in schools per W.S. 21-2-304(a)(iv).

SUGGESTED MOTION(s)/RECOMMENDATION(s): I ask the Wyoming Department of Education to move forward to the next phase in the State Board of Education's adopted process, to share these three standards documents, which include mathematics, science extended, and social studies, with the public and collect input electronically, as well as through four public events around the state.

SUPPORTING INFORMATION ATTACHED: The standards documents for mathematics, science extended, and social studies, as well as presentation materials are included in the Board packet.

PREPARED BY: *Laurie Hernandez*
Laurie Hernandez, WDE Director of Standards & Assessment

ACTION TAKEN BY STATE BOARD: __________________**DATE:**_________________

COMMENTS:

Proposed 2018 Wyoming Content & Performance Standards

State Board of Education Meeting in Cheyenne February 15, 2018

Barb Marquer, M.Ed.
Standards Team Supervisor

Laurie Hernandez, M.Ed.
Standards & Assessment Director

Overview

- Update on the Standards Review Process
- 2018 Proposed Standards
  - Mathematics
  - Science Extended Standards
  - Social Studies Review and Enhancements to include Indian Education for All (HEA 119)
- Next Steps in the Process

Committee Process

- All three committees worked in grade-band groups and in full committee to complete the following:
  - Reviewed and evaluated the current WY Content & Performance Standards
  - Reviewed and evaluated other states' standards
  - Decided direction

WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

Proposed 2018 Wyoming Math Content & Performance Standards

Jill Stringer, M.Ed.
Math Consultant
Jill.Stringer@wyo.gov

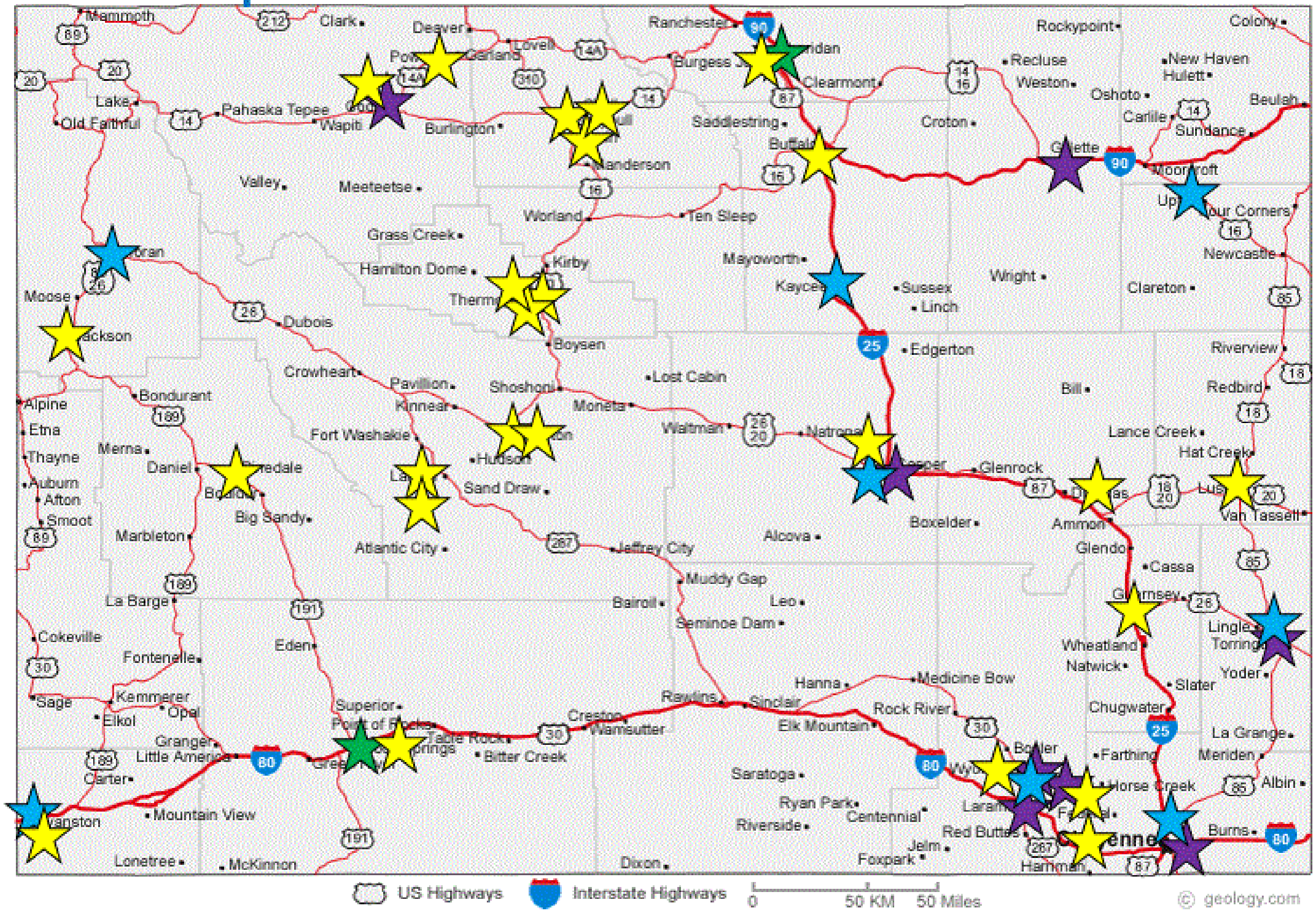
WYOMING
DEPARTMENT OF EDUCATION

2017 Regional Community Meetings - Math Standards Review		
Date & Time	Location & Address	Room
May 2, 2017 6-8 pm	Powell High School Library 1151 East 7th Street Powell, WY 82435	Library
May 3, 2017 6-8 pm	NCSD #1 Central Services Facility 970 North Glenn Road Casper, WY 82601	Jefferson Room
May 4, 2017 6-8 pm	Rock Springs High School 3550 Foothill Boulevard Rock Springs, WY 82901	Board Room
May 9, 2017 6-8 pm	LCSD #1 Administrative Building 2811 House Avenue Cheyenne, WY 82001	Room #130

Content Committee Selection

- Number of members (38)
- Structure of Committees
  - ➢ Content Area Considerations (Math)
  - ➢ Ensure diversity of Content Committees
    - – Large school / Small school
    - – Veteran / Rookie Educators
    - – All corners of the state + central
    - – Grade levels – alignment through the years (K-12)
  - ➢ Content Experts
    - – School District Personnel
    - – University and Community College Personnel
  - ➢ Wyoming Citizens
    - – Parents
    - – Business & Industry Members
    - – Retired, Grandparents, Community Members

Map of 2017 Math Standards Review Committee



Parent — 8

Professor — 8

Educator — 20

Community Member/ Business Owner — 2

Standards Review & Revision

WYOMING DEPARTMENT OF EDUCATION

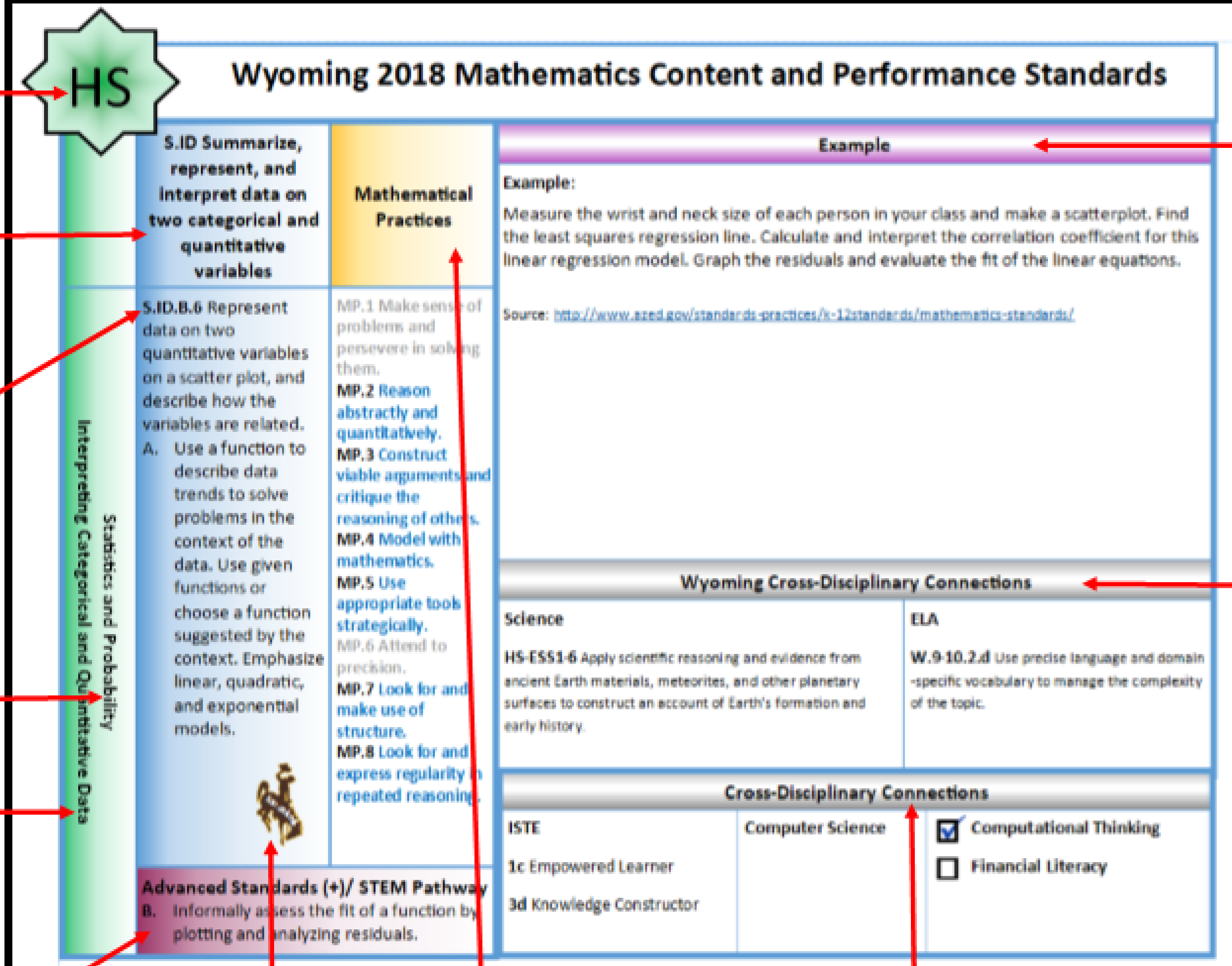
Meeting Type	Date	Length of Meeting	Location
Higher Ed. Committee	April 29, 2017	1 day	Cheyenne
Webinar	May 30, 2017	2 hours	Video Conference
Face-to-Face	June 20-22, 2017	3 days	Casper
Face-to-Face	August 7-9, 2017	3 days	Riverton
Face-to-Face	September 25, 2017	1 day	Casper
Face-to-Face	November 2-3, 2017	2 days	Casper

Committee Options

WYOMING DEPARTMENT OF EDUCATION

1) Keep current standards
2) Revise current standards
3) Adopt standards from a different state
4) Revise standards from a different state
5) Use multiple pieces from different states
6) Create own set of standards

How to Read This Document



Grade Level

Math Standard

S.ID means Statistics and Probability, Interpreting Categorical and Quantitative Data

Benchmark

The skills and content students should understand and be able to do by the end of the grade levels.

Conceptual Category (high school only)

Domain

Cluster of related standards.

Grade-Level Example

Example(s) are suggested options to demonstrate a benchmark. Multiple strategies may be used.

Wyoming Cross-Disciplinary Connections

Connections to other Wyoming Content & Performance Standards. These are intended to be suggestions and may be relevant depending on curriculum and instruction.

Advanced Standard (+) (high school only)

Advanced mathematics standards that students should learn in order to take advanced courses.

Modeling

Symbol denotes modeling to be considered in instruction.

Mathematical Practices

Describe varieties of skills and expertise that math educators at all levels should seek to develop in their students.

Cross-Disciplinary Connections

Connections to real-world concepts and standards. These are intended to be suggestions and may be relevant depending on curriculum and instruction.

Grade Level

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

Mathematical Practices

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Example

The residual in a regression model is the difference between the observed and the predicted y for some x (y the dependent variable and x the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i - (ax_i + b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

Example:

Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science

HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner

3d Knowledge Constructor

4a,d Innovative Designer

5a,b Computational Thinker

Computer Science

☑ **Computational Thinking**

☐ **Financial Literacy**

HS

Wyoming 2018 Mathematics Content and Performance Standards

Math Standard
S.ID means Statistics and Probability, Interpreting Categorical and Quantitative Data

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

The residual in a regression model is the difference between the observed and the predicted y for some x (y the dependent variable and x the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i—(ax_i+ b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

Example:

Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

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Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science

HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

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Cross-Disciplinary Connections

ISTE

1c Empowered Learner

3d Knowledge Constructor

4a,d Innovative Designer

5a,b Computational Thinker

Computer Science

☑ Computational Thinking

☐ Financial Literacy

Wyoming 2018 Mathematics Content and Performance Standards

HS

Benchmark
The skills and content students should understand and be able to do by the end of the grade levels.

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Example

The residual in a regression model is the difference between the observed and the predicted y for some x (y the dependent variable and x the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i—(ax_i+ b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

Example:
Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science

HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner

3d Knowledge Constructor

4a,d Innovative Designer

5a,b Computational Thinker

Computer Science

☑ **Computational Thinking**

☐ **Financial Literacy**

HS

Wyoming 2018 Mathematics Content and Performance Standards

Conceptual Category (high school only)

Interpreting Categorical and Quantitative Data

Statistics and Probability

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.	Mathematical Practices
S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Example

The residual in a regression model is the difference between the observed and the predicted y for some *x* (*y* the dependent variable and *x* the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i—(ax_i+ b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

Example:

Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

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Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science	ELA
HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	**W.9-10.2.d** Use precise language and domain-specific vocabulary to manage the complexity of the topic. **W.11-12.2.d** Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **4a,d** Innovative Designer **5a,b** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

Wyoming 2018 Mathematics Content and Performance Standards

HS

Domain
Cluster of related standards.

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.	Mathematical Practices
S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
B. Informally assess the fit of a function by plotting and analyzing residuals.

Example

The residual in a regression model is the difference between the observed and the predicted y for some *x* (*y* the dependent variable and *x* the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i - (ax_i + b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

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Example:
Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **4a,d** Innovative Designer **5a,b** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.	Mathematical Practices
S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.
Advanced Standards (+)/ STEM Pathway B. Informally assess the fit of a function by plotting and analyzing residuals.	

Example

The residual in a regression model is the difference between the observed and the predicted y for some *x* (*y* the dependent variable and *x* the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i—(ax_i+ b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

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Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **4a,d** Innovative Designer **5a,b** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

Advanced Standard (+)
(high school only)

Advanced mathematics standards that students should learn in order to take advanced courses.

HS Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

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C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

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MP.6 Attend to precision.

MP.7 Look for and make use of structure.

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Example

The residual in a regression model is the difference between the observed and the predicted y for some *x* (*y* the dependent variable and *x* the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i - (ax_i + b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

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Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science

HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner

3d Knowledge Constructor

4a,d Innovative Designer

5a,b Computational Thinker

Computer Science

☑ Computational Thinking

☐ Financial Literacy

Modeling

Symbol denotes modeling to be considered in instruction.

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

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MP.4 Model with mathematics.

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MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Mathematical Practices

Describe varieties of skills and expertise that math educators at all levels should seek to develop in their students.

Example

The residual in a regression model is the difference between the observed and the predicted y for some x (y the dependent variable and x the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i—(ax_i+ b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

Example:

Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science	ELA
HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	**W.9-10.2.d** Use precise language and domain-specific vocabulary to manage the complexity of the topic. **W.11-12.2.d** Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **4a,d** Innovative Designer **5a,b** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Example

The residual in a regression model is the difference between the observed and the predicted y for some x (y the dependent variable and x the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i - (ax_i + b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

Example:

Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science

HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

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Cross-Disciplinary Connections

ISTE

1c Empowered Learner

3d Knowledge Constructor

4a,d Innovative Designer

5a,b Computational Thinker

Computer Science

☑ Computational Thinking

☐ Financial Literacy

Wyoming Cross-Disciplinary Connections

Connections to other Wyoming Content & Performance Standards. These are intended to be suggestions and may be relevant depending on curriculum and instruction.

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

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Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **4a,d** Innovative Designer **5a,b** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

Cross-Disciplinary Connections

Connections to real-world concepts and standards. These are intended to be suggestions and may be relevant depending on curriculum and instruction.

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

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Cross-Disciplinary Connections

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Computer Science

☑ Computational Thinking

☐ Financial Literacy

Grade-Level Example

Example(s) are suggested options to demonstrate a benchmark. Multiple strategies may be used.

2012 – 2018 Math Crosswalk

WYOMING DEPARTMENT OF EDUCATION

	2nd GRADE MATHEMATICS		
	2012 ORIGINAL	**COMMITTEE CHANGES**	**2018 PROPOSED**
2.OA.C.3	Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.	Determine whether a group ~~of objects~~ (up to 20) has an odd or even number of ~~members~~,objects (i.e. by pairing objects or counting them by 2s). A. If the number of objects ~~group~~ is even, then ~~write an equation to express this number as a sum of two equal addends. e.g., by pairing objects or counting them by 2s;~~ write an equation to express this as the sum of two equal addends.~~an even number as a sum of two equal addends~~ B. ~~and~~ If the number of objects ~~group~~ is odd, then write an equation to express this as ~~an odd number as~~ a sum of a near double (double plus 1). ~~Understand the idea of two equal groups a)Determine if a group of objects (up to 20) is even or odd by pairing objects and write an equation to express as a sum of two equal addends or the sum of two equal addends with one extra. Determine whether a group of objects has an odd or even number of objects~~	Determine whether a group (up to 20) has an odd or even number of objects (i.e. by pairing objects or counting them by 2s). A. If the number of objects is even, then write an equation to express this as the sum of two equal addends. B. If the number of objects group is odd, then write an equation to express this as a sum of a near double (double plus 1).

2012 – 2018 Math Crosswalk

WYOMING DEPARTMENT OF EDUCATION

	6th GRADE MATHEMATICS		
	2012 ORIGINAL	**COMMITTEE CHANGES**	**2018 PROPOSED**
6.NS.C.2	Fluently divide multi-digit numbers using the standard algorithm.	~~Fluently d~~Divide multi-digit numbers using efficient and generalizable procedures including, but not limited to the standard algorithm. Assessment boundary: up to 5-digit dividend, 2-digit divisors (add an example showing long division and add "the standard algorithm" to the glossary or somewhere)	Divide multi-digit numbers using efficient and generalizable procedures including, but not limited to the standard algorithm. Assessment Boundary: Use up to 5-digit dividend, 2-digit divisors.
6.NS.C.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	~~Fluently a~~ Add, subtract, multiply, and divide manageable multi-digit decimals using efficient and generalizable procedures including, but not limited to ~~using~~ the standard algorithm for each operation. (add an example showing all standard algorithms and add "the standard algorithm" to the glossary or somewhere)	Add, subtract, multiply, and divide manageable multi-digit decimals using efficient and generalizable procedures including, but not limited to the standard algorithm for each operation.

2012 – 2018 Math Crosswalk

WYOMING DEPARTMENT OF EDUCATION

	HS GRADE MATHEMATICS - STATISTICS & PROBABILITY		
	2012 ORIGINAL	**COMMITTEE CHANGES**	**2018 PROPOSED**
S.ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).*	Represent data with plots on the real number line (dot plots, histograms, and box plots) by hand or using technology.*	Represent data with plots on the real number line (dot plots, histograms, and box plots) by hand or using technology.
S.ID.A.4	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.*	(+) Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use the Empirical Rule, calculators, spreadsheets, and/or tables to estimate areas under the normal curve.*	(+) Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use the Empirical Rule, calculators, spreadsheets, and/or tables to estimate areas under the normal curve.

Key Changes to 2018 Proposed Math Standards

WYOMING
DEPARTMENT OF EDUCATION

- Mathematical Practices – more grade specific
- Modeling integrated within all grade levels
- Examples added to standards/benchmarks
- Wyoming content cross-disciplinary connections
- National standard connections – e.g., ISTE, CSTA
- Assessment Boundaries added to some standards/benchmarks, as needed
- Identified Common Core of Skills (Computational Thinking, Financial Literacy)

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

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MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Mathematical Practices

Describe varieties of skills and expertise that math educators at all levels should seek to develop in their students.

Example

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Wyoming Cross-Disciplinary Connections

Science

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Cross-Disciplinary Connections

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1c Empowered Learner

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Computer Science

☑ **Computational Thinking**

☐ **Financial Literacy**

Math Practice 2
Reason Abstractly and Quantitatively

Original Mathematically proficient students make sense of their quantities and relationships in problem situations. They bring two complimentary abilities to bear on problems involving quantitative relationships: the ability to deconceptualize – to abstract a given situation and represent symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents – and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the unit involved; attending to the meaning of quantities; not just how to compute them; and knowing and flexibility using different properties of operations and objects.

Grade 1 Specific (revised) Students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning means being able to explain through manipulatives or drawings what a problem means while attending to the meanings of quantities. Students make meaning of a problem situation and translate into a number sentence.

2018 Benchmarks and Revisions

WYOMING
DEPARTMENT OF EDUCATION

Grade	# Benchmarks
K	25 (16 *edited)
1	21 (17*)
2	27 (19*)
3	24 (21*)
4	27 (25*)
5	26 (21*)
6	50 (23*)

Grade	# Benchmarks
7	51 (23*)
8	32 (24*)
HS Number & Quantities	9 with 23(+) (1*)
HS Algebra	30 with 5(+) (12*)
HS Functions	29 with 7(+) (14*)
HS Geometry	35 with 7(+) (4*)
HS Statistics & Probability	9 with 27(+) (17*)

Percent of Overall Benchmark Revisions from 2012 to 2018 = 51%

Vertical Alignment of Standards/Benchmarks

2018 Kindergarten Mathematics		Grade 1 Mathematics		Grade 2 Mathematics	
Operations & Algebraic Thinking		Operations & Algebraic Thinking		Operations & Algebraic Thinking	
K.OA.D.1	Model situations that involve representing addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.	1.OA.A.1	Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, by using objects, drawings, or equations with a symbol for the unknown number to represent the problem.	2.OA.A.1	Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
K.OA.D.2	Solve word problems using objects and drawings to find sums up to 10 and differences within 10.	1.OA.A.2	Solve word problems that call for the addition of three whole numbers whose sum is less than or equal to 20, by using objects, drawings, or equations.	2.OA.B.2	Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know automatically all sums of two one-digit numbers based on strategies.
K.OA.D.3	Decompose numbers less than or equal to 10 in more than one way.	1.OA.B.3	Apply commutative and associative properties of addition as strategies to add and subtract.	2.OA.C.3	Determine whether a group (up to 20) has an odd or even number of objects (i.e. by pairing objects or counting them by 2s). A. If the number of objects is even, then write an equation to express this as the sum of two equal addends. B. If the number of objects group is odd, then write an equation to express this as a sum of a near double (double plus 1).
K.OA.D.4	For any number from 1 to 9, find the number that makes 10 when added to the given number.	1.OA.B.4	Understand subtraction as an unknown-addend problem.	2.OA.C.4	Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

QUESTIONS?

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Proposed 2018 Wyoming Science Extended Content & Performance Standards

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WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

Science Extended Standards

- Science Extended Standards (SES) are extensions of the Science Standards
  - Align to the 2016 Science WyCPS
  - Written to each grade (K-5) and in grade spans for MS (6-8) and HS (9-12)
- Designed for the 1% of the most significantly cognitive disabled
- Build to 4 performance levels with embedded examples
- Some benchmarks were incorporated into another

Map of the 2017-18 Science Extended Standards Review Committee

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DEPARTMENT OF EDUCATION

The committee consisted of the following:
13 Special Education Teachers
& 4 Science Teachers

Science Extended Standards Review Committee

Meeting Type	Date	Length of Meeting	Location
Face-to-Face	July 10-12, 2017	3 days	Cheyenne
Webinar	July 20, 2017	2 hours	Video Conference
Webinar	August 22, 2017	2 hours	Video Conference
Webinar	August 31, 2017	2 hours	Video Conference
Webinar	September 7, 2017	2 hours	Video Conference
Face-to-Face	November 17-18, 2017	2 days	Cheyenne
Webinar	December 5, 2017	2 hours	Video Conference

Grade Level

Science Benchmark

4-ESS1-1 means Grade 4, Earth & Space Science, Standard 1, Benchmark 1.

Science Standard

Performance Level Descriptors (PLDs)

PLDs help teachers assess the student's performance of the benchmark.

Level IV - Advanced, Level III - Proficient, Level II - Basic, Level I - Below Basic.

4

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. Clarification Statement: Examples of evidence from patterns (may include, but not limited to, Wyoming specific examples) could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.	SES-4-ESS1-1. Describe that landscapes can change.	**Level IV Students will:** Describe/communicate that landscapes can change over time. *Ex. Use a picture of river eroding the landscape, videos of lava flowing from volcanoes, etc.* **Level III Students will:** Describe that landscapes can change. *Ex. Use pictures of a volcano blowing up, land side, tsunami, etc.* **Level II Students will:** Make observations of landscape differences. *Ex. Compare pictures of different landscapes.* **Level I Students will:** Attend to a presentation of landscapes.

Clarification Statement

Provides further explanation or examples to support educators.

Symbol

Wyoming examples are given or can be considered in instruction.

Science Extended Benchmark

SES-4-ESS1-1 means Science Extended Standard, Grade 4, Earth & Space Science, Standard 1, Benchmark 1.

Grade 4 Example

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4

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS 1 – Earth's Place in the Universe

2016 Wyoming Science Content & Performance Standards	2018 Wyoming Science Extended Standards	Instructional Performance Level Descriptors
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High School Example

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS 3 – Earth and Human Activity

2016 Wyoming Science Content & Performance Standards	2018 Wyoming Science Extended Standards	Instructional Performance Level Descriptors
HS-ESS3-3. Use a computational tools to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.	**SES-HS-ESS3-3. The management factors of natural resources was addressed in the previous standard (ESS3-2).**	**Not applicable.**
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Technological solutions to evaluate could include landscape reclamation, reducing, reusing, and recycling resources, emission control systems, or evaporation control. Examples for limiting future impacts could range from local efforts to large-scale design solutions.	**SES-HS-ESS3-4. Construct a model of a technological solution that reduces impacts of human activities on natural systems.**	**Level IV Students will:** **Construct, and label, a model of a technological solution that reduces impacts of human activities on natural systems.** **Level III Students will:** **Construct a model of a technological solution that reduces impacts of human activities on natural systems.** *Ex. Create a storyboard that depicts landscape reclamation.* *Ex. Create a recycling center in their room or school.* *Ex. Create a model of a car muffler.* **Level II Students will:** **Identify a model of a technological solution that reduces impacts of human activities on natural systems.** **Level I Students will:** **Explore examples of technological solutions that reduce impacts of human activities on natural systems.** *Ex. Visit the local recycling center.* *Ex. Visit the school auto shop and watch a demonstration of how a car's emission control system works.* *Ex. Visit a mining facility and observe their reclamation activities.*

High School Example

WYOMING DEPARTMENT OF EDUCATION

HS

2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS3 – Earth and Human Activity

2018 Wyoming Science Extended Standards	Instructional Performance Level Descriptors
SES-HS-ESS3-2. From factors provided, select which factors need to be considered, prior to developing energy or mineral resources.	**Level IV Students will:** **Identify factors to consider, prior to developing energy or mineral resources.** *Ex. How will opening or closing mines affect the environment and the people in the area?* **Level III Students will:** **From factors provided, select which factors need to be considered, prior to developing energy or mineral resources.** *Ex. Sage grouse habitat destruction vs improved grazing areas.* *Ex. Water source contamination vs. improved water quality.*
SES-HS-ESS3-3. Integrated in SES-HS-ESS3-2. **The management factors of natural resources was addressed in the previous standard.**	**Not applicable.**

QUESTIONS?

Trenton Vonburg
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WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

Proposed 2018 Revisions to Wyoming Social Studies Content & Performance Standards

Rob Black

Social Studies Consultant

Native American Liaison

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2017 House Bill 76, House Enrolled Act 119

- (a) The state board through the department of education shall, in cooperation with tribes of the region including the Eastern Shoshone and Northern Arapaho Indian tribes, **evaluate and review** existing state social studies content and performance standards **to ensure the cultural heritage, history and contemporary contributions of American Indians are addressed** in the Wyoming social studies content and performance standards.

2017 House Bill 76,
House Enrolled Act 119 (cont.)

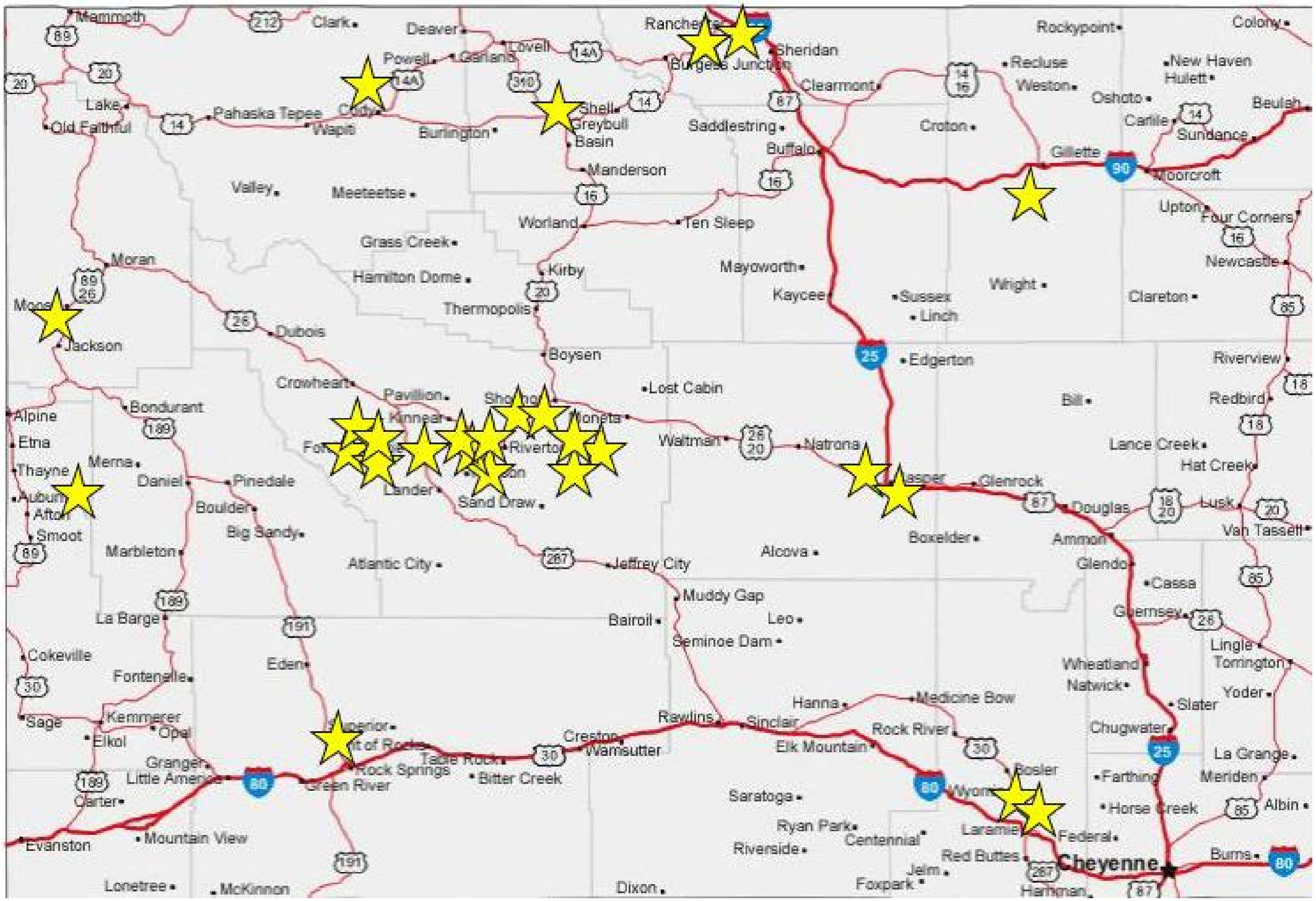
WYOMING
DEPARTMENT OF EDUCATION

- (b) The department shall, in consultation with tribes of the region including the Eastern Shoshone and Northern Arapaho Indian tribes, **make available materials and resources on the department's official web site** to assist school districts in meeting social studies benchmarks within Wyoming social studies content and performance standards relating to the study of American Indian tribes.

2017 Regional Public Input for Wyoming Social Studies Standards			
Date & Time	**Location**	**Attendance**	**Written Comment**
June 12	**Fort Washakie**	**15**	**4**
June 13	**Riverton**	**22**	**3**
June 15	**Cody**	**10**	**3**
June 22	**Sheridan**	**5**	**3**
June 29	**Cheyenne**	**1**	**0**
	Sub-Total	53	14
6/5/17 - 9/8/17	**Collected Online**	**6**	**6**
	TOTAL	**59**	**20**

WYOMING
DEPARTMENT OF EDUCATION

Social Studies Standards Review Committee (2017-2018)



24 Committee Members

– 14 Native Americans – 7 N. Arapaho, 5 E. Shoshone, 1 N. Cheyenne, & 1 Pawnee/Navajo
– 21 Educators from 14 school districts

Standards Review & Revision

Meeting Type	Date	Length of Meeting	Location
Webinar	November 13, 2017	1.5 hours	Video Conference
Face-to-Face	November 28-29, 2017	2 days	Riverton
Webinar	January 11, 2018	2.5 hours	Video Conference
Face-to-Face	January 17-18, 2018	2 days	Lander
Webinar	January 25, 2018	3 hours	Video Conference
Webinar	January 30, 2018	2 hours	Video Conference

Social Studies Standards

WYOMING DEPARTMENT OF EDUCATION

1. Citizenship, Government, and Democracy
2. Culture and Cultural Diversity
3. Production, Distribution, and Consumption
4. Time, Continuity, and Change
5. People, Places, and Environments
6. Technology, Literacy, and Global Connections

Key Additions to the Social Studies Standards

- Added new committee rationale
- Termed tribes of the region as “Indigenous Tribes of Wyoming” and defined
- Enhanced Standards 1, 2, 4, & 5
  - Incorporated directly into existing benchmark
  - Added and denoted with an “a” (e.g., SS8.5.2a)
- Reviewed and added to Performance Level Descriptors to reflect changes to benchmarks
- Identified cross-curricular connections tying the other 8 content areas to Social Studies

Definition

The term "Indigenous Tribes of Wyoming" was selected by the SSSRC to be a working definition inclusive of those groups who:

- Identify as indigenous, Native American, or American Indian under the regulations established by a tribe
- Maintain historical continuity with pre-colonial and/or pre-settler societies
- Maintain a strong link to territories and surrounding natural resources
- Maintain distinct social, economic, or political systems
- Maintain distinct language, culture, and beliefs
- Resolve to maintain their ancestral environments and systems as distinctive peoples and communities (e.g., Northern Arapaho, Eastern Shoshone, Northern Cheyenne, Crow, Ute, Lakota, etc.)

Adapted from the United Nations Permanent Forum on Indigenous Issues
http://www.un.org/esa/socdev/unpfii/documents/5session_factsheet1.pdf

Standard 2 Example

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.2.2 Recognize and describe unique ways in which expressions of culture influence people including Indigenous Tribes of Wyoming (e.g., language, sign language, stories, music, symbolism, and art).	**SS5.2.2** ~~Identify and d~~ Describe, compare and contrast ways in which unique expressions of culture ~~influence people~~ (e.g., tribal affiliation, language, spirituality, stories, folktales, music, art, and dance) influence people.	**SS8.2.2** ~~Examine and e~~ Evaluate how human expression (e.g., language, literature, arts, architecture, traditions, beliefs, and spirituality) contributes ~~to the~~ cultural development, ~~and~~ understanding, and continuity ~~transmission of culture~~ (e.g., oral tradition, Pow Wows, ceremonies, and assimilation).	**SS12.2.2** Analyze human experience and cultural expression (e.g., language, literature, arts, traditions, beliefs, spirituality, values, and behavior) and illustrate integrated views of a specific culture. **SS12.2.2.a** Compare and contrast the human experience and cultural expression of Indigenous Tribes of Wyoming (e.g., oral history, Native literature, traditional arts, values, songs, dance, artifacts, and language).

Standard 4 Example

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
Not assessed at this time.	**SS5.4.4** Discuss different groups that a person may belong to, including Indigenous Tribes of Wyoming, (e.g., family, neighborhood, cultural/ethnic, and workplace) and how those roles and/or groups have changed over time.	**SS8.4.4** Identify historical interactions between and among individuals, groups, and/or institutions (e.g., family, neighborhood, political, economic, religious, social, cultural, and workplace). **SS8.4.4.a** Identify how federal policies have impacted Indigenous Tribes of Wyoming historically and currently (e.g., reservations, treaties, allotment, boarding schools, and forced assimilation).	**SS12.4.4** Describe the historical interactions between and among individuals, groups, and/or institutions (e.g., family, neighborhood, political, economic, religious, social, cultural, and workplace) and their impact on significant historical event. **SS12.4.4.a** Describe the historical interactions between Indigenous Tribes of Wyoming, state, and federal governments (e.g. Chief Washakie and the federal government, treaties, 1871 Indian Appropriations Act, Dawes Act, and the 1956 Indian Relocation Act).

Performance Level Descriptors

GRADE 5 – Standard 2

Advanced: A fifth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify and describe ways groups and cultures meet human needs;

b) identify and describe ways people contribute to personal identity in daily life;

c) identify and describe characteristics, contributions, and possible tensions ~~between~~ **among** cultural groups**, including tribes**.

Proficient: A fifth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify and describe ways groups and cultures meet human needs;

b) identify and describe ways people contribute to personal identity in daily life;

c) identify and describe characteristics, contributions, and possible tensions ~~between~~ **among** cultural groups**, including tribes**.

Basic: A fifth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) identify and describe way groups and cultures meet human needs;

b) identify and describe ways people contribute to personal identity in daily life;

c) identify and describe characteristics, contributions, and possible tensions ~~between~~ **among** cultural groups**, including tribes**.

Below Basic: A fifth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

QUESTIONS?

Rob Black
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WYOMING
DEPARTMENT OF EDUCATION

Creating Opportunities for Students to Keep Wyoming Strong

WYOMING
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Creating Opportunities for Students to Keep Wyoming Strong

NEXT STEPS IN THE PROCESS

Collect Public Input

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Standards & Assessment Director

Barb Marquer, M.Ed.
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Questions

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2018 WYOMING MATHEMATICS

CONTENT AND PERFORMANCE STANDARDS

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TO BE FULLY IMPLEMENTED IN DISTRICTS BY THE BEGINNING OF SCHOOL YEAR 2021-2022

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ACKNOWLEDGEMENT

The Wyoming State Board of Education would like to thank the Wyoming Department of Education, as well as educators, parents and community members, business and industry representatives, community college representatives, and the University of Wyoming representatives for their help with the development of these math standards.

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Wyoming Department of Education

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Higher Education Committee

The Higher Education Committee, consisting of 6 members from the community college and university level, reviewed the current math standards in order to provide feedback for the Math Standards Review Committee's consideration. After studying the 2012 Math Standards, the committee came to two principle conclusions: (i) The eight standards for mathematical practice are more important than any individual mathematical content articulated in the standards; and (ii) the content standards (the non-plus standards) represent a reasonable expectation for students entering credit-bearing college-level math courses.

Math Standard Review Committee (MSRC)

The Math Standards Review Committee was made up of thirty-eight (38) members including educators, parents, and community members from around the state of Wyoming. The MSRC reviewed a compilation of comments from regional community members, K—16 Wyoming educators, and findings from a Higher Education Committee around the current 2012 Wyoming Math Standards. The MSRC also evaluated the 2012 Math Standards, and discussions centered on research, national standards, and other exemplar states' math standards. For the development of the new 2018 Math Standards, the group came to consensus and agreed to use the current standards as a foundation from which to build upon and enhance through revisions, additions, and adaptations. The MSRC also chose to incorporate multiple states' resources when developing the new math standards including: Arizona, South Carolina, Washington, and Indiana, in addition to Wyoming's 2012 Math Standards. The MSRC found these states had philosophies that mirrored the committee's vision for the goal and direction necessary for Wyoming students with the new 2018 Wyoming Math Content and Performance Standards.

Parent Sub-Committee

In the spirit of being champions for all Wyoming kids, we understand successes and failures are a part of the learning journey. Winston Churchill is often given credit for saying, "Success is not final, failure is not fatal: it is the courage to continue that counts." This is what we want for our children, the courage to continue when faced with challenging tasks. As our children learn mathematics throughout their education, they will have opportunities to succeed and celebrate achievements.

As parents, we want children in Wyoming to be critical thinkers and to push the boundaries of mathematical understanding. We believe it is no longer acceptable to say, "I was never good at math, either" or to accept this for our children. We want them to learn and grow their mathematical skills to have the foundational knowledge to succeed in all endeavors.

The Mathematical Standards Review Committee (MSRC) started our meetings in June 2017 to review the mathematical standards for Wyoming K-12. The MSRC was comprised of educators, parents, and community members; all had a voice in every decision. It was a long process that provided valuable discussions and unique experiences, and in the end, we believe that our voices were heard.

We, as parents, play a vital role in our children's education. Mathematics is a significant portion of that educational process. Our children need inspiration, motivation, ability, and the opportunity to explore the mathematical world around them. They deserve to be given ample freedom to manipulate and explore the tools necessary to succeed in mathematics, now and in the future. The resulting revised standards document supports these goals we want for the children of Wyoming. Coupled with excellent instructional support from our Wyoming teachers, our children will have the opportunity to become confident and independent learners that can achieve great things in their lifetime and assist others to do the same.

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2018 Wyoming Math Content and Performance Standards

Introduction

The Wyoming Math Content and Performance Standards (WyCPS) were last reviewed and approved in 2012 in accordance with Wyoming State Statute W.S. 21-2-304(c). The 2018 Wyoming Math Content and Performance Standards were developed collaboratively through the contributions of Math Standard Review Committee (MSRC) members from across the state. The committee's work was informed and guided by initial public input through community forums, as well as input solicited from specific stakeholder groups.

Introduction to Standards

Content Standards

Content standards define what students are expected to know and be able to do by the time they graduate. They do not dictate what methodology or instructional materials should be used, nor how the material is delivered.

Benchmarks

Benchmarks specify what students are expected to know and be able to do at the end of each of the grade levels. Benchmarks specify the skills and content students must master in order to demonstrate proficiency of the content standard by the time they graduate. In this standards document, you will find the benchmarks are broken out into individual grades for Kindergarten through 8th grade (K-8) and into Conceptual Categories at the high school grade levels (9-12).

Advanced Standards (+)

The high school standards specify the mathematics that all students should study to be college and career ready. Each standard **without** a **(+)** symbol should be in the common mathematics curriculum for all students. Advanced mathematics standards, those designated **with** a **(+)** sign, are integrated into the higher level math courses after Algebra II. These standards encourage student experiences in higher level mathematical thinking and/or STEM pathways.

(Adapted from CCSS https://edu.wyoming.gov/downloads/standards/final-2012-math-standards.pdf)

Rationale

Mathematics is the language that defines the blueprint of the universe. Mathematics is woven into all parts of our lives and is more than a list of skills to be mastered. The essence of mathematics is the ability to employ critical thinking and reasoning to solve problems. To be successful in mathematics, one must see mathematics as sensible, useful, and worthwhile. The 2018 Wyoming Mathematics Content and Performance Standards address two kinds of knowledge: mathematical content and mathematical practice.

Why Do We Have Standards for Mathematics?

Uniform and consistent mathematical education is necessary as it ensures that all students in Wyoming are prepared for success in and out of the classroom. Therefore, the 2018 Wyoming Mathematics Content and Performance Standards:

Provide students, parents, and educators focus and coherence through application including understanding of mathematical concepts and processes.

- Align K-12 with clearly defined goals and outcomes for learning.
- Emphasize conceptual understanding.
- Encourage multiple models, representations and strategies.
- Use technology to optimize mathematical understanding.

Develop students' mathematical thinking.

- Develop reasoning, solving, representing, proving, communicating, and connecting across contexts and applications.
- Recognize and identify mathematics in the world around us.
- Engage students in making sense, building conceptual understanding, developing procedural fluency, and employing adaptive reasoning.
- Build constructive attitudes to see mathematics as sensible, useful and worthwhile, and to increase confidence in one's own ability to do mathematics.

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Mathematical Literacy

"Mathematical literacy is an individual's capacity to formulate, employ and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to recognize the role that mathematics plays in the world and to make the well-founded judgements and decisions needed by constructive, engaged and reflective citizens."

https://www.achieve.org/files/StrongStandards.pdf

Why do we have the Standards for Mathematical Practice?

Procedural knowledge alone will not prepare our 21st Century students to be globally competitive. Mathematical thinkers also visualize problems and recognize that multiple strategies may lead to a single solution. They realize mathematics is applicable outside of the classroom and are confident in their ability to apply mathematical concepts to all aspects of life. The Standards for Mathematical Practice cultivate mathematically literate and informed citizens. Using mathematics as a means of synthesizing complex concepts and making informed decisions is paramount to college and career success. The Standards for Mathematical Practice develop skills that serve students beyond the math classroom.

http://www.corestandards.org/Math/Practice/

Standards for Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Computational Thinking

Computational thinking is necessary and meaningful in mathematics. Computational thinking has developed into competencies in problem solving, critical thinking, productivity, and creativity. Over time, engaging in computational thought builds a student's capacity to persevere, work efficiently, gain confidence, tolerate ambiguity, generalize concepts, and communicate effectively. In order to adapt to global advancements in technology, students will need to use their computational thinking skills to formulate, articulate, and discuss solutions in a meaningful manner.

Modeling

Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

The basic modeling cycle involves: (1) identifying variables in the situation and selecting those that represent essential features, (2) formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables, (3) analyzing and performing operations on these relationships to draw conclusions, (4) interpreting the results of the mathematics in terms of the original situation, (5) validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable, (6) reporting on the conclusions and the reasoning behind them. http://www.corestandards.org/Math/Content/HSM/

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Mathematics | Standards for Mathematical Practice

"The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy). "

Source: http://www.corestandards.org/Math/Practice/

1. Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

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4. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

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2018 Wyoming Math Content and Performance Standards

Each standards page will integrate cross-curricular connections with the math standards.

Wyoming Cross-Curricular Connections

- 2016 Science
- 2014 Career & Vocational Education (CVE)
- 2014 Physical Education (PE)
- 2014 Social Studies
- 2013 Fine & Performing Arts (FPA)
- 2013 Foreign Language
- 2012 ELA
- 2012 Health

These standards can be found on the Wyoming Department of Education Website at http://edu.wyoming.gov/educators/standards

International Society for Technology in Education (ISTE) Connections

"Today's students must be prepared to thrive in a constantly evolving technological landscape. The ISTE standards are designed to empower student voice and ensure that learning is a student-driven process."

1. Empowered Learner
2. Digital citizen
3. Knowledge Constructor
4. Innovative Designer
5. Computational Thinker
6. Creative Communicator
7. Global Collaborator

The 2017 ISTE Standards for Students can be found at https://www.iste.org/standards/for-students

Computer Science Teachers Association (CSTA) Connections

"Today's students must be well-educated citizens in a computing-intensive world and to be prepared for careers in the 21st century; our students must have a clear understanding of the principles and practices of computer science."

The CSTA Standards can be found at https://www.csteachers.org/page/standards

Financial Literacy Connections

"The goal of financial education is to help students achieve a level of financial literacy; to help them become financially capable consumers."

Resource from http://www.jumpstart.org/assets/files/2015_NationalStandardsBook.pdf

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How to Read This Document

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID Summarize, represent, and interpret data on two categorical and quantitative variables	Mathematical Practices
S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.
Advanced Standards (+)/ STEM Pathway B. Informally assess the fit of a function by plotting and analyzing residuals.	

Example

Example:

Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science	ELA
HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	**W.9-10.2.d** Use precise language and domain -specific vocabulary to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor		☑ Computational Thinking ☐ Financial Literacy

Grade Level

Math Standard
S.ID means Statistics and Probability, Interpreting Categorical and Quantitative Data

Benchmark
The skills and content students should understand and be able to do by the end of the grade levels.

Conceptual Category
(high school only)

Domain
Cluster of related standards.

Grade-Level Example
Example(s) are suggested options to demonstrate a benchmark. Multiple strategies may be used.

Wyoming Cross-Disciplinary Connections
Connections to other Wyoming Content & Performance Standards. These are intended to be suggestions and may be relevant depending on curriculum and instruction.

Advanced Standard (+)
(high school only)

Advanced mathematics standards that students should learn in order to take advanced courses.

Modeling
Symbol denotes modeling to be considered in instruction.

Mathematical Practices
Describe varieties of skills and expertise that math educators at all levels should seek to develop in their students.

Cross-Disciplinary Connections
Connections to real-world concepts and standards. These are intended to be suggestions and may be relevant depending on curriculum and instruction.

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2018 WYOMING MATH CONTENT AND PERFORMANCE STANDARDS REVIEW COMMITTEE (2017-2018)

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Mathematics | Kindergarten

In Kindergarten, instructional time should focus on two critical areas: (1) representing, relating, and operating on whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to numbers than to other topics.

(1) Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; modeling simple joining and separating situations with sets of objects; or, eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5. (Kindergarten students should see addition and subtraction equations; although student writing of equations in kindergarten is encouraged, it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

(2) Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as, squares, triangles, circles, rectangles, and hexagons; presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In Kindergarten, students begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. Students can explain the meaning of a problem and look for ways to solve it. Students check their thinking by using concrete objects or pictures to help them conceptualize and solve problems. Students are also working on increasing stamina as they work on problems.

2. Reason abstractly and quantitatively.

Students begin to recognize what a number is and that it also represents a specific quantity. Then, they connect the quantity to written symbols. Students make meaning of word problems and use manipulatives to express and solve their thinking. Students are also working on increasing stamina as they work on problems.

3. Construct viable arguments and critique the reasoning of others.

Students construct arguments using concrete illustrations, such as objects, pictures, drawings, and actions. They also begin to develop their mathematical communication skills as they participate in mathematical discussions involving questions such as, "How did you get that? and Why is that true?" They explain their thinking to others and respond to others' thinking by making connections. Students are also working on increasing stamina as they work on problems.

4. Model with mathematics.

Students experiment with representing problem situations in multiple ways including using objects, acting out, drawing pictures, numbers, words (mathematical language), making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed.

5. Use appropriate tools strategically.

Students begin to explore the different available tools when thinking about the concepts of numbers. They begin to learn which tools help strengthen their understanding of concepts. For instance, kindergarteners may decide that it might be advantageous to use linking cubes to represent two quantities and then compare the two representations side-by-side.

6. Attend to precision.

As kindergarteners begin to develop their mathematical communication skills, they try to use clear and precise mathematical vocabulary in their discussions with others and in their own reasoning. Students learn to attend to the shapes of numbers, quickly recognize quantities (subitizing), and simple drawings to show their work.

7. Look for and make use of structure.

Students begin to notice a number pattern or structure. For instance, students recognize the pattern that exists in the teen numbers; every teen number is written with a 1 (representing one ten) and ends with the digit that is first stated, and the pattern of numbers 0-9 repeat in the following numbers of 20, 30, etc. They also recognize that 3 + 2 = 5 and 2 + 3 = 5.

8. Look for and express regularity in repeated reasoning.

Students notice repetitive actions in counting and computation, etc. For example, they may notice that the next number in a counting sequence is one more. When counting by tens, the next number in the sequence is ten more (or one more group of ten). Students also notice that when adding two numbers, order of adding doesn't affect the sum (commutative property).

DRAFT

K

Wyoming 2018 Mathematics Content and Performance Standards

Counting and Cardinality

K.CC.A Know number names and the count sequence.	Mathematical Practices	Example
K.CC.A.1 A. Count to 100 by ones and by tens. B. Count backwards by ones from 20.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Science

K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

K

Wyoming 2018 Mathematics Content and Performance Standards

Counting and Cardinality

K.CC.A Know number names and the count sequence.	Mathematical Practices	Example
K.CC.A.2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Science	FPA
K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.	**FPA4.I.D.4** Students demonstrate the ability to dance to a musical phrase, responding to dynamic changes.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

K

Counting and Cardinality	K.CC.A Know number names and the count sequence.	Mathematical Practices	Example
	K.CC.A.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 (Zero) representing a count of no objects).	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

SL.K.5 Use words and phrases acquired through conversations, reading and being read to, and responding to texts.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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K

Wyoming 2018 Mathematics Content and Performance Standards

Counting and Cardinality

K.CC.B Count to tell the number of objects.	Mathematical Practices
K.CC.B.4 Understand the relationship between numbers and quantities; connect counting to cardinality. A. Use one-to-one correspondence when counting objects. B. Understand that the last number name said, tells the number of objects counted regardless of their arrangement. C. Understand that each successive number name refers to a quantity that is one more, and each previous number name refers to a quantity that is one less.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: When counting objects, say the number names in the standard order pairing each object with one and only one number name and each number name with one and only one object.

Wyoming Cross-Disciplinary Connections

Science	ELA
K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.	**SL.K.5** Use words and phrases acquired through conversations, reading and being read to, and responding to texts.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Counting and Cardinality

K.CC.B Count to tell the number of objects.	Mathematical Practices
K.CC.B.5 When counting: A. Answer the question "how many?" by counting up to 20 objects arranged in a line, a rectangular array, a circle, or as many as 10 objects in a scattered configuration. B. Given a number from 1-20, count out that many objects.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science	ELA
K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.	**SL.K.5** Use words and phrases acquired through conversations, reading and being read to, and responding to texts.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

K

Counting and Cardinality

K.CC.C Compare numbers	Mathematical Practices
K.CC.C.6 Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group. (Include groups with up to ten objects.)	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science

K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

ELA

RI.K.1 Demonstrate understanding of the organization and basic features of print.

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).

SL.K.5 Use words and phrases acquired through conversations, reading and being read to, and responding to texts.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

K

Counting and Cardinality

K.CC.C Compare numbers	Mathematical Practices
K.CC.C.7 Compare two numbers between 1 and 10 presented as written numerals.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science	ELA
K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. **K-ESS3-2** Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.	**RI.K.1** Demonstrate understanding of the organization and basic features of print. **W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). **SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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K

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

K.OA.D Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	Mathematical Practices
K.OA.D.1 Model situations that involve representing addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Drawings need not show details, but should show the mathematics in the problem.

Wyoming Cross-Disciplinary Connections

Science	ELA	Health
K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.	**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	**HE2.3.4** Identify characteristics of effective listening skills to enhance health or reduce/avoid health risks (e.g., eyes on speaker, etc.). PCD, IP/S, FA

Cross-Disciplinary Connections

ISTE	Computer Science	
	1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.	☑ Computational Thinking ☐ Financial Literacy

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K

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

K.OA.D Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	Mathematical Practices
K.OA.D.2 Solve word problems using objects and drawings to find sums up to 10 and differences within 10.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: My family has ___ members, your family has ____ members. How many altogether? How many more members are in your family than in mine?

Wyoming Cross-Disciplinary Connections

Science	CVE
K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.	**CV5.3.1** Students identify and define real-world problems and meaningful questions for investigation.

Cross-Disciplinary Connections

ISTE	Computer Science	
3a & 3d Knowledge Constructor **5c** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

K

Operations and Algebraic Thinking	K.OA.D Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	Mathematical Practices	Example
	K.OA.D.3 Decompose numbers less than or equal to 10 in more than one way.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	By using objects or drawings, and modeling how to record each decomposition by a drawing or equation. **Example:** 5 = 2 + 3 and 5 = 4 + 1 and 5 = 2 + 2 + 1. (Part/Part/Whole)

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

K

Operations and Algebraic Thinking	K.OA.D Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	Mathematical Practices
	K.OA.D.4 For any number from 1 to 9, find the number that makes 10 when added to the given number.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Example: By using objects or drawings, and record the answer with a drawing or equation.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

K

Operations and Algebraic Thinking	K.OA.D Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	Mathematical Practices	Example
	K.OA.D.5 Fluently add and subtract within 5.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	K.NBT.E Work with numbers 11-19 to gain foundations for place value.	Mathematical Practices	Example
	K.NBT.E.1 Describe, explore, and explain how the counting numbers 11 to 19 is: A. Composed of ten ones and more ones. B. Decomposed into ten ones and more ones.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

K

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

K.MD.F Describe and compare measurable attributes.	Mathematical Practices
K.MD.F.1 Describe several measurable attributes of one or more objects.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**

Modeling

Example

Example: Students compare shoes in ways that they are alike and different, thinking about how tall the shoe is, how light the shoe is and which is heavier. Non-defining attributes are those that do not define a mathematical characteristic: color, orientation, overall size.

Adapted from: http://www.nctm.org/Classroom-Resources/Lessons/Alike-and-Different/

Wyoming Cross-Disciplinary Connections

Science	ELA	Health
K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. **K-ESS2-1** Use and share observations of local weather conditions to describe patterns over time.	**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). **RI.K.1** With prompting and support, ask and answer questions about key details in a text.	**HE2.3.4** Identify characteristics of effective listening skills to enhance health or reduce/avoid health risks (e.g., eyes on speaker, etc.). PCD, IP/S, FA **HE2.4.8** Describe the ways people are similar and different. FAM, VP/B

Cross-Disciplinary Connections

ISTE	Computer Science	
3a & 3d Knowledge Constructor **5c** Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

K

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

K.MD.F Describe and compare measurable attributes.

K.MD.F.2 Make direct comparisons of the length, capacity, weight, and temperature of objects, and recognize which object is shorter/longer, taller, lighter/heavier, warmer/cooler, and which holds more/less.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Students compare shoes in ways that they are alike and different, thinking about how tall the shoe is, how light the shoe is and which is heavier.

Adapted from: http://www.nctm.org/Classroom-Resources/Lessons/Alike-and-Different/

Wyoming Cross-Disciplinary Connections

Science

K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

K-PS3-1 Make observations to determine the effect of sunlight on Earth's surface.

ELA

RI.K.1 With prompting and support, ask and answer questions about key details in a text.

W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

K

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

K.MD.G Classify objects and count the number of objects in each category.	Mathematical Practices
K.MD.G.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. (Limit category counts to be less than or equal to 10.)	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Use living and nonliving examples to sort and classify.

Wyoming Cross-Disciplinary Connections

Science	ELA
K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.	**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).

Cross-Disciplinary Connections

ISTE	Computer Science	
5c Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

K.MD .G Classify objects and count the number of objects in each category.	Mathematical Practices
K.MD.G.4 Identify U.S. coins by name (pennies, nickels, dimes, and quarters).	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Social Studies

SS2.3.2 Identify how price may affect buying, selling, and saving decisions.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☑ Financial Literacy

DRAFT

Geometry	**K.G.H Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).**	**Mathematical Practices**
	K.G.H.1 Describe objects in the environment using the names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

Modeling

DRAFT

K

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	**K.G.H Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).**	**Mathematical Practices**
	K.G.H.2 Correctly name shapes regardless of their orientations or overall size.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

K

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	K.G.H Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).	Mathematical Practices
	K.G.H.3 Identify shapes as two-dimensional or three-dimensional.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

K

Geometry	K.G.I Analyze, compare, create, and compose shapes.	Mathematical Practices	Example
	K.G.I.4 Analyze and compare two- and three-dimensional shapes, using informal language to describe their similarities, differences, and attributes.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

K

Geometry	K.G.I Analyze, compare, create, and compose shapes.	Mathematical Practices
	K.G.I.5 Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

K

Geometry	K.G.I Analyze, compare, create, and compose shapes.	Mathematical Practices	Example
	K.G.I.6 Use simple shapes to compose squares, rectangles, and hexagons.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Kindergarten Resources

Standard/Page Number	Resource/Link
K.MD.F.1 on page 25.	Adapted from: http://www.nctm.org/Classroom-Resources/Lessons/Alike-and-Different/
K.MD.F.2 on page 26.	Adapted from: http://www.nctm.org/Classroom-Resources/Lessons/Alike-and-Different/
Grade Level Math Practices on page 11.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

DRAFT

Mathematics | Grade 1

In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; (4) reasoning about attributes of, and composing and decomposing geometric shapes.

(1) Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., "making tens") to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.

(2) Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.

(3) Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement For example, if object A is heavier than object B, and object B is heavier than object C, then object A is heavier than object C through indirect measurement. Students engage in activities that lay the foundation to tell time to the hour and half hour, and to identify and differentiate the value of standard US coins.

(4) Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, determine how they are alike and different, and develop the background for measurement and initial understandings of properties such as congruence and symmetry.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In first grade, students realize that doing mathematics involve solving problems and discussing how they solved them. Students explain the meaning of a problem and look for ways to solve it. Students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by revisiting their work and asking themselves, "Does this make sense? "or, "Should I try another strategy.? Students are also working on increasing stamina as they work on problems.

2. Reason abstractly and quantitatively.

Students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning means being able to explain through manipulatives or drawings what a problem means while attending to the meanings of the quantities. Students make meaning of a problem situation and translate into a number sentence.

3. Construct viable arguments and critique the reasoning of others.

First graders construct arguments using concrete illustrations referents, such as objects, pictures, drawings, and actions. They also practice their mathematical communication skills as they participate in mathematical discussions involving questions like, "How did you get that?" Explain your thinking, "Why is that true?" They not only explain their own thinking, but listen to others' explanations. They decide if the explanations make sense and ask questions for clarity.

4. Model with mathematics.

Students experiment with representing problem situations in multiple ways including using objects, acting out, drawing pictures, numbers, words (mathematical language), making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed.

5. Use appropriate tools strategically.

Students begin to consider the different tools available when thinking about the concepts of number. They evaluate the available tools (including concrete manipulatives, drawings, estimation, and applications) when solving a mathematical problem and decide when certain tools might be helpful and give a reason for using the tool to solve the problem. For instance, first graders decide it might be best to use colored chips to model an addition problem.

6. Attend to precision.

Students begin to develop their mathematical communication skills. They try to use clear and precise mathematical vocabulary in their discussions with others and in their own reasoning. Students learn to express their work with mathematical language and symbols.

7. Look for and make use of structure.

First graders begin to discern a number pattern or structure. For instance, if students recognize 12 + 3 = 15, then they also know 3 + 12 = 15. (Commutative property of addition.) To add 4 + 6 + 4, the first two numbers can be added to make a ten, so 4 + 6 + 4 = 10 + 4 = 14. Students continue to develop their understanding of patterns in our number system.

8. Look for and express regularity in repeated reasoning.

Students notice repetitive actions in counting and computation, etc. When children have multiple opportunities to add and subtract ten, including multiples of ten, then they notice the pattern and gain a better understanding of place value. Students also notice that when adding two numbers, order of adding doesn't affect the sum (commutative property). They also notice that three numbers create a family when adding or subtracting (2+3=5 and 5-2=3).

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

1.OA.A Represent and solve problems involving addition and subtraction.	Mathematical Practices
1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, by using objects, drawings, or equations with a symbol for the unknown number to represent the problem.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science	ELA	CVE
1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year.	**W.1.7** Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	**CV5.3.1** Students identify and define real-world problems and meaningful questions for investigation.

Cross-Disciplinary Connections

ISTE	Computer Science	
	1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information.	☑ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	1.OA.A Represent and solve problems involving addition and subtraction.	Mathematical Practices	Example
	1.OA.A.2 Solve word problems that call for the addition of three whole numbers whose sum is less than or equal to 20, by using objects, drawings, or equations.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Modeling

Wyoming Cross-Disciplinary Connections

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

1.OA.B Understand and apply properties of operations and the relationship between addition and subtraction.	Mathematical Practices	Example
1.OA.B.3 Apply commutative and associative properties of addition as strategies to add and subtract.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	**Example:** If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.) *Teacher Note: This is fact families and number bonds. (Students need not use formal terms for these properties.)

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	1.OA.B Understand and apply properties of operations and the relationship between addition and subtraction.	Mathematical Practices	Example
	1.OA.B.4 Understand subtraction as an unknown-addend problem.	**MP.1** **Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** **Look for and make use of structure.** **MP.8** **Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

1.OA.C Add and subtract within 20.	Mathematical Practices	Example
1.OA.C.5 Relate counting to addition and subtraction using strategies, such as, by counting on and back.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	**Example**: Counting on two in order to add two.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	1.OA.C Add and subtract within 20.	Mathematical Practices	Example
	1.OA.C.6 Add and subtract within 20, demonstrating fluency in addition and subtraction within 10. Use strategies such as counting on; making ten using the relationship between addition and subtraction.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	Other
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

1.OA.D Work with addition and subtraction equations.	Mathematical Practices
1.OA.D.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Example: Which of the following equations are true and which are false?

a. 6 = 6

b. 7 = 8 – 1

c. 5 + 2 = 2 + 5

d. 4 + 1 = 5 + 2

Wyoming Cross-Disciplinary Connections

FPA

FPA4.1.M.3 Students improvise simple rhythms, melodies and accompaniments using a variety of traditional and nontraditional sounds.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	1.OA.D Work with addition and subtraction equations.	Mathematical Practices	Example
	1.OA.D.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers.	**MP.1** Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	**Example:** Determine the unknown that makes the equation true in each of the equations: a. 8 + __ = 11 b. 5 = __ - 3 c. 6 + 6 = __

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

1st

Number and Operations in Base Ten	1.NBT.E Extend the counting sequence.	Mathematical Practices	Example
	1.NBT.E.1 Extend the number sequences to 120. In this range: A. Count forward and backward, starting at any number less than 12. B. **R**ead numerals. C. Write numerals. D. Represent a number of objects with a written numeral.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	1.NBT.F Understand place value.	Mathematical Practices	Example
	1.NBT.F.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: A. 10 can be thought of as a bundle of ten ones — called a "ten". B. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. C. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

1.NBT.F Understand place value.	Mathematical Practices
1.NBT.F.3 Compare pairs of two-digit numbers based on the values of the tens digit and the ones digits, recording the results of comparisons with the words "is greater than," "is equal to," "is less than," and with the symbols >, =, and <.	**MP.1** Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science	ELA
1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.	**RI.1.1** Ask and answer questions about key details in a text. **RI.1.2** Identify the main topic and retell key details of a text. **RI.1.10** With prompting and support, read informational texts appropriately complex for grade 1.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	1.NBT.G Use place value understanding and properties of operations to add and subtract.	Mathematical Practices
	1.NBT.G.4 Add within 100, using concrete models or drawings and strategies based on place value: A. Including adding a two-digit number and a one-digit number. B. Adding a two-digit number and a multiple of 10. C. Understand that in adding two-digit numbers, adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. D. Relate the strategy to a written method and explain the reasoning used.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Wyoming Cross-Disciplinary Connections

ELA

RI.1.1 Ask and answer questions about key details in a text.

RI.1.2 Identify the main topic and retell key details of a text.

RI.1.10 With prompting and support, read informational texts appropriately complex for grade 1.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

1.NBT.G Use place value understanding and properties of operations to add and subtract.	Mathematical Practices	Example
1.NBT.G.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used .	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

ELA

RI.1.1 Ask and answer questions about key details in a text.

RI.1.2 Identify the main topic and retell key details of a text.

RI.1.10 With prompting and support, read informational texts appropriately complex for grade 1.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

1.NBT.G Use place value understanding and properties of operations to add and subtract.	Mathematical Practices	Example
1.NBT.G.6 Subtract multiples of 10 from an equal or larger multiple of 10 both in the range 10-90, using concrete models, drawings, and strategies based on place value.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Science	ELA
1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.	**RI.1.1** Ask and answer questions about key details in a text. **RI.1.2** Identify the main topic and retell key details of a text. **RI.1.10** With prompting and support, read informational texts appropriately complex for grade 1.

Cross-Disciplinary Connections

ISTE	Computer Science	
	1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem.	☑ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

1.MD.H Measure lengths indirectly and by iterating length units.	Mathematical Practices
1.MD.H.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: Students make clay snakes, given a tower of cubes, each student compares his or her snake to the tower. Then students make statements such as, "My snake is longer than the cube tower. Your snake is shorter than the cube tower."

Adapted from: https://www.engageny.org/resource/prekindergarten-mathematics-module-4-topic-a-lesson-3/file/116496

Wyoming Cross-Disciplinary Connections

Science	ELA	FPA
1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.	**RI.1.1** Ask and answer questions about key details in a text. **W.1.7** Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	**FPA4.1.M.2** Students perform independently and with others a varied repertoire of music, developing pitch accuracy, rhythm, posture, dynamics, and steady beat.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

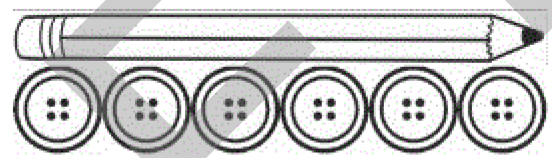
Measurement and Data

1.MD.H Measure lengths indirectly and by iterating length units.	Mathematical Practices
1.MD.H.2 Use nonstandard units to show the length of an object as the number of same size units of length with no gaps or overlaps.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Use but not limited to cubes, counting bears, links, etc. that are the same size. Teacher discretion.

Activity: Have students use connecting blocks or some other nonstandard unit to measure three pencils and then put them in order from shortest to longest. For example, students may use buttons to measure the pencils and determine that a pencil is 6 buttons long.



Adapted from: https://www.doe.in.gov/sites/default/files/standards/mathematics/grade-1-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

Science	FPA
1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.	**FPA4.1.M.5** Students read and notate simple rhythm, dynamics and pitch notation.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

1st

Measurement and Data

1.MD.I Work with time and money.	Mathematical Practices
1.MD.I.3 A. Tell and write time in hours and half-hours using analog and digital clocks. B. Identify U.S. coins by value (pennies, nickels, dimes, quarters).	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: What time does the clock show?

Adapted from: https://www.doe.in.gov/sites/default/files/standards/mathematics/grade-1-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

Social Studies

SS2.3.2 Identify how price may affect buying, selling, and saving decisions.

SS2.4.2 Identify tools and technologies that make life easier (e.g., cars for getting one place to another, washing machines for washing clothes, or flashlights to see in the dark).

CVE

CV5.5.2 Students examine family, community, monetary, and school systems.

Cross-Disciplinary Connections

ISTE

Computer Science

☐ **Computational Thinking**

☐ **Financial Literacy**

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

1.MD.J Represent and interpret data.	Mathematical Practices
1.MD.J.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

ELA	CVE
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	**CV5.4.4** Students interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (*Adapted from CCSS RI.4.7)

Cross-Disciplinary Connections

ISTE	Computer Science	
	1A-DA-07 Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea.	☑ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	1.G.K Reason with shapes and their attributes.	Mathematical Practices
	1.G.K.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); for a wide variety of shapes; build and draw shapes to possess defining attributes.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

1st

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	1.G.K Reason with shapes and their attributes.	Mathematical Practices	Example
	1.G.K.2 Use two-dimensional shapes (rectangles, squares, trapezoids, rhombuses, and triangles) or three-dimensional shapes (cubes, rectangular prisms, cones, and cylinders) to create a composite figure, and create new figures from the composite figure.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	1.G.K Reason with shapes and their attributes.	Mathematical Practices	Example
	1.G.K.3 Partition circles and rectangles into two and four equal shares and: A. Describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. B. Describe the whole as two of, or four of the shares. C. Recognize that decomposing into more equal shares creates smaller shares.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Grade 1 Resources

Standard/Page Number	Resource/Link
1.MD.H.1 on page 50.	https://www.engageny.org/resource/prekindergarten-mathematics-module-4-topic-a-lesson-3/file/116496
1.MD.H.2 on page 51.	https://www.doe.in.gov/sites/default/files/standards/mathematics/grade-1-resource-guide.pdf
1.MD.I.3 on page 52.	https://www.doe.in.gov/sites/default/files/standards/mathematics/grade-1-resource-guide.pdf
Grade Level Math Practices on page 36.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

DRAFT

Mathematics | Grade 2

In Grade 2, instructional time should focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

(1.) Students extend their understanding of the base-ten system. This includes ideas of counting in fives, tens, and multiples of hundreds, tens, and ones, as well as number relationships involving these units, including comparing. Students understand multi-digit numbers (up to 1000) written in base-ten notation, recognizing that the digits in each place represent amounts of thousands, hundreds, tens, or ones (e.g., 853 is 8 hundreds + 5 tens + 3 ones).

(2) Students use their understanding of addition to develop fluency with addition and subtraction within 100. They solve problems within 1000 by applying their understanding of models for addition and subtraction. They develop, discuss, and use efficient, accurate, generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations. They select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.

(3) Students recognize the need for standard units of measure (centimeter and inch) and they use rulers and other measurement tools with the understanding that linear measure involves an iteration of units. They recognize that the smaller the unit, the more iterations they need to cover a given length. Students engage in activities that lay the foundation to tell time in five minute increments, and are able to use standard US currency up to $10 to solve problems.

(4) Students describe and analyze shapes by examining their sides and angles. Students investigate, describe, and reason about decomposing and combining shapes to make other shapes. Through building, drawing, and analyzing two- and three-dimensional shapes, students develop a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In second grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain the meaning of a problem and look for ways to solve it. They may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They make conjectures about the solution and plan out a problem-solving approach. Students work on increasing stamina.

2. Reason abstractly and quantitatively.

Students recognize that a number represents a specific quantity and connect the quantity to written symbols. Quantitative reasoning entails being able to explain through manipulatives or drawings what a problem means, while attending to the meanings of the quantities. Students make meaning of a problem situation and translate into a number sentence. Second graders begin to know and use different properties of operations and relate addition and subtraction.

3. Construct viable arguments and critique the reasoning of others.

Second graders may construct arguments using concrete illustrations, such as objects, pictures, drawings, and actions. They practice their mathematical communication skills as they participate in mathematical discussions involving questions like, "How did you get that?" Explain your thinking, "Why is that true?" They not only explain their own thinking, but listen to others' explanations and compare strategies. They decide if the explanations make sense and ask appropriate questions for clarity.

4. Model with mathematics.

Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed.

5. Use appropriate tools strategically.

Students decide how and when to use the available tools appropriately and efficiently when solving a mathematical problem. Students reason whether or not a tool was helpful in solving the problem. For instance, second graders may decide to solve a problem by drawing a picture rather than writing an equation.

6. Attend to precision.

Students begin to develop their mathematical communication skills, (orally and written) They use clear and precise mathematical language and symbols when explaining their own reasoning.

7. Look for and make use of structure.

Second graders look for patterns. For instance, they adopt mental math strategies based on patterns (making ten, fact families, doubles, adding and subtracting numbers by place, and equal shares). Their understanding of the number system develops into 3- and 4- digit numbers.

8. Look for and express regularity in repeated reasoning.

Second grade students notice repetitive actions in counting and computation, etc. When children have multiple opportunities to add and subtract, they look for shortcuts, such as tens are added to tens, ones are added to ones, and sometimes the ones make a new ten. They also notice when a whole is shared into equal groups, the size of the share gets smaller the more shares.

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Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	2.OA.A Represent and solve problems involving addition and subtraction.	Mathematical Practices
	2.OA.A.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, by using drawings and equations with a symbol for the unknown number to represent the problem.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Common Core Addition and Subtraction Table

Source: http://www.corestandards.org/Math/Content/mathematics-glossary/Table-1/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
	1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

2nd

Operations and Algebraic Thinking

2.OA.B Add and subtract within 20.	Mathematical Practices	Example
2.OA.B.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know automatically all sums of two one-digit numbers based on strategies.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	**Example:** Automaticity should be grounded in efficient strategies such as: doubles, 5-wise (5+2, 5+4), decomposing to create a ten and leftovers (8+6 = 8+2+4), relationships between addition and subtraction, related combinations, known combinations. Once conceptual understanding is achieved, students can practice for automaticity.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

2.OA.C Work with equal groups of objects to gain foundations for multiplication.	Mathematical Practices	Example
2.OA.C.3 Determine whether a group (up to 20) has an odd or even number of objects (i.e. by pairing objects or counting them by 2s). A. If the number of objects is even, then write an equation to express this as the sum of two equal addends. B. If the number of objects group is odd, then write an equation to express this as a sum of a near double (double plus 1).	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	*Teacher Note: this relates to doubles and doubles plus one in addition and subtraction and also a foundation for multiplication with repeated addition.

Wyoming Cross-Disciplinary Connections

FPA

FPA4.1.A.1 Students create and revise original art to express ideas, experiences, and stories.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	2.OA.C Work with equal groups of objects to gain foundations for multiplication.	Mathematical Practices	Example
	2.OA.C.4 Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

2nd

Number and Operations in Base Ten

2.NBT.D Understand place value.	Mathematical Practices
2.NBT.D.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; and demonstrate that: A. 100 can be thought of as a bundle of ten tens — called a "hundred." B. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). C. Three-digit numbers can be decomposed in multiple ways (e.g. 524 can be decomposed as 5 hundreds, 2 tens and 4 ones or 4 hundreds, 12 tens, and 4 ones, etc.)	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science

2-ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Cross-Disciplinary Connections

ISTE		
		☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

2.NBT.D Understand place value.	Mathematical Practices	Example
2.NBT.D.2 Skip-count by 10s and 100s within 1000 starting at any given number.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	**Examples:** A. Counting by 10s: 217, 227, 237, 257, ... B. Counting by 100s: 345, 445, 545,645, ...

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
	1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem.	☑ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

2.NBT.D Understand place value.	Mathematical Practices	Example
2.NBT.D.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	**Example:** Standard/Numeral form: 364 Word form: Three hundred sixty-four Expanded form: 300+60+4

Wyoming Cross-Disciplinary Connections

ELA

SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	2.NBT.D Understand place value.	Mathematical Practices
	2.NBT.D.4 Compare pairs of three-digit numbers based on meanings of the hundreds, tens, and ones digits, using the words "is greater than," "is equal to," "is less than," and with the symbols >, =, and < to record the results of comparisons.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections		
ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	2.NBT.E Use place value understanding and properties of operations to add and subtract.	Mathematical Practices	Example
	2.NBT.E.5 Add and subtract within 100 using strategies based on place value, properties of addition, and/or the relationship between addition and subtraction.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	**Example:** 54+38 (50+30) + (4+8) 54+30 = 84; 84+6+2 = 92 54+(38+2) = 94; 94-2 = 92

Wyoming Cross-Disciplinary Connections

Science

2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

2.NBT.E Use place value understanding and properties of operations to add and subtract.	Mathematical Practices
2.NBT.E.6 Add up to four two-digit numbers using strategies based on place value and/or properties of addition.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Wyoming Cross-Disciplinary Connections

ELA

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

RI.2.3 Describe how characters in a story respond to major events and challenges.

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

2.NBT.E Use place value understanding and properties of operations to add and subtract.	Mathematical Practices
2.NBT.E.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of addition, and/or the relationship between addition and subtraction: A. Relate the strategy to a written method and explain the reasoning used. B. Understand that in adding or subtracting three-digit numbers, add or subtract hundreds and hundreds, tens and tens, ones and ones. C. Understand that sometimes it is necessary to compose or decompose tens or hundreds.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

*Teacher Note: It is strongly recommended that students should practice writing about math and communicating their thoughts in math journals .

Wyoming Cross-Disciplinary Connections

ELA

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

RI.2.3 Describe how characters in a story respond to major events and challenges.

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

Cross-Disciplinary Connections

ISTE	Computer Science	
	IA-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.	☑ **Computational Thinking** ☐ **Financial Literacy**

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	2.NBT.E Use place value understanding and properties of operations to add and subtract.	Mathematical Practices	Example
	2.NBT.E.8 Mentally: A. Add 10 or 100 to a given number 100-900, and B. Subtract 10 or 100 from a given number 100-900.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** **Attend to precision.** **MP.7** **Look for and make use of structure.** **MP.8** **Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

2.NBT.E Use place value understanding and properties of operations to add and subtract.	Mathematical Practices	Example
2.NBT.E.9 Explain why addition and subtraction strategies work, using place value and the properties of addition. (Explanations may be supported by drawings, objects, or written form.)	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

RI.2.3 Describe how characters in a story respond to major events and challenges.

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	2.MD.F Measure and estimate lengths in standard units.	Mathematical Practices
	2.MD.F.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

2.MD.F Measure and estimate lengths in standard units.	Mathematical Practices	Example
2.MD.F.2 Measure the same object or distance using a standard unit of one length and then a standard unit of a different length. Explain how the two measurements relate to the size of the unit chosen.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	**Example:** Measure a pencil in inches and then measure it in centimeters. Explain why centimeters give a larger number than inches do.

Wyoming Cross-Disciplinary Connections

FPA

FPA.4.1.M.2 Students perform independently and with others a varied repertoire of music, developing pitch accuracy, rhythm, posture, dynamics, and steady beat.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

2nd

Measurement and Data

2.MD.F Measure and estimate lengths in standard units.	Mathematical Practices	Example
2.MD.F.3 Estimate lengths using units of inches, feet, centimeters, and meters.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	2.MD.F Measure and estimate lengths in standard units.	Mathematical Practices	Example
	2.MD.F.4 Measure in standard length units to determine how much longer one object is than another.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	2.MD.G Relate addition and subtraction to length.	Mathematical Practices
	2.MD.G.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

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Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

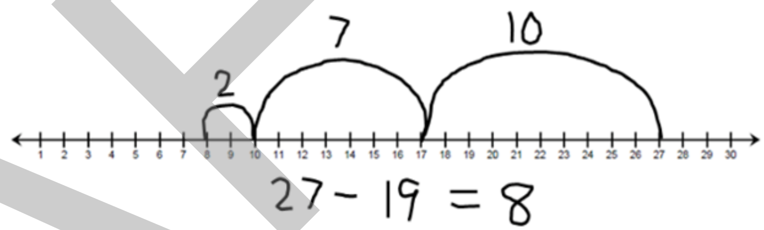
2.MD.G Relate addition and subtraction to length.	Mathematical Practices
2.MD.G.6 Use a number line diagram with equally spaced points to: A. Represent whole-number sums and differences within 100 on a number line diagram. B. Locate the multiple of 10 before and after a given number within 100.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Part A:

Example: **There were 27 students on the bus. 19 got off the bus. How many students are on the bus?**

Student A: I used a number line. I started at 27. I broke up 19 into 10 and 9. That way, I could take a jump of 10. I landed on 17. Then I broke the 9 up into 7 and 2. I took a jump of 7. That got me to 10. Then I took a jump of 2. That's 8. So, there are 8 students now on the bus.



Part B:

Example: The number 46 is located between 40 and 50.

*Teacher note: this is a visual for understanding the patterns in numbers. This is not about students creating number lines. This is about understanding how to use the

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

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Wyoming 2018 Mathematics Content and Performance Standards

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Measurement and Data	2.MD.H Work with time and money.	Mathematical Practices	Example
	2.MD.H.7 Tell and write time from analog and digital clocks in five minute increments using a.m. and p.m.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Social Studies

SS2.4.2 Identify tools and technologies that make life easier (e.g., cars for getting one place to another, washing machines for washing clothes, or flashlights to see in the dark).

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

2.MD.H Work with time and money.	Mathematical Practices
2.MD.H.8 Solve word problems up to $10 involving dollar bills, quarters, dimes, nickels, and pennies, using $ (dollars) and ¢ (cents) symbols appropriately.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: A student is given 1 quarter, 2 dimes and 3 pennies.

- How many cents would he/she have?
- What could be another way to show the same amount of money with different coins?

Example: Jack buys a toy for 58¢ and hands the clerk $5.00. What change should he get back?

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

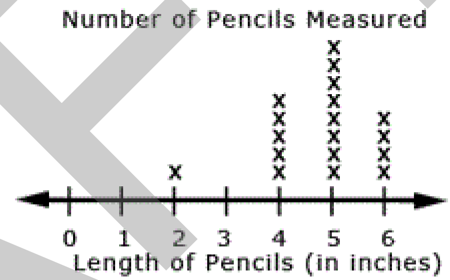
Measurement and Data

2.MD.I Represent and interpret data.	Mathematical Practices
2.MD.I.9 Generate measurement data based on whole units and show data by making a line plot.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example:

This standard emphasizes representing data using a line plot. Students will use the measurement skills learned in earlier standards to measure objects. Line plots are first introduced in this grade level. A line plot can be thought of as plotting data on a number line. An interactive whiteboard may be used to create and/or model line plots.



Adapted from: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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2nd

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

2.MD.I Represent and interpret data.	Mathematical Practices
2.MD.I.10 Use data to: A. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. B. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Compare distances a toy car travels from a ramp, and graph. Tie to physical science activity.

Wyoming Cross-Disciplinary Connections

Science

2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

PE

PE 2.2.1 Students identify current levels of personal health-related fitness.

ELA

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

RI.2.8 Describe how reasons support specific points the author makes in a text.

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Social Studies

SS2.5.3 Use the human features of a community to describe what makes that community special (e.g., cultural, language, religion, food, clothing political, economic, population, and types of jobs in an area) and why others want to move there or move away from there.

CVE

CVE.5.4.4 Students interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (*Adapted from CCSS RI.4.7)

Cross-Disciplinary Connections

ISTE

Computer Science

1A-DA-07 Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions.

☑ **Computational Thinking**

☐ **Financial Literacy**

DRAFT

2nd

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	2.G.J Reason with shapes and their attributes.	Mathematical Practices	Example
	2.G.J.1 Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. (Sizes are compared directly or visually, not compared by measuring.)	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

FPA

FPA4.1.A.2 Students investigate and apply a variety of materials, resources, technologies and processes to communicate experiences and ideas through art.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	2.G.J Reason with shapes and their attributes.	Mathematical Practices	Example
	2.G.J.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

2nd

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	2.G.J Reason with shapes and their attributes.	Mathematical Practices	Example
	2.G.J.3 Partition circles and rectangles into two, three, or four equal shares by: A. Describing the shares using the words *halves, thirds, half of, a third of,* etc. B. Describing the whole as two halves, three thirds, four fourths. C. Recognizing that equal shares of identical wholes need not have the same shape.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Grade 2 Resources

Standard/Page Number	Resource/Link
2.OA.A.1 on page 60.	http://www.corestandards.org/Math/Content/mathematics-glossary/Table-1/
2.MD.I.9 by page 81.	Adapted from: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
Grade Level Math Practices on page 59.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Mathematics | Grade 3

In Grade 3, student learning is focused on four critical areas: (1) develop understanding of multiplication and division including strategies for multiplication and division within 100; (2) develop understanding of fractions, especially unit fractions (fractions with numerator 1); (3)develop understanding of the structure of rectangular arrays and of area; (4) describe and analyze two-dimensional shapes.

(1) Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

(2) Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

(3) Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

(4) Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In third grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Third grade students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense? "They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.

2. Reason abstractly and quantitatively.

Students recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities.

3. Construct viable arguments and critique the reasoning of others.

Students may construct arguments using concrete referents, such as objects, pictures, and drawings. They refine their mathematical communication skills as they participate in mathematical discussions involving questions such as, "How did you get that? and "Why is that true?" They explain their thinking to others and respond to others' thinking.

4. Model with mathematics.

Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Students should evaluate their results in the context of the situation and reflect on whether the results make sense.

5. Use appropriate tools strategically.

Students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper to find all the possible rectangles that have a given perimeter. They compile the possibilities into an organized list or a table, and determine whether they have all the possible rectangles.

6. Attend to precision.

As students develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the area of a rectangle they record their answers in square units.

7. Look for and make use of structure.

Students look closely to discover a pattern or structure. For example, students use properties of operations as strategies to multiply and divide (commutative and distributive properties).

8. Look for and express regularity in repeated reasoning.

Students notice repetitive actions in computation and look for shortcut methods. For example, students may use the distributive property as a strategy for using products they know to solve products that they don't know. For example, if students are asked to find the product of 7 x 8, they might decompose 7 into 5 and 2 then multiply 5 x 8 and 2 x 8 to arrive at 40 + 16 or 56. In addition, third graders continually evaluate their work by asking themselves, "Does this make sense?"

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	3.OA.A Represent and solve problems involving multiplication and division.	Mathematical Practices	Example
	3.OA.A.1 Represent the concept of multiplication of whole numbers using models including, but not limited to, equal-sized groups ("groups of"), arrays, area models, repeated addition, and equal "jumps" on a number line.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

3.OA.A Represent and solve problems involving multiplication and division.	Mathematical Practices
3.OA.A.2 Represent the concept of division of whole numbers (resulting in whole number quotients) using models including, but not limited to, partitioning, repeated subtraction, sharing, and inverse of multiplication.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

CVE	ELA
CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation. **CV5.3.2** Students plan and manage activities to develop a solution or complete a project.	**L.3.4** Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies. **L.3.6** Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

3.OA.A Represent and solve problems involving multiplication and division.	Mathematical Practices	Example
3.OA.A.3 Solve multiplication and division word problems within 100 using appropriate modeling strategies and equations.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	3.OA.A Represent and solve problems involving multiplication and division.	Mathematical Practices	Example
	3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers when the unknown is a missing factor, product, dividend, divisor, or quotient. (Students need not know formal terms.)	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	3.OA.B Understand properties of multiplication and the relationship between multiplication and division.	Mathematical Practices	Example
	3.OA.B.5 Apply properties of multiplication as strategies to multiply and divide. (Students need not use formal terms for these properties.)	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	3.OA.B Understand properties of multiplication and the relationship between multiplication and division.	Mathematical Practices	Example
	3.OA.B.6 Understand division as an unknown-factor problem.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking	3.OA.C Multiply and divide within 100.	Mathematical Practices	Example
	3.OA.C.7 Fluently multiply and divide with factors 1 - 10 using mental strategies. By end of Grade 3, know automatically all products of one-digit factors based on strategies.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

3.OA.D Solve problems involving the four operations, and identify and explain patterns in arithmetic.	Mathematical Practices	Example
3.OA.D.8 Solve two-step word problems (limited to the whole number system) using the four basic operations. Students should apply the Order of Operations when there are no parentheses to specify a particular order. A. Represent these problems using equations with a symbol standing for the unknown quantity. B. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. Modeling	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	
3c & 3d Knowledge Constructor		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

3rd

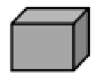
Wyoming 2018 Mathematics Content and Performance Standards

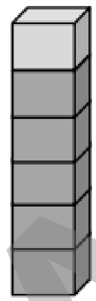
Operations and Algebraic Thinking

3.OA.D Solve problems involving the four operations, and identify and explain patterns in arithmetic.	Mathematical Practices
3.OA.D.9 Identify arithmetic patterns and explain the relationships using properties of operations.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Example:

1. Each  has a value of 9. Complete the equations to find the total value of the tower of blocks.



_____ × 9 = (5 + ____) × 9

= (5 × _____) + (_____ × _____)

= 45 + _____

= _____

2. Hector solves 9 × 8 by subtracting 1 eight from 10 eights. Draw a model, and explain Hector's strategy.

Source: https://www.engageny.org/file/34966/download/math-g3-m3-topic-d-lesson-12.pdf?token=Vir-k0Ou

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

3rd

Number and Operations in Base Ten	3.NBT.E Use place value understanding and properties of operations to perform multi-digit arithmetic (a range of algorithms may be used).	Mathematical Practices	Example
	3.NBT.E.1 Use place value understanding to round whole numbers to the nearest 10 or 100.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☑ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

3.NBT.E Use place value understanding and properties of operations to perform multi-digit arithmetic (a range of algorithms may be used).	Mathematical Practices	Example
3.NBT.E.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of addition, and/or the relationship between addition and subtraction.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☑ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

3rd

Number and Operations in Base Ten

3.NBT.E Use place value understanding and properties of operations to perform multi-digit arithmetic (a range of algorithms may be used).	Mathematical Practices	Example
3.NBT.E.3 Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of multiplication.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

3rd

Number and Operations –Fractions

3.NF.F Develop understanding of fractions as numbers. (Limited to denominators 2, 3, 4, 6, and 8) *no sideways fractions	Mathematical Practices	Example
3.NF.F.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations –Fractions

3.NF.F Develop understanding of fractions as numbers. (Limited to denominators 2, 3, 4, 6, and 8) *no sideways fractions	Mathematical Practices	Example
3.NF.F.2 Understand and represent fractions on a number line diagram. A. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. B. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

DRAFT

Number and Operations –Fractions

3.NF.F Develop understanding of fractions as numbers. (Limited to denominators 2, 3, 4, 6, and 8) *no sideways fractions	Mathematical Practices
3.NF.F.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. A. Understand two fractions as equivalent if they are the same size, or the same point on a number line. B. Recognize and generate simple equivalent fractions. Explain why the fractions are equivalent. C. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. D. Compare two fractions with the same numerator or the same denominator, by reasoning about their size, Recognize that valid comparisons rely on the two fractions referring to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

CVE	ELA
CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation. **CV5.3.2** Students plan and manage activities to develop a solution or complete a project.	**L.3.4** Determine or clarify the meaning of unknown and multiple -meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies. **L.3.5** Demonstrate understanding of word relationships and nuances in word meanings. **L.3.6** Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

Wyoming 2018 Mathematics Content and Performance Standards

3rd

Measurement and Data	3.MD.G Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	Mathematical Practices
	3.MD.G.1 Use analog clocks to tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

3.MD.G Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	Mathematical Practices
3.MD.G.2 Measure and estimate liquid volumes and masses of objects using grams (g), kilograms (kg), and liters (L). (Excludes compound units such as cm^3 and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units. (Excludes multiplicative comparison problems involving notions of "times as much.")	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

3rd

Measurement and Data

3.MD.H Represent and interpret data.	Mathematical Practices
3.MD.H.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled graphs.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Science	PE
3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	**PE 5.2.1** Students assess current levels of personal health-related fitness.
CVE	**Health**
CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation. **CV5.3.2** Students plan and manage activities to develop a solution or complete a project.	**HE 4.4.7** Set a measurable short-term personal health goal and monitor progress on achieving the goal (e.g., brush teeth two times per day, walk 10,000 steps every day). PA, NUT, IP/S

Cross-Disciplinary Connections

ISTE	Computer Science	
5b Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

3.MD.H Represent and interpret data.	Mathematical Practices
3.MD.H.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Use the data to create a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

CVE

CV5.4.4 Students interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (*Adapted from CCSS RI.4.7)

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

Cross-Disciplinary Connections

ISTE

5b Computational Thinker

Computer Science

1B-DA-06 Organize and present collected data visually to highlight relationships and support a claim.

☑ **Computational Thinking**

☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

3rd

Measurement and Data	3.MD.I Geometric measurement: understand concepts of area and relate area to multiplication and to addition.	Mathematical Practices	Example
	3.MD.I.5 Understand area as an attribute of plane figures and understand concepts of area measurement, such as square units without gaps or overlaps.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	3.MD.I Geometric measurement: understand concepts of area and relate area to multiplication and to addition.	Mathematical Practices	Example
	3.MD.I.6 Measure areas by counting unit squares (square cm, square m, square in., square ft, and improvised units).	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

DRAFT

Measurement and Data

3.MD.I Geometric measurement: understand concepts of area and relate area to multiplication and to addition.	Mathematical Practices
3.MD.I.7 Relate area to the operations of multiplication and addition. A. Find the area of a rectangle with whole-number side lengths (dimensions) by multiplying them. Show that this area is the same as when counting unit squares. B. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. **C.** Use area models to represent the distributive property in mathematical reasoning. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Modeling	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	3.MD.J Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.	Mathematical Practices
	3.MD.J.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different area or with the same area and different perimeter.	**MP.1** **Make sense of problems and persevere in solving them.** **MP.2** **Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** **Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	3.G.K Reason with shapes and their attributes.	Mathematical Practices
	3.G.K.1 Use attributes of quadrilaterals to classify rhombuses, rectangles, and squares. Understand that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA	CVE	FPA
SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly. **L.3.6** Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.	**CV5.3.1** Students identify and define real-world problems and meaningful questions for investigation. **CV5.3.2** Students plan and manage activities to develop a solution or complete a project.	**FPA 4.1.A.3** Students apply the elements and principles of design to their artwork. **FPA 4.4.A.1** Students identify connections between the visual arts and other disciplines in the curriculum.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

3rd

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

3.G.K Reason with shapes and their attributes.	Mathematical Practices	Example
3.G.K.2 Partition rectangles, regular polygons, and circles into parts with equal areas. Express the area of each part as a unit fraction of the whole.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Grade 3 Resources

Standard/Page Number	Resource/Link
3.OA.D.9 on page 96.	https://www.engageny.org/file/34966/download/math-g3-m3-topic-d-lesson-12.pdf?token=Vir-k0Ou
Grade Level Math Practices on page 87.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Mathematics | Grade 4

In Grade 4, student learning is focused on three critical areas: (1) develop understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) develop understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understand that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

(1) Students generalize their understanding of place value to 1,000,000, and the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers. They understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

(2) Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), they develop methods for generating and recognizing equivalent fractions. Students extend previous understanding about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and multiplication to multiply a fraction by a whole number.

(3) Students describe, analyze, compare, and classify two-dimensional figures. Through building, drawing, and analyzing two-dimensional figures, students deepen their understanding of properties of two-dimensional objects and use them to solve problems involving symmetry.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In grade four, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Third grade students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense? "They listen to the strategies of others and will try different approaches. They will often use another method to check their answers.

2. Reason abstractly and quantitatively.

Students recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions, record calculations with numbers, and represent or round numbers using place value concepts.

3. Construct viable arguments and critique the reasoning of others.

Students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like, "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.

4. Model with mathematics.

Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect different representations and explain the connections. They should be able to use all of these representations as needed. Students should evaluate their results in the context of the situation and reflect on whether the results make sense.

5. Use appropriate tools strategically.

Students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper or a number line to represent and compare decimals, they may use protractors to measure angles. They use other measurement tools to understand the relative size of units within a system and express measurements given in larger units in terms of smaller units.

6. Attend to precision.

As students develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and stating the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.

7. Look for and make use of structure.

Students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial products model). They relate representations of counting problems such as tree diagrams and arrays to the multiplication principal of counting. They generate number or shape patterns that follow a given rule.

8. Look for and express regularity in repeated reasoning.

Students notice repetitive actions in computation to make generalizations Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

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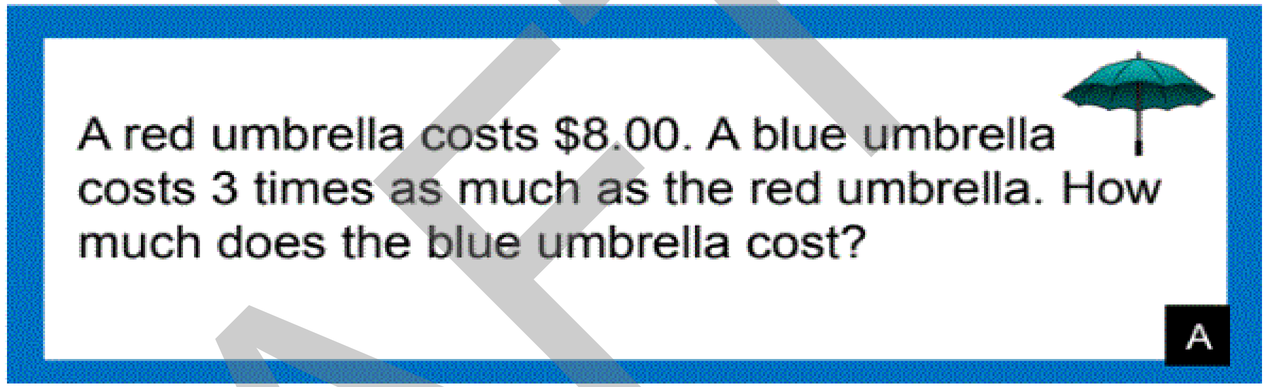
Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

4.OA .A Use the four operations with whole numbers to solve problems.	Mathematical Practices
4.OA.A.1 Intentionally removed **4.OA.A.2** Multiply or divide to solve word problems involving multiplicative comparison, by using strategies including, but not limited to, drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Example:



Source for appendix: https://drive.google.com/open?id=0B79xRIb9WGbFR3FJcHZFRENkNXM

Website: https://www.k-5mathteachingresources.com/support-files/word-problems-multiplicative-comparison.pdf

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

4th

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

4.OA .A Use the four operations with whole numbers to solve problems.	Mathematical Practices
4.OA.A.3 Solve multi-step word problems posed with whole numbers, including problems in which remainders must be interpreted. A. Represent these problems using equations with a letter standing for the unknown quantity. B. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

ELA	CVE
L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies. **L.3.6** Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships	**CV5.3.1** Students identify and define real-world problems and meaningful questions for investigation. **CV5.3.2** Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☑ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

4.OA.B Develop understanding of factors and multiples.	Mathematical Practices
4.OA.B.4 Demonstrate an understanding of factors and multiples. A. Find all factor pairs for a whole number in the range 1-100. B. Recognize that a whole number is a multiple of each of its factors. C. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. **D.** Determine whether a given whole number in the range 1-100 is prime or composite.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

4th

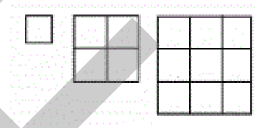
Operations and Algebraic Thinking

4.OA.C Generate and analyze patterns.	Mathematical Practices
4.OA.C.5 Given a pattern, explain the rule that the pattern follows and extend the pattern. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Examples:

1. Work with a partner. Use square tiles to copy and extend the pattern below until you have a sequence of six square arrays.



2. Draw the square arrays on grid paper. Write a multiplication equation to represent each square array.
3. Describe any patterns that you notice in the number of tiles in consecutive square arrays.
4. If you continued making square arrays, how many square tiles would you need to make the 9th term in the sequence? What about the 20th? Explain your thinking.

Sources:https://drive.google.com/open?id=0B79xRIb9WGbFbWlIQ0JZajdKeTA
https://drive.google.com/open?id=1oNGVawzANnFUiUf2aF6vHLxG1fV4L_wReJzpEwAzTDg

Wyoming Cross-Disciplinary Connections

FPA

FPA 4.1.M.4 Students create music using a variety of traditional and nontraditional sound sources.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

4th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	4.NBT.D Generalize place value understanding for multi-digit whole numbers (limited to numbers less than or equal to 1,000,000).	Mathematical Practices	Example
	4.NBT.D.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

4th

Number and Operations in Base Ten

4.NBT.D Generalize place value understanding for multi-digit whole numbers (limited to numbers less than or equal to 1,000,000).	Mathematical Practices
4.NBT.D.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

4th

Number and Operations in Base Ten	4.NBT.D Generalize place value understanding for multi-digit whole numbers (limited to numbers less than or equal to 1,000,000).	Mathematical Practices	Example
	4.NBT.D.3 Use place value understanding to round multi-digit whole numbers to any place.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☑ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	4.NBT.E Use place value understanding and properties of operations to perform multi-digit arithmetic (limited to whole numbers less than or equal to 1,000,000).	Mathematical Practices	Example
	4.NBT.E.4 Add and subtract multi-digit whole numbers using place value strategies including the standard algorithm.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☑ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

4th

Number and Operations in Base Ten

4.NBT.E Use place value understanding and properties of operations to perform multi-digit arithmetic (limited to whole numbers less than or equal to 1,000,000).	Mathematical Practices
4.NBT.E.5 Use strategies based on place value and the properties of multiplication to: A. Multiply a whole number of up to four digits by a one-digit whole number. B. Multiply a pair of two-digit numbers. **C.** Use appropriate models to explain the calculation, such as by using equations, rectangular arrays, and/or area models.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☑ Financial Literacy

DRAFT

4th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	4.NBT.E Use place value understanding and properties of operations to perform multi-digit arithmetic (limited to whole numbers less than or equal to 1,000,000).	Mathematical Practices	Example
	4.NBT.E.6 Use strategies based on place value, the properties of multiplication, and/or the relationship between multiplication and division to find quotients and remainders with up to four-digit dividends and one-digit divisors. Use appropriate models to explain the calculation, such as by using equations, rectangular arrays, and/or area models.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

4th

Number and Operations—Fractions

4.NF.F Extend understanding of fraction equivalence and ordering (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100).	Mathematical Practices	Example
4.NF.F.1 Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions	4.NF.F Extend understanding of fraction equivalence and ordering (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100).	Mathematical Practices	Example
	4.NF.F.2 Compare two fractions with different numerators and different denominators by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. A. Recognize that comparisons are valid only when the two fractions refer to the same whole. **B.** Record the results of comparisons with symbols >, =, or <. **C.** Justify the conclusions by using a visual fraction model.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

FPA

FPA 4.1.M.5 Students read and notate simple rhythm, dynamics and pitch notation.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

4th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

4.NF.G Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100).

4.NF.G.3 Understand a fraction a/b with a > 1 as a sum of unit fractions (1/b).

A. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
B. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions by using a visual fraction model.
C. Add and subtract mixed numbers with like denominators by replacing each mixed number with an equivalent fraction, and/or by using properties of addition and the relationship between addition and subtraction.
D. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

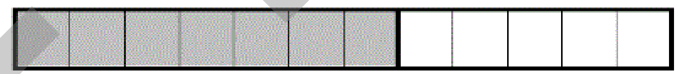
Example

Example:

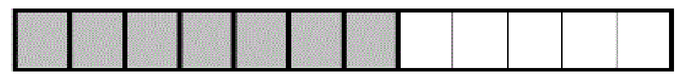
Decompose the fraction $\frac{7}{12}$ into a sum of fractions in 3 different ways. Use visual fraction models to show that these compositions are equivalent.

Possible Answers:

$\frac{7}{12}$



$\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}$



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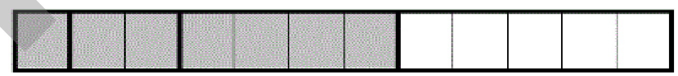

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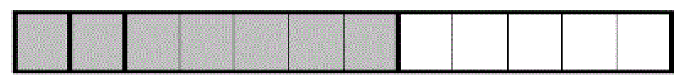

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

4th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

4.NF.G Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100).

Mathematical Practices

4.NF.G.4 Apply and extend an understanding of multiplication by multiplying a whole number and a fraction.

A. Understand a fraction *a/b* as a multiple of *1/b*.
B. Understand a multiple of *a/b* as a multiple of *1/b*, and use this understanding to multiply a fraction by a whole number.
C. Solve real-world problems involving multiplication of a fraction by a whole number, using visual fraction models and equations to represent the problem.

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example:

Rewrite the following addition expression as a multiplication expression and then evaluate the expression: $\frac{3}{10}+\frac{3}{10}+\frac{3}{10}+\frac{3}{10}$

Solution:

$$4 \times \frac{3}{10} = (4 \times 3) \times \frac{1}{10} = 12 \times \frac{1}{10} = \frac{12}{10}$$

Wyoming Cross-Disciplinary Connections

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

4.NF.H Understand decimal notation for fractions, and compare decimal fractions.	Mathematical Practices	Example
4.NF.H.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

4.NF.H Understand decimal notation for fractions, and compare decimal fractions.	Mathematical Practices	Example
4.NF.H.6 Use decimal notation for fractions with denominators 10 or 100.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

4.NF.H Understand decimal notation for fractions, and compare decimal fractions.	Mathematical Practices
4.NF.H.7 Compare and order decimal numbers to hundredths and justify by using concrete and visual models. Record the results of comparisons with the words "is greater than," "is equal to," "is less than," and with the symbols >, =, and <.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

4th

Measurement and Data

4.MD.I Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	Mathematical Practices	Example
4.MD.I.1 Know relative sizes of measurement units within one system of units including, but not limited to, km, m, cm; kg, g; lb, oz.; l L, ml; hr, min, sec; ft, in., gal., qt. pt., c., . Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

ELA

L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

4th

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

4.MD.I Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	Mathematical Practices
4.MD.I.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. Assessment Boundary: Use denominators of 2, 4, 8 and decimals up to hundredths. Modeling	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: Lois wants to send a box of oranges to a friend by mail. The box of oranges cannot exceed a mass of 10 kg. If each orange has a mass of 200 g, what is the maximum number she can send?

Source: helpingwithmath.com

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	Computational Thinking
3c Knowledge Constructor		☐ Financial Literacy ☐

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

4th

Measurement and Data	4.MD.I Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	Mathematical Practices	Example
	4.MD.I.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Measurement and Data	4.MD.J Represent and interpret data.	Mathematical Practices
	4.MD.J.4 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

PE	Health
PE5.2.1 Students assess current levels of personal health-related fitness.	**HE4.4.7** Set a measurable short-term personal health goal and monitor progress on achieving the goal (e.g., brush teeth two times per day, walk 10,000 steps every day). PA, NUT, IP/S

Cross-Disciplinary Connections

ISTE	Computer Science	
5b Computational Thinker		☐ Computational Thinking ☐ Financial Literacy

Wyoming 2018 Mathematics Content and Performance Standards

4th

Measurement and Data

4.MD.K Geometric measurement: understand concepts of angle and measure angles.	Mathematical Practices
4.MD.K.5 Regarding angles: A. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint. B. Understand concepts of angle measurement. An angle is measured with reference to a circle with its center at the common endpoint of the rays.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	4.MD.K Geometric measurement: understand concepts of angle and measure angles.	Mathematical Practices	Example
	4.MD.K.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

4th

Measurement and Data

4.MD.K Geometric measurement: understand concepts of angle and measure angles.	Mathematical Practices
4.MD.K.7 Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	4.G.L Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	Mathematical Practices
	4.G.L.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA	FPA
L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies. **L.3.6** Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.	**FPA 4.1.A.3** Students apply the elements and principles of design to their artwork. **FPA 4.4.A.1** Students identify connections between the visual arts and other disciplines in the curriculum.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

4th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	4.G.L Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	Mathematical Practices
	4.G.L.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

FPA

FPA 4.1.A.3 Students apply the elements and principles of design to their artwork.

FPA 4.4.A.1 Students identify connections between the visual arts and other disciplines in the curriculum.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	4.G.L Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	Mathematical Practices
	4.G.L.3 Identify line-symmetric figures. Recognize and draw lines of symmetry for two-dimensional figures.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

FPA

FPA 4.1.A.3 Students apply the elements and principles of design to their artwork.

FPA 4.4.A.1 Students identify connections between the visual arts and other disciplines in the curriculum

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Grade 4 Resources

Standard/Page Number	Resource/Link
4.OA.A.2 on page 115.	https://www.k-5mathteachingresources.com/support-files/word-problems-multiplicative-comparison.pdf
4.OA.C.5 on page 118.	https://drive.google.com/open?id=0B79xRlb9WGbFbWlIQ0JZajdKeTA https://drive.google.com/open? id=1oNGVawzANnFUiUf2aF6vHLxG1fV4L_wReJzpEwAzTDg
4.MD.I.2 on page 133.	helpingwithmath.com
Grade Level Math Practices on page 114.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

DRAFT

Mathematics | Grade 5

In Grade 5, student learning is focused on three critical areas: (1) develop fluency with addition and subtraction of fractions; develop understanding of the multiplication of fractions and of division fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extend division to 2-digit divisors, integrating decimal fractions into the place value system; developing understanding of operations with decimals to hundredths, and fluency with whole number and decimal operations; (3) develop understanding of volume.

(1) Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators, as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, to make reasonable estimates of them. Students also use the meaning of fractions, multiplication and division, including the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

(2) Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths, efficiently and accurately.

(3) Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional figures and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of figures in order to determine volumes to solve real world and mathematical problems.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In grade five, students solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?".

2. Reason abstractly and quantitatively.

Students recognize that a number represents a specific quantity. They connect quantities to written symbols and create logical representation of the problem at hand, while considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions that record calculations with numbers and represent or round numbers using place value concepts.

3. Construct viable arguments and critique the reasoning of others.

Students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like, "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.

4. Model with mathematics.

Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, to create equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.

5. Use appropriate tools strategically.

Fifth graders consider the available tools, including estimation, when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems, or to make predictions from real world data.

6. Attend to precision.

Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism, they record their answers in cubic units.

7. Look for and make use of structure.

Students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.

8. Look for and express regularity in repeated reasoning.

Students use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and to perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

DRAFT

5th

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

5.OA.A Write, interpret, and/or evaluate numerical expressions.	Mathematical Practices
5.OA.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

L.5.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

5th

Wyoming 2018 Mathematics Content and Performance Standards

Operations and Algebraic Thinking

5.OA .A Write, interpret, and/or evaluate numerical expressions.	Mathematical Practices
5.OA.A.2 Write simple expressions requiring parentheses that record calculations with numbers, and interpret numerical expressions without evaluating them.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: Express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.

Wyoming Cross-Disciplinary Connections

ELA

L.5.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

5th

Operations and Algebraic Thinking

5.OA.B Analyze patterns and relationships.	Mathematical Practices
5.OA.B.3. Generate two numerical patterns with each pattern having its own rule. Explain informally the relationship(s) between corresponding terms in the two patterns. A. Form ordered pairs consisting of corresponding terms from the two patterns. **B.** Graph the ordered pairs on a coordinate plane.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA	FPA
L.5.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.	**FPA 8.1.M.4** Students compose and arrange music within specified guidelines

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

5th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

5.NBT.C Understand the place value system.	Mathematical Practices
5.NBT.C.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
3a & 3d Knowledge Constructor **5c** Computational Thinker		☐ Computational Thinking ☑ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	5.NBT.C Understand the place value system.	Mathematical Practices
	5.NBT.C.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole number exponents to denote powers of 10.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Wyoming Cross-Disciplinary Connections

ELA

L.5.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.5.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten

5.NBT.C Understand the place value system.	Mathematical Practices	Example
5.NBT.C.3 Read, write, and compare decimals to thousandths. A. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form. **B.** Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Example: 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000)

Wyoming Cross-Disciplinary Connections

ELA

L.5.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.5.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	5.NBT.C Understand the place value system.	Mathematical Practices	Example
	5.NBT.C.4 Use place value understanding to round decimals to any place to a given place. Assessment Boundary: Limit place value to the thousandths.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☑ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Operations in Base Ten

5.NBT.D Perform operations with multi-digit whole numbers and with decimals to hundredths.	Mathematical Practices
5.NBT.D.5 Multiply multi-digit whole numbers using place value strategies including the standard algorithm.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	5.NBT.D Perform operations with multi-digit whole numbers and with decimals to hundredths.	Mathematical Practices	Example
	5.NBT.D.6 Find whole-number quotients with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of multiplication, and/or the relationship between multiplication and division, including the standard algorithm. Use appropriate models to Illustrate and explain the calculation, such as equations, rectangular arrays, and/or area models. Assessment Boundary: The standard algorithm for division will not be assessed.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations in Base Ten	5.NBT.D Perform operations with multi-digit whole numbers and with decimals to hundredths.	Mathematical Practices	Example
	5.NBT.D.7 Add, subtract, multiply, and divide decimals to hundredths using concrete models or drawings, and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; Relate the strategy to a written method and explain the reasoning used.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

5.NF.E Use equivalent fractions as a strategy to add and subtract fractions.	Mathematical Practices	Example
5.NF.E.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Operations—Fractions

5.NF.E Use equivalent fractions as a strategy to add and subtract fractions.	Mathematical Practices
5.NF.E.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

5.NF.F Apply and extend previous understandings of multiplication and division to multiply an divide fractions.	Mathematical Practices
5.NF.F.3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers by using visual fraction models or equations to represent the problem.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions	5.NF.F Apply and extend previous understandings of multiplication and division to multiply an divide fractions.	Mathematical Practices
	5.NF.F.4 Extend the concept of multiplication to multiply a fraction or whole number by a fraction. A. Recognize the relationship between multiplying fractions and finding the areas of rectangles with fractional side lengths. B. Interpret multiplication of a fraction by a whole number and a whole number by a fraction and compute the product. C. Interpret multiplication in which both factors are fractions less than one and compute the product.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

5.NF.F Apply and extend previous understandings of multiplication and division to multiply an divide fractions.	Mathematical Practices
5.NF.F.5 Justify the reasonableness of a product when multiplying with fractions. A. Estimate the size of the product based on the size of the two factors. B. Explain why multiplying a given number by a number greater than 1 (improper fractions, mixed numbers, whole numbers) results in a product larger than the given number. C. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. **D.** Explain why multiplying the numerator and denominator by the same number has the same effect as multiplying the fraction by 1.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

SL.5.1.a Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

SL.5.1.b Follow agreed-upon rules for discussions and carry out assigned roles.

SL.5.1.c Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

SL.5.1.d Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

SL.5.2 Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.5.3 Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

5.NF.F Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	Mathematical Practices
5.NF.F.6 Solve real world problems involving multiplication of fractions and mixed numbers by using visual fraction models or equations to represent the problem.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	
3c Knowledge Constructor		☐ **Computational Thinking** ☐ **Financial Literacy**

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Number and Operations—Fractions

5.NF.F Apply and extend previous understandings of multiplication and division to multiply an divide fractions.	Mathematical Practices
5.NF.F.7 Extend the concept of division to divide unit fractions and whole numbers by using visual fraction models and equations. A. Interpret division of a unit fraction by a non-zero whole number and compute the quotient. B. Interpret division of a whole number by a unit fraction and compute the quotient. C. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions by using visual fraction models and equations to represent the problem.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

CVE

CV5.3.1 Students identify and define real-world problems and meaningful questions for investigation.

CV5.3.2 Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	
3c Knowledge Constructor		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

5th

Measurement and Data

5.MD.G Convert like measurement units within a given measurement system.	Mathematical Practices	Example
5.MD.G.1 Solve multi-step real world problems by converting among different-sized standard measurement units within a given measurement system.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☑ Financial Literacy

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

5.MD.H Represent and interpret data.	Mathematical Practices
5.MD.H.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions to solve problems involving information presented in line plots.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

PE	Health
PE 5.2.1 Students assess current levels of personal health-related fitness.	**HE 6.4.7** Monitor progress toward achieving a short-term personal health goal and analyze why it is achieved or not achieved (e.g., the goal to be physically active for 30 minutes every day was not achieved because of snowy weather and no community facility was available for exercise). PA, NUT, PH

Cross-Disciplinary Connections

ISTE	Computer Science	
5b Computational Thinker	**1B-DA-06** Organize and present collected data visually to highlight relationships and support a claim	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data

5.MD.I Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	Mathematical Practices
5.MD.I.3 Recognize volume as an attribute of three-dimensional figures and understand concepts of volume measurement such as "unit cube" and a volume of *n* cubic units.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA

L.5.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

L.5.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	5.MD.I Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	Mathematical Practices	Example
	5.MD.I.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Measurement and Data	5.MD.I Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	Mathematical Practices	Example
	5.MD.I.5 Relate volume to the operations of multiplication and solve real world and mathematical problems involving volume. A. Find the volume of a right rectangular prism with whole number dimensions by multiplying them. Show that this volume is the same as when counting unit cubes. **B.** Find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems given the formulas V =(l)(w)(h) and V = (B)(h) for rectangular prisms.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	**Wyoming Cross-Disciplinary Connections**

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

5th

Geometry

5.G.J Graph points on the coordinate plane to solve real-world and mathematical problems.	Mathematical Practices
5.G.J.1 Understand a coordinate system. A. The x- and y- axes are perpendicular number lines that intersect at 0 (the origin). B. Any point on the coordinate plane can be represented by its coordinates. C. The first number in an ordered pair is the x-coordinate and represents the horizontal distance from the origin. D. The second number in an ordered pair is the y-coordinate and represents the vertical distance from the origin.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

ELA	PE
L.5.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies. **L.5.6** Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.	**PE 5.2.1** Students assess current levels of personal health-related fitness.

Cross-Disciplinary Connections

ISTE	Computer Science	
5b Computational Thinker	**1B-DA-06** Organize and present collected data visually to highlight relationships and support a claim. **1B-DA-07** Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea.	☑ **Computational Thinking** ☐ **Financial Literacy**

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

5.G.J Graph points on the coordinate plane to solve real-world and mathematical problems.	Mathematical Practices
5.G.J.2 Plot and interpret points in the first quadrant of the coordinate plane to represent real-world and mathematical situations.	**MP.1** **Make sense of problems and persevere in solving them.** **MP.2** **Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** **Model with mathematics.** **MP.5** **Use appropriate tools strategically.** **MP.6** **Attend to precision.** **MP.7** **Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science	ELA	CVE
5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. **5-ESS2-1** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	**L.5.4** Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies. **L.5.6** Acquire and use accurately grade-appropriate conversational, general academic, and domain specific words and phrases, including those that signal spatial and temporal relationships.	**CV5.3.1** Students identify and define real-world problems and meaningful questions for investigation. **CV5.3.2** Students plan and manage activities to develop a solution or complete a project.

Cross-Disciplinary Connections

ISTE	Computer Science	
5b Computational Thinker	**1B-DA-06** Organize and present collected data visually to highlight relationships and support a claim. **1B-DA-07** Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea.	☑ **Computational Thinking** ☑ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry	5.G.K Classify two-dimensional figures into categories based on their properties.	Mathematical Practices	Example
	5.G.K.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. Assessment Boundary: Use polygons only.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

FPA

FPA 8.1.A.3 Students analyze the use of the elements and principles of design in their artwork.

FPA 8.4.A.1 Students describe ways in which the principles and subject matter of other disciplines taught in the school are interrelated with the visual arts.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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5th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

5.G.K Classify two-dimensional figures into categories based on their properties.	Mathematical Practices
5.G.K.4 Classify polygons in a hierarchy based on properties.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

FPA

FPA 8.1.A.3 Students analyze the use of the elements and principles of design in their artwork.

FPA 8.4.A.1 Students describe ways in which the principles and subject matter of other disciplines taught in the school are interrelated with the visual arts.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Grade 5 Resources

Standard/Page Number	Resource/Link
Grade Level Math Practices on page 143.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Mathematics | Grade 6

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; (4) developing understanding of statistical thinking.

(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

2) Students use the meaning of fractions, multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular, negative integers. They reason about the order and absolute value of rational numbers and the location of points in all four quadrants of the coordinate plane.

(3) Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

(4) Students begin to develop their ability to think statistically, by building on and reinforcing their understanding of number. Students recognize that a data distribution may not have a definite center and different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (range or interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Students will be given the opportunity to determine formulas for the areas of triangles and parallelograms through the use of manipulatives or inquiry based exploration. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In grade 6, students solve problems involving ratios and rates and discuss (verbally or in writing) how they solve them. Students analyze the problem (including what is given, not given, and what is being asked), identify what strategies are needed, recognize multiple pathways to a solution, and make an initial attempt to solve the problem. Students analyze the result for validity and refine strategies if necessary.

2. Reason abstractly and quantitatively.

Students recognize a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students begin to contextualize to understand the meaning of the number or variable as it relates to the problem.

3. Construct viable arguments and critique the reasoning of others.

Students begin to contextualize to understand the meaning of the number or variable as it relates to the problem. They make conjectures, explore validity, reason mathematically, justify, evaluate their own thinking.

4. Model with mathematics.

Students can clearly show their work by using diagrams, words, symbols or pictures. They are able to identify important quantities in a practical situation and map their relationships using tools such as, diagrams, two-way tables, graphs, flowcharts or formulas. They can recognize and analyze those relationships mathematically to draw conclusions. They can interpret their mathematical results of problems involving non-negative rational numbers in the context of the situation and reflect on whether the results make sense.

5. Use appropriate tools strategically.

Students consider available tools (including estimation, concrete models, and technology), and decide when certain tools might be helpful. They choose the representation (table, graph, equation, words) that best suits the problem. Students use concrete models to develop insight into ratios and other concepts. Students extend this insight to more abstract representations, including pictures and symbols. Students understand the limitations of each tool. Tools might include: unifix cubes, fraction bars, base-ten blocks, number lines, graph paper, calculator, paper and pencil, and others.

6. Attend to precision.

Students continue to refine their mathematical communication and reasoning skills by using clear language in their discussions with others. Students define variables, including their relationship, specify units of measure, and label each axis accurately. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations or inequalities. Students use appropriate symbols, labels, and units of measure when solving problems with calculations that are accurate and efficient. The answer to the problem matches what was asked in the problem.

7. Look for and make use of structure.

Students routinely seek patterns or structure to model and solve problems. They recognize that patterns exist in ratio tables. Students notice patterns and identify strategies for creating equivalent expressions. Students identify complicated expressions or figures as compositions of simple parts.

8. Look for and express regularity in repeated reasoning.

Students use repeated reasoning to understand algorithms and make generalizations about patterns. They construct examples and models that confirm their generalization. They develop short cuts and check for reasonableness of answers. Students ask questions such as, "How would we verify that?" and "How is this similar to patterns with whole numbers?"

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6th

Wyoming 2018 Mathematics Content and Performance Standards

Ratios and Proportional Relationships

6.RP.A Understand ratio concepts and use ratio reasoning to solve problems.	Mathematical Practices	Example
6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	**Example:** The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

Wyoming Cross-Disciplinary Connections

Science

MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

MS-PS4-1 Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.

MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.

MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.

MS-ESS3-4 Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems.

FPA

FPA8.4.M.2 Students describe ways in which other disciplines are interrelated with music.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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6th

Wyoming 2018 Mathematics Content and Performance Standards

Ratios and Proportional Relationships

6.RP.A Understand ratio concepts and use ratio reasoning to solve problems.	Mathematical Practices
6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Example: "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar."

Example: "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."

Wyoming Cross-Disciplinary Connections

SCIENCE

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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6th

Wyoming 2018 Mathematics Content and Performance Standards

Ratios and Proportional Relationships

6.RP.A Understand ratio concepts and use ratio reasoning to solve problems.	Mathematical Practices
6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. A. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. B. Solve unit rate problems including those involving unit pricing and constant speed. C. Understand that a percentage is a rate per 100 and use this to solve problems involving wholes, parts, and percentages. D. Use ratio reasoning to convert measurement units; convert units appropriately when multiplying or dividing quantities.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Examples on resource page.

Wyoming Cross-Disciplinary Connections

Science

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

MS-PS4-1 Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.

MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems.

FPA

FPA8.4.M.2 Students describe ways in which other disciplines are interrelated with music.

SOCIAL STUDIES

SS8.3.4 Explain or illustrate how money is used by individuals, groups, and financial institutions.

CVE

CV8.5.2 Career-aware students plan tasks recognizing human resources, financial and timeline constraints that take into account priorities and goals.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☑ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

6.NS.B Apply and extend previous understandings of multiplication and division to divide fractions by fractions.	Mathematical Practices
6.NS.B.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions by using visual fraction models and equations to represent the problem.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. How many 3/4-cup servings are in 2/3 of a cup of yogurt?

Wyoming Cross-Disciplinary Connections

Science

MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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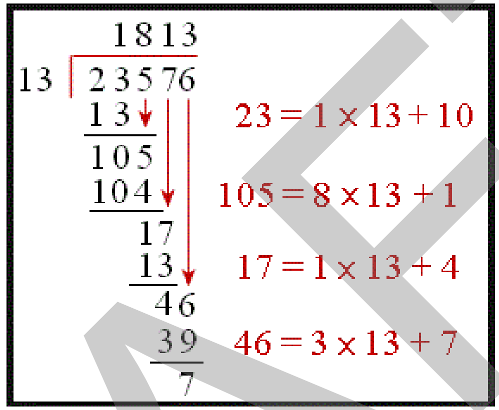
Wyoming 2018 Mathematics Content and Performance Standards

The Number System

6.NS.C Compute fluently with multi-digit numbers and find common factors and multiples.	Mathematical Practices
6.NS.C.2 Divide multi-digit numbers using efficient and generalizable procedures including, but not limited to the standard algorithm. Assessment boundary: Use up to 5-digit dividend, 2-digit divisors.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example:



Source: https://www.intmath.com/basic-algebra/img/long-division.png

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

6.NS.C Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.C.3 Add, subtract, multiply, and divide manageable multi-digit decimals using efficient and generalizable procedures including, but not limited to the standard algorithm for each operation.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example:

$$\begin{array}{r} {}^{1}\,{}^{1}\quad\; \\ 7\,5\,9\,4 \\ +\,4\,1\,2\,8 \\ \hline 1\,1\,7\,2\,2 \end{array} \qquad \begin{array}{r} {}^{11}_{12}\; \\ 158 \\ \times\quad 23 \\ \hline 474 \\ +\;3160 \\ \hline 3634 \end{array} \qquad \begin{array}{r} 6\;15 \\ 3\,\cancel{7}\,\cancel{5} \\ -\;38 \\ \hline 337 \end{array}$$

Source: Illustrative Mathematics:

- multiplication - web.mnstate.edu/peil/MDEV102/U1/S8/Standard2.htm
- addition - http://study.com/academy/lesson/what-is-a-standard-algorithm-in-math-definition-examples.htm

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

6.NS.C Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.C.4 Find common factors and multiples using two whole numbers.

A. Find the greatest common factor of two whole numbers less than or equal to 100.
B. Find the least common multiple of two whole numbers less than or equal to 12.
C. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

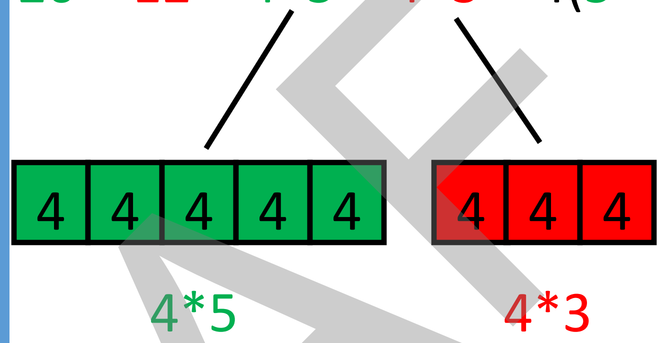
MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

Example:

$20 + 12 = 4*5 + 4*3 = 4(5 + 3)$



Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

6.NS.D Apply and extend previous understandings of numbers to the system of rational numbers.

6.NS.D.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values and use them to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: For each of the actions given, describe an action that will get you back where you started.

- Earn 8 dollars. (Spend 8 dollars)
- It gets 5 degrees warmer. (It gets 5 degrees colder)
- Travel south 3 kilometers. (Travel north 3 kilometers)
- Run backward 9 steps. (Run forwards 9 steps)

Wyoming Cross-Disciplinary Connections

SCIENCE

MS-PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

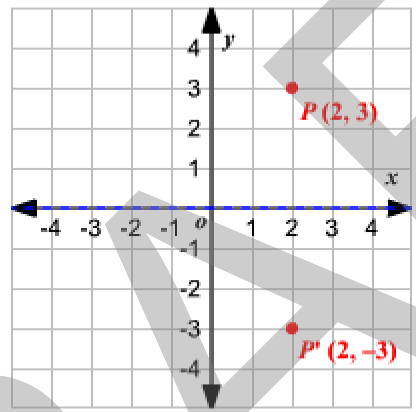
The Number System

6.NS.D Apply and extend previous understandings of numbers to the system of rational numbers.	Mathematical Practices
6.NS.D.6 Extend the understanding of the number line to include all rational numbers and apply this concept to the coordinate plane. A. Understand the concept of opposite numbers, including zero, and their relative locations on the number line. B. Understand that signs of numbers in ordered pairs indicate locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. C. Find and position rational numbers on a horizontal or vertical number line diagram; find and position pairs of rational numbers on a coordinate plane.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Example: The opposite of 3 is -3. The opposite of -3 is 3. The opposite of zero is itself.

Example: A reflection of a point over the x -axis is shown.



The rule for a reflection over the x -axis is (x,y)→(x,−y).

Source: https://www.varsitytutors.com/hotmath/hotmath_help/topics/reflections

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

6.NS.D Apply and extend previous understandings of numbers to the system of rational numbers.

Mathematical Practices

6.NS.D.7 Understand ordering and absolute value of rational numbers.

A. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
B. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
C. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
D. Distinguish comparisons of absolute value from statements about order.

Modeling

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

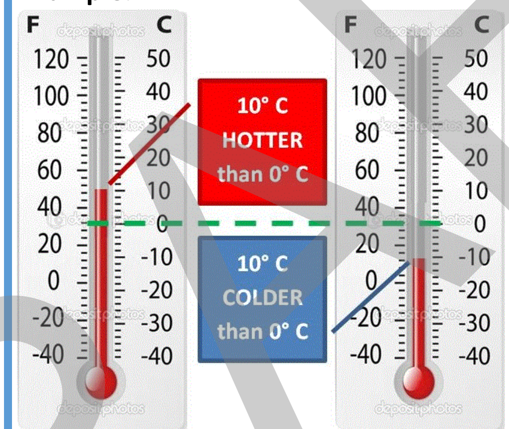
Example

Example: Interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.

Example: An account balance of -50 dollars is less than an account balance of –30 dollars. -50 is a greater debt because |-50| is greater than |-30|.

Example: Write –3°C > –7°C to express the fact that –3°C is warmer than –7°C.

Example:



Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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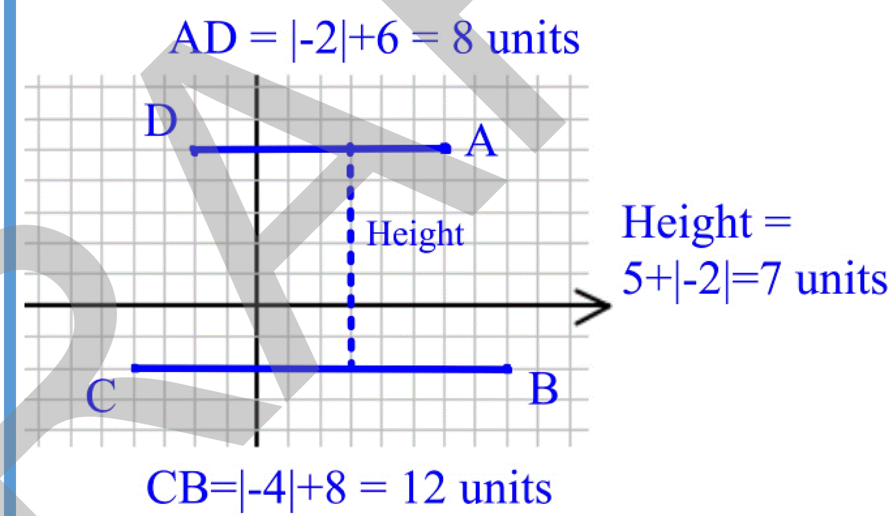
Wyoming 2018 Mathematics Content and Performance Standards

The Number System

6.NS.D Apply and extend previous understandings of numbers to the system of rational numbers.	Mathematical Practices	Example
6.NS.D.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Find distances between points with the same first coordinate or the same second coordinate; relate absolute value and distance.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	**Example:** • Graph the trapezoid A(6, 5), B(8, −2), C(−4, −2), D(−2, 5). • Find the length of the bottom base (segment CB). • Find the length of the top base (segment AD). • Use grid units to find the distance between the two bases, which is called the height. Use grid units. 

Modeling

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

6th

Expressions and Equations

6.EE.E Apply and extend precious understandings of arithmetic to algebraic expressions.	Mathematical Practices
6.EE.E.1 Write and evaluate numerical expressions involving whole-number exponents.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

6th

Expressions and Equations

6.EE.E Apply and extend precious understandings of arithmetic to algebraic expressions.	Mathematical Practices
6.EE.E.2 Write, read, and evaluate expressions in which letters stand for numbers. A. Write expressions that record operations with numbers and with letters standing for numbers. B. Identify parts of an expression using mathematical terms (sum, difference, term, product, factor, quotient, coefficient, constant). C. Use Order of Operations to evaluate algebraic expressions at using positive rational numbers and whole-number exponents. Include expressions that arise from formulas in real-world problems.	**MP.1** Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: Express the calculation "Subtract y from 5" as 5 – y; Review other keywords like 'plus', 'more than', 'product'. This is worth emphasizing because all other word combinations are converted to equations or to expressions in the order in which they occur. Subtraction (aka "less than") is an exception in that the first component is what is taken away from or comes second after the calculation "Subtract y from 5" as 5 – y.

Use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.

Wyoming Cross-Disciplinary Connections

SCIENCE

MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

6.EE.E Apply and extend precious understandings of arithmetic to algebraic expressions.	Mathematical Practices	Example
6.EE.E.3 Apply the properties of operations to generate equivalent expressions.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	**Example:** Apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; i.e. 3(2+x) = 6 + 3x. **Example:** Apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); i.e. 24x + 18y = 6(4x + 3y).

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations	6.EE.E Apply and extend precious understandings of arithmetic to algebraic expressions.	Mathematical Practices	Example
	6.EE.E.4 Identify when two expressions are equivalent.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	**Example:** The expressions y + y + y and 3y are equivalent because they represent the same number regardless of which number y stands. **Wyoming Cross-Disciplinary Connections**

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking
1c Empowered Learner		☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

6.EE.F Reason about and solve one-variable equations and inequalities.	Mathematical Practices	Example
6.EE.F.5 Understand a solution to an equation or an inequality makes the equation or inequality true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	**Example:** Given, 2x + 5 = 11, which numbers in the set make this equation true: {1,2,3,4,5}; for 3x +1 < 20, which numbers in the set make this true? {4,5,6,7,8} ?

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

6.EE.F Reason about and solve one-variable equations and inequalities.	Mathematical Practices
6.EE.F.6 Use variables to represent unknown numbers and write expressions when solving a real-world or mathematical problem.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Gym Membership: you pay $50 per month and $2 for each time you workout. Write an expression that represents your monthly cost for exercising d days a month .

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**2-AP-11** Create clearly named variables that represent different data types and perform operations on their values.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

6.EE.F Reason about and solve one-variable equations and inequalities.	Mathematical Practices
6.EE.F.7 Write and solve real-world and mathematical problems in the form of one-step, linear equations involving nonnegative rational numbers.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Example: Write an equation for the problem and solve it. Be sure to define your variable. You want to buy a new smart TV that costs $1575. You check your savings-account balance and realize that to buy the smart TV, you will need $125 more than what you have in your savings account. How much money do you have in your savings account?

Wyoming Cross-Disciplinary Connections

Science	CVE
MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. **MS-LS2-4** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **MS-LS2-5** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. **MS-ESS2-6** Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	**CV8.3.1** Career-aware students identify real-world problems and efficiently locate & effectively use various sources of information for informed decision making.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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6th

Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

6.EE.F Reason about and solve one-variable equations and inequalities.	Mathematical Practices
6.EE.F.8 Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Example: Write an inequality for the problem below, and solve it. Show your solutions on a number line. Be sure to define your variable. Wyoming Air Lines will allow you to fly with suitcases that weigh no more than 30 pounds. If your suitcase weighs 10 pounds and the Chromebook you need to bring on your trip weigh 2 pounds, how many pounds of clothes and other items can you pack?

Wyoming Cross-Disciplinary Connections

CVE

CV8.3.1 Career-aware students identify real-world problems and efficiently locate & effectively use various sources of information for informed decision making.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

6.EE.G Represent and analyze quantitative relationships between dependent and independent variables.	**Mathematical Practices**
6.EE.G.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity (dependent variable), in terms of the other quantity (independent variable). Analyze their relationship using graphs and tables, and relate these to the equation.	**MP.1** **Make sense of problems and persevere in solving them.** **MP.2** **Reason abstractly and quantitatively.** **MP.3** **Construct viable arguments and critique the reasoning of others.** **MP.4** **Model with mathematics.** **MP.5** **Use appropriate tools strategically.** **MP.6** **Attend to precision.** **MP.7** **Look for and make use of structure.** **MP.8** **Look for and express regularity in repeated reasoning.**

Modeling

Example

Example: In a motion problem that has constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.

Wyoming Cross-Disciplinary Connections

SCIENCE

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-LS1-2 Develop and use models to describe the parts, functions, and basic processes of cells.

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

MS-LS1-7 Develop a model to describe how food molecules (sugar) are rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

Cross-Disciplinary Connections

ISTE	**Computer Science**	
1c Empowered Learner	**2-AP-11** Create clearly named variables that represent different data types and perform operations	☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

6th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	6.G.H Solve real-world and mathematical problems involving area, surface area, and volume.	Mathematical Practices
	6.G.H.1 Find area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Science

MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

ELA

L.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner

Computer Science

2-AP-14 Create procedures with parameters to organize code and make it easier to reuse.

- [x] Computational Thinking
- [ ] Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

6th

Geometry

6.G.H Solve real-world and mathematical problems involving area, surface area, and volume.	Mathematical Practices	Example
6.G.H.2 Find the volume of a right rectangular prism with fractional edge lengths in the context of solving real-world and mathematical problems by applying the formulas V = (l)(w)(h) and V = (B)(h), and label with appropriate units.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Modeling

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**2-AP-14** Create procedures with parameters to organize code and make it easier to reuse.	☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

6th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

6.G.H Solve real-world and mathematical problems involving area, surface area, and volume.	Mathematical Practices
6.G.H.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Triangle PQR and triangle QRS have vertices P(–9,7), Q(4,7), R(4,–3), and S(10,–3). What is the area, in square units, of quadrilateral PQSR?

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

6.G.H Solve real-world and mathematical problems involving area, surface area, and volume.	Mathematical Practices	Example
6.G.H.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures in the context of solving real-world and mathematical problems.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Modeling

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

6.SP.I Develop understanding of statistical variability.	Mathematical Practices
6.SP.I.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS2-1 Ask questions about a common household appliance, collect data to reverse-engineer the appliance and learn how it's design has evolved, describe how scientific discoveries, technological advances, and engineering design played significant roles in its development, and explore how science, engineering and technology might be used together or individually in producing improved versions of the appliance.

Health

HE8.2.5 Analyze how peers, culture, and media can influence decisions students make about health practices and risk behaviors (e.g., time, fiscal, etc.). SEXUALITY, ATOD, ME

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **5b** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

6th

Statistics and Probability

6.SP.I Develop understanding of statistical variability.	Mathematical Practices	Example
6.SP.I.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Modeling

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
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HE8.2.5 Analyze how peers, culture, and media can influence decisions students make about health practices and risk behaviors (e.g., time, fiscal, etc.). SEXUALITY, ATOD, ME

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **5b** Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

6th

Statistics and Probability

6.SP.I Develop understanding of statistical variability.	Mathematical Practices
6.SP.I.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Science

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MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS2-1 Ask questions about a common household appliance, collect data to reverse-engineer the appliance and learn how it's design has evolved, describe how scientific discoveries, technological advances, and engineering design played significant roles in its development, and explore how science, engineering and technology might be used together or individually in producing improved versions of the appliance.

ELA

RL.6.7 Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they "see" and "hear" when reading the text to what they perceive when they listen or watch.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3b** Knowledge Constructor	**2-DA-07** Represent data using multiple encoding schemes. **2-DA-09** Refine computational models based on the data they have generated.	☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

6th

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability	6.SP.J Summarize and describe distributions.	Mathematical Practices	Example
	6.SP.J.4 Display numerical data in plots on a number line, including dot plots, stem-and-leaf plots, histograms, and box plots.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Science

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ELA

RL.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3c** Knowledge Constructor **5b** Computational Thinker **6a,c,d** Creative Communicator	**2-DA-07** Represent data using multiple encoding schemes. **2-DA-09** Refine computational models based on the data they have generated.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

6.SP.J Summarize and describe distributions.

6.SP.J.5 Summarize numerical data sets in relation to their real-world context.

A. Report the sample size.
B. Describe the context of the data under investigation, including how it was measured and its units of measurement.
C. Find quantitative measures of center (median, mode and mean) and variability (range and interquartile range). Describe any overall pattern (including outliers, clusters, and distribution), with reference to the context in which the data was gathered.
D. Justify the choice of measures of center (median, mode, or mean) based on the shape of the data distribution and the context in which the data was gathered.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: If the distribution is symmetric, the mean and mean absolute deviation are the best center-spread measure combo to use. When the data is skewed, the median and interquartile range are the center-spread pair of choice

Wyoming Cross-Disciplinary Connections

Science
MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
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MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

ELA
RI.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
W.6.7 Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

Social Studies—SS8.6.3 Use digital tools to research, design, and present social studies concepts (e.g., understand how individual responsibility applies in usage of digital media). https://www.iste.org/standards/nets-for-students.

PE
PE8.2.1 Students create and monitor a personal plan using current levels of fitness and physical activity.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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Grade 6 Resources

Standard/Page Number	Resource/Link/Example(s)
6.RP.A.3 on page 174.	**Example:** Are the ratios 16:8 and 2:1 equivalent? **Example:** If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? **Example:** Recognize that 25% (twenty five per cent) means twenty five per 100 and equate that to 25/100. 119% is still 199/100;0.17% is the same as .17/100 and then to create as a proper fraction = (17/100)/100 = 17/10,000. **Example:** Convert 3 feet to inches; knowing that there are 12 inches in each foot, we can say that 12 inches = 1 foot; so 3 feet = 3 (1 foot) = 3 (12 inches) = 36 inches; Convert 6 feet to yards; knowing that there are 3 feet are in one yard, 6 feet = 2(3 feet) = 2(1 yard) = 2 yards. What is ½ of ⅔ of cup? ½ x ⅔ = ⅓.
6.NS.C.2 on page 176.	https://www.intmath.com/basic-algebra/img/long-division.png
6.NS.C.3 on page 177.	multiplication - web.mnstate.edu/peil/MDEV102/U1/S8/Standard2.htm addition - http://study.com/academy/lesson/what-is-a-standard-algorithm-in-math-definition-examples.htm
6.NS.D.6 on page 180.	https://www.varsitytutors.com/hotmath/hotmath_help/topics/reflections
Grade Level Math Practices on page 171.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Mathematics | Grade 7

In Grade 7, instructional time should focus on four critical areas: (1) develop understanding of and applying proportional relationships; (2) develop understanding of operations with rational numbers and working with expressions and linear equations; (3) solve problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; (4) draw inferences about populations based on samples.

(1) Students extend their understanding of ratios and develop understanding of proportionality to solve single-and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

(2) Students develop a unified understanding of number by recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

(3) Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8, they reason about relationships among two- dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two-and three-dimensional objects which are composed of triangles, quadrilaterals, polygons, cubes and right prisms.

(4) Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.

In grade 7, students solve real world problems involving ratios, rates, proportions, rational numbers and geometric concepts and discuss (verbally or in writing) how they solve them. Students analyze the problem (including what is given, not given, and what is being asked), identify what strategies are needed, choose an appropriate pathway, then make an initial attempt to solve the problem. Students analyze the result for validity and refine strategies if necessary.

2. Reason abstractly and quantitatively.

Students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. Construct viable arguments and critique the reasoning of others.

Students construct arguments using verbal or written explanations that involve solving problems with rational numbers. They make conjectures, explore validity, reason mathematically, justify, evaluate their own thinking and the thinking of other students.

4. Model with mathematics.

Students can clearly show their work by using diagrams, words, symbols or pictures. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and/or formulas. They can analyze those relationships mathematically to draw conclusions. They interpret their mathematical results of problems involving rational numbers in the context of the situation and reflect on whether the results make sense.

5. Use appropriate tools strategically.

Students consider available tools (including estimation, concrete models, and technology as appropriate), and decide when certain tools might be helpful. Students develop more efficacy with technology. They choose the representation (table, graph, equation, words) that best suits the problem. Students use concrete models to develop insight into proportions and other concepts. Students then extend this insight to more abstract representations, including pictures and symbols. Students understand the limitations of each tool. Tools might include: integer tiles, algebra tiles, geometric nets, number lines, graphing technology, scientific calculator, paper and pencil, and others.

6. Attend to precision.

Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, including their relationship, specify units of measure, and label each axis accurately. Student use appropriate terminology when referring to rates, ratios, proportions, probability models, geometric figures, data displays, and components of expressions, equations or inequalities. Students use appropriate symbols, labels, and units of measure when solving problems with calculations that are accurate and efficient. Answer to the problem matches what was asked in the problem.

7. Look for and make use of structure.

Students routinely seek patterns or structure to model and solve problems. They recognize that patterns exist in ratio tables and make connections with the constant of proportionality in a table and the slope of a graph. Students recognize patterns and identify and develop strategies for creating equivalent expressions. Students identify complicated expressions or figures as compositions of simple parts.

8. Look for and express regularity in repeated reasoning.

Students routinely seek patterns or structure to model and solve problems. They apply properties to solve problems based upon patterns they have identified. Students examine patterns to generate equations and describe relationships. Students simplify complicated expressions into simple terms. Students recognize the effects of transformations and describe them in terms of congruence and similarity.

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Wyoming 2018 Mathematics Content and Performance Standards

Ratios and Proportional Relationships

7.RP.A Analyze proportional relationships and use them to solve real-world and mathematical problems.	Mathematical Practices
7.RP.A.1 Compute unit rates, including those involving complex fractions, with like or different units.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Example: If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour.

Wyoming Cross-Disciplinary Connections

Science

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

DRAFT

7th

Wyoming 2018 Mathematics Content and Performance Standards

Ratios and Proportional Relationships

7.RP.A Analyze proportional relationships and use them to solve real-world and mathematical problems.	Mathematical Practices
7.RP.A.2 Recognize and represent proportional relationships between quantities. A. Decide whether two quantities in a table or graph are in a proportional relationship. B. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. C. Represent proportional relationships with equations. D. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. Modeling	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Example: If total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.

Sources: https://www.engageny.org/resource/released-2017-3-8-ela-and-mathematics-state-test-questions

Wyoming Cross-Disciplinary Connections

Science

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
MS-PS4-1 Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.
MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
MS-LS1-7 Develop a model to describe how food molecules (sugar) are rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.
MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ESS3-4 Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems.

CVE

CV8.5.2 Career-aware students plan tasks recognizing human resources, financial and timeline constraints that take into account priorities and goals.

FPA

FPA8.4.M.2 Students describe ways in which other disciplines are interrelated with music.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☑ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Ratios and Proportional Relationships

7.RP.A Analyze proportional relationships and use them to solve real-world and mathematical problems.	Mathematical Practices
7.RP.A.3 Solve multistep real world and mathematical problems involving ratios and percentages.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Science	CVE
MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. **MS-LS1-6** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. **MS-LS1-7** Develop a model to describe how food molecules (sugar) are rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. **MS-LS3-2** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. **MS-ESS1-3** Analyze and interpret data to determine scale properties of objects in the solar system. **MS-ESS3-1** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	**CV8.5.2** Career-aware students plan tasks recognizing human resources, financial and timeline constraints that take into account priorities and goals.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☑ Financial Literacy

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7th

Wyoming 2018 Mathematics Content and Performance Standards

The Number System

7.NS.B Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.B.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers.

A. Describe situations in which opposite quantities combine to make zero (the additive identity).
B. Understand that p + q represents the distance |q| from p whose placement is determined by the sign of q. Interpret sums of rational numbers by describing real-world contexts.
C. Show that a number and its opposite have a sum of 0 (are additive inverses).
D. Understand subtraction of rational numbers as adding the additive inverse, p - q = p + (-q). Apply this principal in real-world contexts.
E. Apply properties of addition as strategies to add and subtract rational numbers.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: A hydrogen atom has 0 charge because its constituents proton and electron are oppositely charged.

Example: It is 5 degrees Celsius outside. A winter storm suddenly makes the temperature drop to negative 15 degrees Celsius.

What was the temperature change? 5+|-15| = 20 degree temperature change.

Example: -2 + 2 = 0

Example: Sara's account had $10 in it. She wrote a check for $15. What is her balance? 10-15 represents $10 in the account, subtract $15 spent by the check. 10+(-15) represents $10 in the account add a negative charge of $15. Both result in a balance of -$5.

Wyoming Cross-Disciplinary Connections

Science

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused changes in global temperatures over time.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

7.NS.B Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.B.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

A. 1. Understand that the multiplicative inverse of a number is its reciprocal and their product is equal to one (the multiplicative identity).
   2. Understand positive and negative sign rules for multiplying rational numbers. Interpret products of rational numbers by describing real-world contexts.

B. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers is a rational number. Recognize that if p and q are integers then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

C. Apply properties of multiplication (commutative, associative, distributive, or properties of identity and inverse elements) to multiply and divide rational numbers.

D. Convert a rational number to a decimal. Recognize that rational numbers can be written as fractions or decimal numbers that terminate or repeat.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: 3*(1/3) = 1

Example: 4 students each take a turn digging in the same hole. If each student digs three feet down, how deep is the hole when they are finished? 4*(-3)= -12 means the hole is twelve feet in depth. Sign rules: positive times positive equals positive, negative times negative is positive, and positive times negative is negative.

Example: -(12/4) = -12/4 = 12/-4.

Example: Your mom paid $12 for you and three friends to go to the show. What is each persons' debt to your mom? The debt is $3 which can be represented as -$3.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System	**7.NS.B Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**	**Mathematical Practices**
	7.NS.B.3 Solve real-world and mathematical problems involving the four arithmetic operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**

Modeling

Example

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

MS-LS1-7 Develop a model to describe how food molecules (sugar) are rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

7.EE.C Use properties of operations to generate equivalent expressions.	Mathematical Practices
7.EE.C.1 Describe several measurable attributes of one or more objects.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Expressions and Equations	7.EE.C Use properties of operations to generate equivalent expressions.	Mathematical Practices
	7.EE.C.2 Recognize that algebraic expressions may have a variety of equivalent forms that reveal different information, and determine an appropriate form for a given real-world situation.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."

Wyoming Cross-Disciplinary Connections

CVE

CV8.5.2 Career-aware students plan tasks recognizing human resources, financial and timeline constraints that take into account priorities and goals.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☑ Financial Literacy

7th

Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

7.EE.D Solve real-life and mathematical problems using numerical and algebraic expressions and equations.	Mathematical Practices
7.EE.D.3 Solve multi-step real-world and mathematical problems involving rational numbers. Include fraction bars as a grouping symbol.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50.

Example: If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

Wyoming Cross-Disciplinary Connections

Science	CVE
MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. **MS-PS2-2** Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	**CV8.5.2** Career-aware students plan tasks recognizing human resources, financial and timeline constraints that take into account priorities and goals. **CV8.3.1** Career-aware students identify real-world problems and efficiently locate & effectively use various sources of information for informed decision making.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☑ Financial Literacy

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7th

Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

7.EE.D Solve real-life and mathematical problems using numerical and algebraic expressions and equations.	Mathematical Practices
7.EE.D.4 Apply the concepts of linear equations and inequalities in one variable to real-world and mathematical situations. A. Write and fluently solve linear equations of the form $ax + b = c$ and $a(x + b) = c$ where a, b, and c are rational numbers. B. Write and solve multi-step linear equations that include the use of the distributive property and combining like terms. Exclude equations that contain variables on both sides. C. Write and solve two-step linear inequalities. Graph the solution set on a number line and interpret its meaning. D. Identify and justify the steps for solving multi-step linear equations and two-step linear inequalities. Modeling	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Example: The perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

Example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

Wyoming Cross-Disciplinary Connections

Science

MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-ESS1-2 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-4 Construct a scientific explanation based on evidence from rocks and rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.

MS-ESS3-4 Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems.

MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused changes in global temperatures over time.

CVE

CV8.3.1 Career-aware students identify real-world problems and efficiently locate & effectively use various sources of information for informed decision making.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**2-AP-11** Create clearly named variables that represent different data types and perform operations on their values.	☑ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

7th

Geometry

7.G.E Draw, construct, and describe geometrical figures and describe the relationships between them.	Mathematical Practices
7.G.E.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Example: If the scale is 1 in : 3 ft, what is the area of a bedroom that is 3 in by 4 in on a scale drawing?

Wyoming Cross-Disciplinary Connections

Science	Social Studies
MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. **MS-ESS2-1** Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. **MS-ESS2-3** Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.	**SS8.5.1** Use and create models of the Earth to analyze the interactions of physical and human systems to demonstrate global interconnectedness.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **5c** Computational Thinker	**2-AP-14** Create procedures with parameters to organize code and make it easier to reuse.	☑ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry	7.G.E Draw, construct, and describe geometrical figures and describe the relationships between them.	Mathematical Practices
	7.G.E.2 Draw geometric shapes with given conditions using a variety of tools (e.g., ruler and protractor, or technology). Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Examples of technology could include, but are not limited to, Geometer's Sketchpad and Mathematica.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c,d Empowered Learner **4b** Innovative Designer	**2-AP-14** Create procedures with parameters to organize code and make it easier to reuse.	☑ Computational Thinking ☐ Financial Literacy

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7th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	7.G.E Draw, construct, and describe geometrical figures and describe the relationships between them.	Mathematical Practices
	7.G.E.3 Describe the two-dimensional figures that result from slicing three-dimensional figures parallel to the base, as in plane sections of right rectangular prisms and right rectangular pyramids.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: The cross-section of a rectangular pyramid is a rectangle. The cross section of a rectangular prism is a rectangle.

Wyoming Cross-Disciplinary Connections

ELA

L.7.4.b Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., belligerent, bellicose, rebel).

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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7th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

7.G.F Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.F.4 Investigate the concept of circles.

A. Demonstrate an understanding of the proportional relationships between diameter, radius, and circumference of a circle.

B. Understand that pi is defined by the constant of proportionality between the circumference and diameter.

C. Given the formulas for circumference and area of circles, solve real-world and mathematical problems.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

Example: Find the circumference of a steering wheel that is 45 cm in diameter. Find the area of a pizza with a diameter of 12 inches. Find the length of the minute hand on a clock whose circumference is 66 cm.

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-ESS1-2 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner

Computer Science

2-AP-14 Create procedures with parameters to organize code and make it easier to reuse.

- [x] **Computational Thinking**
- [ ] **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

7.G.F Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	Mathematical Practices
7.G.F.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. **7.G.F.6** Intentionally Removed	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Example:

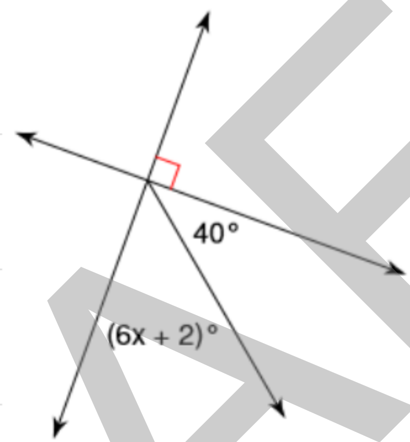

Image from Kuta Software

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**2-AP-14** Create procedures with parameters to organize code and make it easier to reuse.	☑ Computational Thinking ☐ Financial Literacy

DRAFT

7th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	7.G.F Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	Mathematical Practices
	7.G.F.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-ESS1-2 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **5c** Computational Thinker		☐ **Computational Thinking** ☐ **Financial Literacy**

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7th

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

7.SP.G Use random sampling to draw inferences about a population.

7.SP.G.1 Solve real-world and mathematical problems involving:

A. Understand that a sample is a subset of a population.

B. Differentiate between random and non-random sampling.

C. Understand that generalizations from a sample are valid only if the sample is representative of the population.

D. Understand that random sampling is used to gather a representative sample and tends to support valid inferences about the population.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
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MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
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MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

ELA

RI.7.1 Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
W.7.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Cross-Disciplinary Connections

ISTE
1c Empowered Learner
3a,b,c,d Knowledge Constructor
5b Computational Thinker

Computer Science

☑ **Computational Thinking**
☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

7th

Statistics and Probability

7.SP.G Use random sampling to draw inferences about a population.

7.SP.G.2 Draw inferences about a population by collecting multiple random samples of the same size to investigate variability in estimates of the characteristic of interest.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
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MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
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MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

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Social Studies

SS8.6.1 Use and evaluate multiple sources of information in diverse formats and media in order to address a question or solve a problem.

Health

HE8.2.5 Analyze how peers, culture, and media can influence decisions students make about health practices and risk behaviors (e.g., time, fiscal, etc.). SEXUALITY, ATOD, ME

Cross-Disciplinary Connections

ISTE

1c Empowered Learner
3a,b,c,d Knowledge Constructor
5b Computational Thinker

Computer Science

2-DA-08 Collect data using computational tools and transform the data to make it more useful and

☑ **Computational Thinking**
☐ **Financial Literacy**

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7th

Wyoming 2018 Mathematics Content and Performance Standards

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Statistics and Probability

7.SP.H Draw informal comparative inferences about two populations.

Mathematical Practices

7.SP.H.3
Visually compare the centers, spreads, and overlap of two displays of data (e.g., back-to-back stem and leaf plots, dot plots, histograms, box plots) that are graphed on the same scale and draw inferences about this data.

Modeling

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MP.5 Use appropriate tools strategically.
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MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

https://drive.google.com/drive/folders/0B4tmm987k4xER0EwMTcya3hfaW8

Wyoming Cross-Disciplinary Connections

Science

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MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
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Cross-Disciplinary Connections

ISTE

1c Empowered Learner
3b,d Knowledge Constructor
5b Computational Thinker

Computer Science

2-DA-07 Represent data using multiple encoding schemes.
2-DA-09 Refine computational models based on the data they have generated.

☑ **Computational Thinking**
☐ **Financial Literacy**

7th

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

7.SP.H Draw informal comparative inferences about two populations.	Mathematical Practices
7.SP.H.4 Given measures of center and variability (mean, median and/or mode; range, interquartile range, and/or standard deviation), for numerical data from random samples, draw appropriate informal comparative inferences about two populations.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Decide whether the words in a chapter of a seventh-grade science book are generally longer than the

Wyoming Cross-Disciplinary Connections

Science

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Cross-Disciplinary Connections

ISTE

1c Empowered Learner
3b,d Knowledge Constructor
5b Computational Thinker

Computer Science

2-DA-07 Represent data using multiple encoding schemes.
2-DA-09 Refine computational models based on the data they have generated.

☑ Computational Thinking
☐ Financial Literacy

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7th

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

7.SP.I Investigate chance processes and develop, use, and evaluate probability models.	Mathematical Practices
7.SP.I.5 Find and interpret the probability of a random event. Understand that the probability of a random event is a number between, and including, 0 and 1 that expresses the likelihood of the event occurring.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Science

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Cross-Disciplinary Connections

ISTE

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- ☐ **Computational Thinking**
- ☐ **Financial Literacy**

DRAFT

7th

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

7.SP.I Investigate chance processes and develop, use, and evaluate probability models.	Mathematical Practices
7.SP.I.6 Collect multiple samples to compare the relationship between theoretical and experimental probabilities for simple events.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: When rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.

Wyoming Cross-Disciplinary Connections

Science

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Cross-Disciplinary Connections

ISTE

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2-DA-08 Collect data using computational tools and transform the data to make it more useful and reliable.

☑ **Computational Thinking**
☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

7th

Statistics and Probability

7.SP.I Investigate chance processes and develop, use, and evaluate probability models.	Mathematical Practices
7.SP.I.7 Apply the concepts of theoretical and experimental probabilities for simple events. A. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. B. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. C. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancies.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Example: If a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.

Example: Find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

Wyoming Cross-Disciplinary Connections

Science

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Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

DRAFT

7th

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

7.SP.I Investigate chance processes and develop, use, and evaluate probability models.

7.SP.I.8 Find probabilities of compound events using organized lists, tables, and tree diagrams.

A. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

B. Represent sample spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

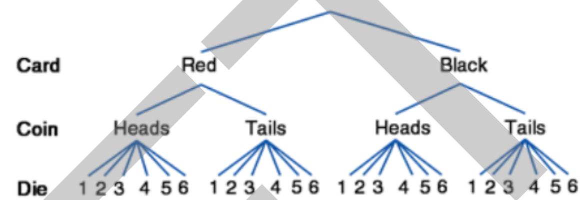
MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

Example:



Source: https://www.shmoop.com/basic-statistics-probability/compound-events-exercises.html

Wyoming Cross-Disciplinary Connections

Science

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Cross-Disciplinary Connections

ISTE

1c Empowered Learner

Computer Science

☐ **Computational Thinking**

☐ **Financial Literacy**

Modeling

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Grade 7 Resources

Standard/Page Number	Resource/Link/Example(s)
7.RP.A.2 on page 204.	https://www.engageny.org/resource/released-2017-3-8-ela-and-mathematics-state-test-questions
Grade Level Math Practices on page 202.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Mathematics | Grade 8

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

(1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m·A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

(2) Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

(3) Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students continue their work on volume by solving problems involving cylinders .

Standards for Mathematical Practice at Grade Level

1. Make sense of problems and persevere in solving them.
In grade 8, students solve real world problems through the application of algebraic and geometric concepts and discuss (verbally or in writing) how they solve them. Students analyze the problem (including what is given, not given, and what is being asked), identify what strategies are needed, choose the most efficient pathway, then make an initial attempt to solve the problem. Students analyze the result for validity and refine strategies if necessary.

2. Reason abstractly and quantitatively.
Students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. Construct viable arguments and critique the reasoning of others.
Students construct arguments using verbal or written explanations that involve solving problems with real numbers. They make conjectures, explore validity, reason mathematically, justify, evaluate their own thinking and analytically critique the reasoning of other students.

4. Model with mathematics.
Students can clearly show their work by using diagrams, words, symbols or pictures. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results of problems involving real numbers in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.
Students consider available tools (including estimation, concrete models, and technology as appropriate), and decide when certain tools might be helpful. Students can interpret results provided by technology. They choose the representation (table, graph, equation, words) that best suits the problem. Students use concrete models to develop insight into linear equations and other concepts. Students then extend this insight to more abstract representations, including pictures and symbols. Students understand the limitations of each tool. Tools might include: integer tiles, algebra tiles, geometric nets, number lines, graphing technology, scientific calculator, paper and pencil, and others.

6. Attend to precision.
Students continue to refine their mathematical communication skills by using clear and precise mathematical language in their discussions with others and in their own reasoning. Students define variables, including their relationship, specify units of measure, and label each axis accurately. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays. Students use appropriate symbols, labels, and units of measure when solving problems with calculations that are accurate and efficient. Answer to the problem matches what was asked in the problem.

7. Look for and make use of structure.
Students routinely seek patterns or structure to model and solve problems. They apply properties to solve problems based upon patterns they have identified. Students examine patterns to generate equations and describe relationships. Students simplify complicated expressions into simple terms. Students recognize the effects of transformations and describe them in terms of congruence and similarity.

8. Look for and express regularity in repeated reasoning.
Students use repeated reasoning to understand algorithms and make generalizations about patterns. They develop efficient strategies for solving problems and check for reasonableness of answers. Students ask questions such as, "What evidence supports that conclusion?"

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

8.NS.A Know that there are numbers that are not rational, and approximate them by rational numbers.

8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. Explore the real number system and its appropriate usage in real-world situations.

A. Make comparisons between rational and irrational numbers.
B. Understand that all real numbers have a decimal expansion.
C. Model the hierarchy of the real number system, including natural, whole, integer, rational, and irrational numbers.
D. Convert repeating decimals to fractions.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: 2.3 is a decimal that terminates and is less than 2 and 1/3, which is a decimal that repeats and both are greater than the square root ($\sqrt{5}$) which is a decimal that neither repeats nor terminates:

$\sqrt{5}$ <2.3<2 1/3

Example: Converting a repeating decimal to a fraction:

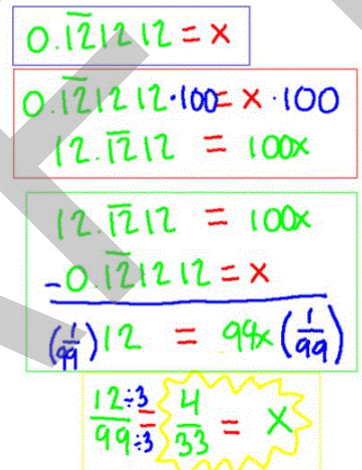
•Set your repeating decimal equal to x

•Start with your repeating decimal and **multiply both sides** by $10^{\text{factor length}}$.

- In the example to the right 12 repeats itself so we have a factor length of 2 since 12 has 2 units in it and we multiply by 10^2 =100.

•Now we can subtract the two equations to **eliminate the repeating portion** of the decimal.

•Solve for x and simplify the fraction!



Source: https://www.google.com/url sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwis5NmezaDXAhUr9IMKHT4GBfwQjRwIBw&url=http%3A%2F%2Fwww.showme.com%2Fsearch%2F%3Fq%3Drepeating%2520and%2520terminating%2520decimals&psig=AOvVaw2r8oaaVjrxqQRyNy8uP2IM&ust=1509736515940671

Wyoming Cross-Disciplinary Connections

Science	ELA	Social Studies
MS-PS4-3 Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	**L.8.5.b** Use the relationship between particular words to better understand each of the words.	**SS8.4.2** Describe how tools and technology in different historical periods impacted the way people lived, made decisions, and saw the world.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

The Number System

8.NS.A Know that there are numbers that are not rational, and approximate them by rational numbers.

Mathematical Practices

8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Estimating a Square Root

Estimate $\sqrt{27}$ to the nearest tenth.

$\sqrt{25} < \sqrt{27} < \sqrt{36}$ *Find the two perfect squares that 27 lies between.*

$5 < \sqrt{27} < 6$ *Find the two integers that lies between $\sqrt{27}$.*

Because 27 is closer to 25 than to 36, $\sqrt{27}$ is close to 5 than to 6.

Try 5.2: $5.2^2 = 27.04$ *Too high, try 5.1.*

$5.1^2 = 26.01$ *Too low*

Because 27 is closer to 27.04 than 26.01, $\sqrt{27}$ is closer to 5.2 than to 5.1.

Check On a calculator $\sqrt{27} \approx 5.1961524 \approx 5.2$ rounded to the nearest tenth. ✓

Source: https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwibqsn5zaDXAhUl0oMKHf1BBnwQjRwIBw&url=http%3A%2F%2Fslideplayer.com%2Fslide%2F7819310%2F&psig=AOvVaw1gMwKqVtUDB4pG0_-797EC&ust=1509736758310295

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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8th

Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

8.EE.B Work with radicals and integer exponents.	Mathematical Practices
8.EE.B.1 Understand and apply the laws of exponents (i.e. product rule, quotient rule, power to a power, product to a power, quotient to a power, zero power property, negative exponents) to generate equivalent numerical expressions limited to integer exponents.	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Example: $3^2 x\ 3^{-5} = 3^{-3} = 1/(3^{-3}) = 1/27$

Example:

Law	Example
$x^1 = x$	$6^1 = 6$
$x^0 = 1$	$7^0 = 1$
$x^{-1} = 1/x$	$4^{-1} = 1/4$
$x^m x^n = x^{m+n}$	$x^2 x^3 = x^{2+3} = x^5$
$x^m/x^n = x^{m-n}$	$x^6/x^2 = x^{6-2} = x^4$
$(x^m)^n = x^{mn}$	$(x^2)^3 = x^{2\times3} = x^6$
$(xy)^n = x^n y^n$	$(xy)^3 = x^3 y^3$
$(x/y)^n = x^n/y^n$	$(x/y)^2 = x^2 / y^2$
$x^{-n} = 1/x^n$	$x^{-3} = 1/x^3$

Wyoming Cross-Disciplinary Connections

Science

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

8.EE.B Work with radicals and integer exponents.	Mathematical Practices	Example
8.EE.B.2 Investigate concepts of square and cube roots. A. Use radical notation, if applicable, to represent the exact solutions to equations of the form $x^2 = p$ and $x^3 = q$ where p is a positive rational number and q is any rational number. B. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. C. Recognize that square roots of non-perfect squares and the cube roots of non-perfect cubes are irrational. Assessment Boundary: Include perfect squares up to 144 and perfect cubes up to 125.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**	**Examples:** • $3^2 = 9$ and $\sqrt{9} = \pm 3$ • $\left(\frac{1}{3}\right)^3 = \left(\frac{1^3}{3^3}\right) = \frac{1}{27}$ and $\sqrt[3]{\frac{1}{27}} = \frac{\sqrt[3]{1}}{\sqrt[3]{27}} = \frac{1}{3}$ • Solve $x^2 = 9$ • Solution: $x^2 = 9$ • $\sqrt{x^2} = \pm\sqrt{9}$ • $x = \pm 3$ • Solve $x^3 = 8$ • Solution: $x^3 = 8$ • $\sqrt[3]{x^3} = \sqrt[3]{8}$ • $x = 2$ Source: https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566

Wyoming Cross-Disciplinary Connections

Science

MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-ESS1-2 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

8.EE.B Work with radicals and integer exponents.	Mathematical Practices
8.EE.B.3 Explore the relationship between quantities in decimal and scientific notation. A. Express very large and very small quantities, p, in scientific notation in the form $a \times 10^{b} = p$ where $1 \leq a < 10$ and b is an integer. B. Translate between decimal notation and scientific notation. C. Estimate and compare the relative size of two quantities in scientific notation.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Example: Estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9, and determine that the world population is more than 20 times larger.

Example: $9.296 \times 10^{7} = 92{,}960{,}000$ $7.03 \times 10^{-6} = 0.00000703$

Wyoming Cross-Disciplinary Connections

Science

MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

MS-ESS1-4 Construct a scientific explanation based on evidence from rocks and rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ESS3-4 Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

8.EE.B Work with radicals and integer exponents.

8.EE.B.4 Apply the concepts of decimal and scientific notation to real-world and mathematical problems.

A. Select appropriate units of measure when representing answers in scientific notation.

B. Interpret scientific notation that has been generated by a variety of technologies.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Modeling

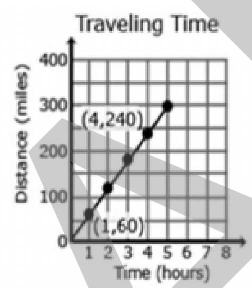
Example

Using graphs of experiences that are familiar to students increases accessibility and supports understanding and interpretation of proportional relationship. Students are expected to both sketch and interpret graphs.

Example:

- Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation.

Scenario 1:



Scenario 2:

$y = 50x$

x is time in hours

y is distance in miles

Source: https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566

Example: When measuring long distances, such as, between planets, use miles rather than inches. A larger unit of measure is more appropriate.

Wyoming Cross-Disciplinary Connections

Science

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.
evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
MS-ESS3-4 Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

Wyoming 2018 Mathematics Content and Performance Standards

8th

Expressions and Equations

8.EE.C Understand the connections between proportional relationships, lines, and linear equations.	Mathematical Practices
8.EE.C.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

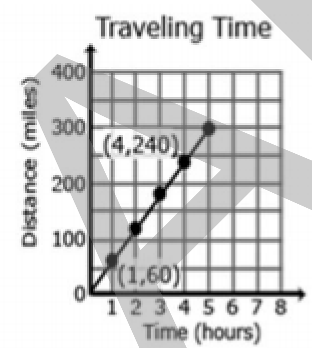
Example

Using graphs of experiences that are familiar to students increases accessibility and supports understanding and interpretation of proportional relationship. Students are expected to both sketch and interpret graphs.

Example:

- Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation.

Scenario 1:



Scenario 2:

$y = 50x$

x is time in hours

y is distance in miles

Source: https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566

Wyoming Cross-Disciplinary Connections

Science

MS-ESS3-4 Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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8th

Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations	8.EE.C Understand the connections between proportional relationships, lines, and linear equations.	Mathematical Practices
	8.EE.C.6 Explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y =mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at (0,b).	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

Wyoming Cross-Disciplinary Connections

Science

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**2-AP-14** Create procedures with parameters to organize code and make it easier to reuse.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

8th

Expressions and Equations

8.EE.D Analyze and solve linear equations and pairs of simultaneous linear equations.	Mathematical Practices
8.EE.D.7 Extend concepts of linear equations and inequalities in one variable to more complex multi-step equations and inequalities in real-world and mathematical situations. A. Solve linear equations and inequalities with rational number coefficients that include the use of the distributive property, combining like terms, and variable terms on both sides. B. Recognize the three types of solutions to linear equations: one solution, infinitely many solutions, or no solutions. C. Generate linear equations with the three types of solutions. D. Justify why linear equations have a specific type of solution.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Example: One solution: only one value of x will make it true; No solution: there is no value of x that could ever make the equation true; Infinite solutions: there are infinite values of x that can make the equation true

Wyoming Cross-Disciplinary Connections

Science

MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

MS-PS4-1 Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.

MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ESS3-4 Construct an argument supported by evidence for how changes in human population and per-capita

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **5a** Computational Thinker	**2-AP-10** Use flowcharts and/or pseudocode to address complex problems as algorithms.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Expressions and Equations

8.EE.D Analyze and solve linear equations and pairs of simultaneous linear equations.	Mathematical Practices
8.EE.D.8 Analyze and solve pairs of simultaneous linear equations. A. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. B. Solve systems of two linear equations in two variables with integer solutions by graphing the equations. C. Solve simple real-world and mathematical problems leading to two linear equations in two variables given y = mx + b form with integer solutions.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5** Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Example

Example: 3x+2y=5 and 3x+2y=6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.

Example: Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Wyoming Cross-Disciplinary Connections

Science	Social Studies
MS-LS1-2 Develop and use models to describe the parts, functions, and basic processes of cells. **MS-LS2-3** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. **MS-LS2-4** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **MS-LS2-5** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. **MS-ESS3-1** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result	**SS8.3.1** Identify and apply basic economic concepts (e.g., supply, demand, production, exchange and consumption, labor, wages, scarcity, prices, incentives, competition, and profits).

Cross-Disciplinary Connections

ISTE	Computer Science	
1c,d Empowered Learner **5a** Computational Thinker	**2-AP-10** Use flowcharts and/or pseudocode to address complex problems as algorithms.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Functions

8.F.E Define, evaluate, and compare functions.	Mathematical Practices
8.F.E.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: A person's distance ran in a direction is a direct result of the (constant) speed they've run and the time they've spent running.

Wyoming Cross-Disciplinary Connections

CVE

CVE8.3.1 Career-aware students identify real-world problems and efficiently locate & effectively use various sources of information for informed decision making.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Functions

8.F.E Define, evaluate, and compare functions.	Mathematical Practices
8.F.E.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

Wyoming Cross-Disciplinary Connections

CVE

CVE8.3.1 Career-aware students identify real-world problems and efficiently locate & effectively use various sources of information for informed decision making.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

8th

Functions

8.F.E Define, evaluate, and compare functions.	Mathematical Practices
8.F.E.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.	MP.1 Make sense of problems and persevere in solving them. **MP.2** **Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** **Model with mathematics.** **MP.5** **Use appropriate tools strategically.** **MP.6** **Attend to precision.** **MP.7** **Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Example: The function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

Wyoming Cross-Disciplinary Connections

Science	FPA
MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. **MS-PS3-5** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. **MS-PS4-1** Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.	**FPA8.4.M.2** Students describe ways in which other disciplines are interrelated with music.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

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Functions

8.F.F Use functions to model relationships between quantities.

8.F.F.4 Apply the concepts of linear functions to real-world and mathematical situations.

A. Understand that the slope is the constant rate of change and the *y*-intercept is the point where *x* = 0.
B. Determine the slope and the *y*-intercept of a linear function given multiple representations, including two points, tables, graphs, equations, and verbal descriptions.
C. Construct a function in slope-intercept form that models a linear relationship between two quantities.
D. Interpret the meaning of the slope and the *y*-intercept of a linear function in the context of the situation.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: For the function y = 3x - 5; slope = 3, as an increase of one unit in x will cause a 3 unit increase in y; y-intercept = -5, as 3*0-5 = -5.

Example: For the points (2,6) and (1,2): slope = (change in y)/(change in x) = (6-2)/(2-1) = 4. We can find the y-intercept using point-slope form: y-2=4(x-1) => y=4x-2, so the y-intercept is -2.

Example: A driver's distance from home (y) as a function of time driven (x): starting the day 1000 miles from home and driving towards it at 75 miles per hour. y= -75x +1000.

Example: A car mechanic's pay (y) is a function of the number of repairs she does in a day (x); y=2x+5. Here, the slope of 2 represents her increase in pay for each hour worked. The y-intercept 5 represents how much money she will make having repaired 0 cars.

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-2 Develop and use models to describe the parts, functions, and basic processes of cells.
MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

CVE

CVE8.3.1 Career-aware students identify real-world problems and efficiently locate & effectively use various sources of information for informed decision making.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner
5a Computational Thinker

Computer Science

2-DA-08 Collect data using computational tools and transform the data to make it more useful and reliable.
2-AP-10 Use flowcharts and/or pseudocode to

☑ **Computational Thinking**
☐ **Financial Literacy**

Wyoming 2018 Mathematics Content and Performance Standards

Functions

8.F.F Use functions to model relationships between quantities.	Mathematical Practices
8.F.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph where the function is increasing, decreasing, constant, linear, or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

ELA

RI.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

W.8.2.b Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

W.8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**2-DA-08** Collect data using computational tools and transform the data to make it more useful and reliable.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry	8.G.G Understand congruence and similarity using physical models, transparencies, or geometry software.	Mathematical Practices
	8.G.G.1 Verify experimentally the properties of rotations, reflections, and translations. A. Lines are taken to lines, and line segments to line segments of the same length. B. Angles are taken to angles of the same measure. C. Parallel lines are taken to parallel lines.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Example

Wyoming Cross-Disciplinary Connections

Science

MS-PS3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c,d Empowered Learner	**2AP-14** Create procedures with parameters to organize code and make it easier to reuse.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

8th

Geometry

8.G.G Understand congruence and similarity using physical models, transparencies, or geometry software.	Mathematical Practices
8.G.G.2 Recognize through visual comparison that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Science

MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c,d Empowered Learner	**2AP-14** Create procedures with parameters to organize code and make it easier to reuse.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry	8.G.G Understand congruence and similarity using physical models, transparencies, or geometry software.	Mathematical Practices
	8.G.G.3 Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	8.G.G Understand congruence and similarity using physical models, transparencies, or geometry software.	Mathematical Practices
	8.G.G.4 Recognize through visual comparison that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry	8.G.G Understand congruence and similarity using physical models, transparencies, or geometry software.	Mathematical Practices
	8.G.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Example: Arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry	8.G.H Understand and apply the Pythagorean Theorem.	Mathematical Practices	Example
	8.G.H.6 Use models or diagrams to explain the Pythagorean Theorem and its converse.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

8th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	8.G.H Understand and apply the Pythagorean Theorem.	Mathematical Practices	Example
	8.G.H.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Modeling

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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8th

Wyoming 2018 Mathematics Content and Performance Standards

Geometry	8.G.H Understand and apply the Pythagorean Theorem.	Mathematical Practices	Example
	8.G.H.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

8.G.I Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.	Mathematical Practices
8.G.I.9 Given the formulas, solve real-world and mathematical problems involving volume and surface area of cylinders.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

DRAFT

8th

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

8.SP.J Investigate patterns of association in bivariate data.

8.SP.J.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe the association by form (linear / nonlinear), direction (positive / negative), strength (correlation), and unusual features.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: shown on resource page.

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ETS2-2 Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual property rights might constrain future development.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4 Develop a model for a proposed object, tool or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design.

ELA

RI.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
W.8.2.b Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Social Studies

SS8.6.3 Use digital tools to research, design, and present social studies concepts (e.g., understand how individual responsibility applies in usage of digital media). https://www.iste.org/standards/nets-for-student

PE

PE8.2.5 Students explain valid characteristics of fitness-related products, technology, and resources related to fitness literacy.

CVE

CV8.3.3 Career-aware students demonstrate an ability to explain and interpret solutions to problems using data and information compiled from a variety of reputable sources.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner
3b,c,d Knowledge Constructor
4a Innovative Designer
6a,c,d Creative Communicator

Computer Science

2-DA-07 Represent data using multiple encoding schemes.
2-DA-09 Refine computational models based on the data they have

- [x] **Computational Thinking**
- [ ] **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

8th

Statistics and Probability

8.SP.J Investigate patterns of association in bivariate data.

8.SP.J.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Example: shown on resource page.

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ETS2-2 Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual property rights might constrain future development.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4 Develop a model for a proposed object, tool or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design.

ELA

RI.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
W.8.2.b Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **6a,c,d** Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

8th

Statistics and Probability

8.SP.J Investigate patterns of association in bivariate data.

8.SP.J.3 Use an equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Modeling

Example

Example: In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an predicted additional 1.5 cm in mature plant height.

Wyoming Cross-Disciplinary Connections

Science

MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ETS2-2 Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual property rights might constrain future development.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ETS1-4 Develop a model for a proposed object, tool or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design.

ELA

RI.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
W.8.2.b Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner
3b,c,d Knowledge Constructor
4a Innovative Designer
5a Computational Thinker

Computer Science

2-AP-10 Use flowcharts and/or pseudocode to address complex problems as algorithms.

☑ **Computational Thinking**
☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

8th

Statistics and Probability

8.SP.J Investigate patterns of association in bivariate data.

8.SP.J.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.

A. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects.

B. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

Source: https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566 Folder

Wyoming Cross-Disciplinary Connections

Science

MS-PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population affects individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ETS2-2 Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual property rights might constrain future development.
MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4 Develop a model for a proposed object, tool or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design.

ELA

RI.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
W.8.2.b Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

CVE

CV8.3.3 Career-aware students demonstrate an ability to explain and interpret solutions to problems using data and information compiled from a variety of reputable sources.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner
3b,c,d Knowledge Constructor
4a Innovative Designer
6a,c,d Creative Communicator

Computer Science

☐ **Computational Thinking**

☐ **Financial Literacy**

DRAFT

Grade 8 Resources

Standard/Page Number	Resource/Link/Example(s)
Grade Level Math Practices on page 228.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010
8.NS.A.1 on page 229.	**Example:** 2/3 can be rewritten as 0.666 repeating (use proper symbology)
8.NS.A.1D on page 229.	https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwis5NmezaDXAhUr9IMKHT4GBfwQjRwIBw&url=http%3A%2F%2Fwww.showme.com%2Fsearch%2F%3Fq%3Drepeating%2520and%2520terminating%2520decimals&psig=AOvVaw2r8oaaVjrxqQRyNy8uP2IM&ust=1509736515940671
8.NS.A.2 on page 230.	https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwibqsn5zaDXAhUl0oMKHf1BBnwQjRwIBw&url=http%3A%2F%2Fslideplayer.com%2Fslide%2F7819310%2F&psig=AOvVaw1gMwKqVtUDB4pG0_-797EC&ust=1509736758310295
8.EE.B.2 on page 232.	https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566 https://drive.google.com/open?id=1FgyXWYxIMi9LzN1joq2uNDyyTNER_ecb1Sl0Goo_UWQ https://drive.google.com/open?id=1bw-ft1r0iAfXqDuo8HxBYqejgXnlxQD5hQZrVfXmsbE
8.EE.B.4 on page 234.	https://www.montereyinstitute.org/courses/DevelopmentalMath/TEXTGROUP-9-14_RESOURCE/U11_L1_T4_text_final.html https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566
8.EE.C.5 on page 235.	https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566
8.EE.D.7 on page 237.	http://www.montereyinstitute.org/courses/DevelopmentalMath/COURSE_TEXT2_RESOURCE/U10_L1_T2_text_final.html http://www.charleston.k12.il.us/cms/Teachers/math/PreAlgebra/paunit5/L5-4.PDF

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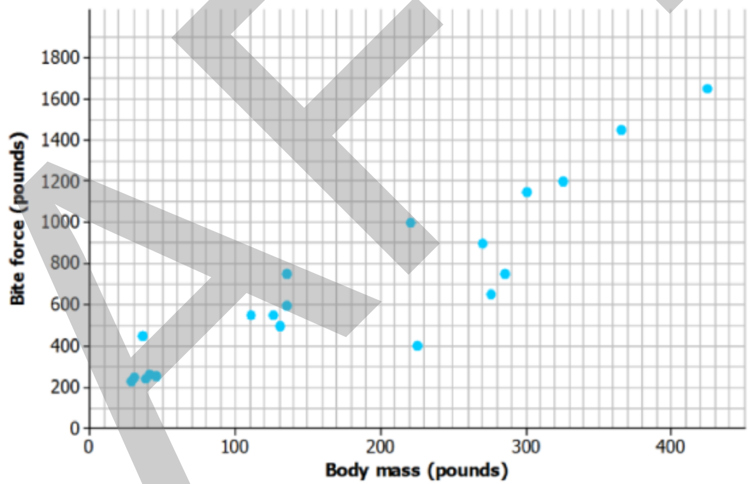
Grade 8 Resources

Standard/Page Number	Resource/Link/Example(s)
8.SP.J.1 on page 252.	https://www.engageny.org/  4. Do you think that there is a statistical relationship between body mass and bite force? If so, describe the nature of the relationship. *Sample response: Yes, because it looks like there is an upward pattern in the scatter plot. It appears that alligators with larger body mass also tend to have greater bite force.* 5. Based on the scatter plot, can you conclude that increased body mass causes increased bite force? Explain. *Sample response: No. Just because there is a statistical relationship between body mass and bite force does not mean that there is a cause-and-effect relationship.*

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Grade 8 Resources

Standard/Page Number	Resource/Link/Example(s)

8.SP.J.2 on page 253.

https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566

The capacity of the fuel tank in a car is 13.5 gallons. The table below shows the number of miles traveled and how many gallons of gas have been used. Describe the relationship between the variables. If the data is linear, determine a line of best fit. Do you think the line represents a good fit for the data set? Why or why not? What is the average fuel efficiency of the car in miles per gallon?

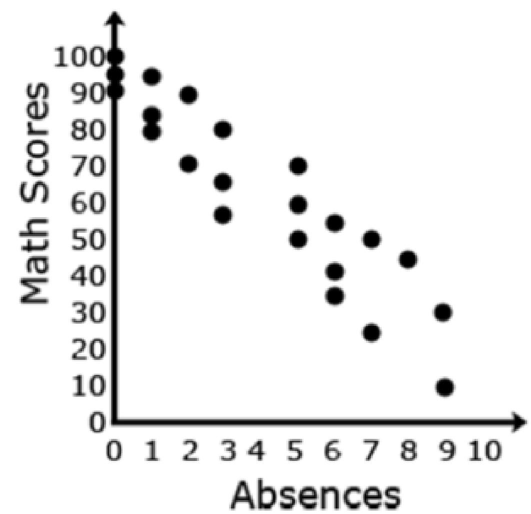
Miles Traveled	0	75	120	160	250	300
Gallons Used	0	2.3	4.5	5.7	9.7	10.7

8.SP.J.3 on page 254.

https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566

Given data from students' math scores and absences, make a scatterplot.

Absences	Math Scores
3	65
5	50
1	95
1	85
3	80
6	34
5	70
3	56
0	100
7	24
8	45
2	71
9	30
0	95
6	55
6	42
2	90
0	92
5	60
7	50
9	10
1	80



DRAFT

Grade 8 Resources

Standard/Page Number	Resource/Link/Example(s)
8.SP.J.4 on page 255.	https://cms.azed.gov/home/GetDocumentFile?id=555281e1aadebe0f94591566 The table illustrates the results when 100 students were asked the survey questions: “Do you have a curfew?” and “Do you have assigned chores?” Is there evidence that those who have a curfew also tend to have chores? Solution: Of the students who answered that they had a curfew, 40 had chores and 10 did not. Of the students who answered they did not have a curfew, 10 had chores and 40 did not. From this sample, there appears to be a positive correlation between having a curfew and having chores.

Curfew

Chores		Yes	No
	Yes	40	10
	No	10	40

DRAFT

High School Standards for Mathematical Practices

1. Make sense of problems and persevere in solving them.
Students start to examine problems by explaining to themselves the meaning of a problem and restating the problem in their own words. These students analyze the given information in the problem, including constraints, relationships, and goals. Students make conjectures about the form and meaning of the solution, devise a plan, and solve. They will consider both similar problems, and simpler forms of the original problem, in order to gain insight and efficiency in problem solving. Students monitor and evaluate their progress and change course if necessary. Students may utilize algebraic methods or technology. Students explain relationships between equations and the following: descriptions/situations, tables, and graphs. Students produce diagrams of important features and relationships, graph data, and search for patterns or trends. They check answers to problems and continually ask if the solution makes sense in context. They understand different approaches to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.
Students seek to make sense of quantities and explore relationships in problem situations. Students represent a given situation by defining and manipulating variables. Students consider the units involved and attend to the meaning of quantities in addition to computational reasoning -- knowing and using the different properties of operations.

3. Construct viable arguments and critique the reasoning of others.
Students understand and use stated assumptions, definitions, and previously established results in constructing arguments. Students make conjectures and build logical progressions of statements to explore the truth of their conjectures. They are able to analyze situations through decomposition and produce counterexample(s) if necessary. Students justify their conclusions, communicate these conclusions, and respond to arguments of others. Students make plausible arguments by reasoning inductively about the data and take into account the context from which the data arose. Students are able to compare the effectiveness of two plausible arguments, and distinguish correct logic from flawed logic. If there is a flaw in an argument, then they explain why the logic is flawed. Students determine a general process and/or domain to which an argument applies. The students listen or read the arguments of others, decide whether the argument makes sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics.
Students apply their mathematical knowledge to solve problems arising in everyday life, society, and the workplace. Students may use geometry to solve a design problem or they may use a function to describe how one quantity of interest depends on another. Students may use assumptions and approximations to simplify a complicated situation and realize these may need revision later. Students identify important relationships between quantities in a practical situation and map these relationships using tools such as: diagrams, two-way tables, graphs, flowcharts, and formulas. Students analyze those relationships mathematically to draw conclusions and interpret the results in the context of the situation. Students are reflective of the results and may improve the model if it has not served the purpose.

5. Use appropriate tools strategically.
Students consider appropriate tools when solving a mathematical problem, including but not limited to: a) pencil and paper, b) concrete models, c) ruler, d) protractor, e) calculator, f) spreadsheet, and g) analytical software applications. Students familiar with mathematical tools make sound decisions about when each of these tools may be helpful and recognize both the insight to be gained and the limitations of the tool. Students may use a graphing calculator to analyze graphs of functions knowing that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Students may identify relevant external mathematical resources, such as digital content located on a website, and use those resources to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.
Students communicate using mathematically correct definitions in their own reasoning and in discussions with others. They state the meaning of symbols they choose, specify units of measure, and label axes in order to clarify the correspondence with quantities in a problem. Students accurately and efficiently calculate. They express numerical answers with the degree of precision appropriate for the problem context.

7. Look for and make use of structure.
Students look closely to discern a pattern or structure and holistically consider the overview. Students may shift perspectives if needed to gain understanding of the pattern or structure. Students in algebra may use patterns to create equivalent expressions, factor and solve equations, compose functions, and transform figures. They may consider certain algebraic expressions as single objects or as being composed of several objects. Students in geometry recognize the significance of an existing line in a geometric figure and may use the strategy of drawing an auxiliary line for solving problems

8. Look for and express regularity in repeated reasoning.
Students notice repeated calculations, look for general expressions to annotate the calculation, and consider potential shortcuts. Students maintain oversight of a process as they work to solve problems, derive formulas, or make generalizations, while attending to details. They assess the reasonableness of their intermediate results.

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Numbers and Number Systems. During the years from kindergarten to eighth grade, students must repeatedly extend their conception of number. At first, "number" means "counting number": 1, 2, 3... Soon after that, 0 is used to represent "none" and the whole numbers are formed by the counting numbers together with zero. The next extension is fractions. At first, fractions are barely numbers and tied strongly to pictorial representations. Yet by the time students understand division of fractions, they have a strong concept of fractions as numbers and have connected them, via their decimal representations, with the base-ten system used to represent the whole numbers. During middle school, fractions are augmented by negative fractions to form the rational numbers. In Grade 8, students extend this system once more, augmenting the rational numbers with the irrational numbers to form the real numbers. In high school, students will be exposed to yet another extension of number, when the real numbers are augmented by the imaginary numbers to form the complex numbers.

With each extension of number, the meanings of addition, subtraction, multiplication, and division are extended. In each new number system—integers, rational numbers, real numbers, and complex numbers—the four operations stay the same in two important ways: They have the commutative, associative, and distributive properties and their new meanings are consistent with their previous meanings.

Extending the properties of whole-number exponents leads to new and productive notation. For example, properties of whole-number exponents suggest that (5^1/3)^3 should be 5^(1/3)^3 = 5^1 = 5 and that 5^1/3 should be the cube root of 5.

Calculators, spreadsheets, and computer algebra systems can provide ways for students to become better acquainted with these new number systems and their notation. They can be used to generate data for numerical experiments, to help understand the workings of matrix, vector, and complex number algebra, and to experiment with non-integer exponents.

Quantities. In real world problems, the answers are usually not numbers but quantities: numbers with units, involving measurement. In their work in measurement up through Grade 8, students primarily measure commonly used attributes such as length, area, and volume. In high school, students encounter a wider variety of units in modeling, for example, acceleration, currency conversions, derived quantities such as person-hours and heating degree days, social science rates such as per-capita income, and rates in everyday life such as points scored per game or batting averages. They also encounter novel situations in which they themselves must conceive the attributes of interest. For example, to find a good measure of overall highway safety, they might propose measures such as accidents per year, accidents per year per driver, or accidents per vehicle-mile traveled. Such a conceptual process is sometimes called quantification. Quantification is important for science, as when surface area suddenly "stands out" as an important variable in evaporation. Quantification is also important for companies, which must conceptualize relevant attributes and create or choose suitable measures for them.

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
The Real Number System

N.RN.A Extend the properties of exponents to rational exponents.	Mathematical Practices
N.RN.A.1 Explain how the meaning of the definition of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: $5^{1/3}$ is defined to be the cube root of 5, in order for $[5^{1/3}]^3 = 5^{[1/3x3]}$ to hold so that $[5^{1/3}]^3$ equals 5.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
The Real Number System

N.RN.A Extend the properties of exponents to rational exponents.	Mathematical Practices
N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Examples:

- $\sqrt[3]{5^2} = 5^{\frac{2}{3}}$; $5^{\frac{2}{3}} = \sqrt[3]{5^2}$
- Rewrite using fractional exponents: $\sqrt[5]{16} = \sqrt[5]{2^4} = 2^{\frac{4}{5}}$
- Rewrite $\frac{\sqrt{x}}{x^2}$ in at least three alternate forms.

  Solution: $x^{-\frac{3}{2}} = \frac{1}{x^{\frac{3}{2}}} = \frac{1}{\sqrt{x^3}} = \frac{1}{x\sqrt{x}}$
- Rewrite $\sqrt[4]{2^{-4}}$ using only rational exponents.
- Rewrite $\sqrt[3]{x^3 + 3x^2 + 3x + 1}$ in simplest form.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
The Real Number System

N.RN.B Use properties of rational and irrational numbers.	Mathematical Practices
N.RN.B.3 Explain why the sum or product of rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Since every difference is a sum and every quotient is a product, this includes differences and quotients as well. Explaining why the four operations on rational numbers produce rational results can be a review of students understanding of fractions and negative numbers. Explaining why the sum of a rational number and an irrational number is irrational, or why the product is irrational, includes reasoning about the inverse relationship between addition and subtraction (or between multiplication and addition).

Example: Explain why the number 2π must be irrational, given that π is irrational. Answer: If 2π were rational, then half of 2π would also be rational, so π would have to be rational as well.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ **Computational Thinking** ☑ **Financial Literacy**

DRAFT

HS Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
Quantities

N.Q.C Reason quantitatively and use units to solve problems.	Mathematical Practices
N.Q.C.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. Modeling	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Two objects are moving at different rates. One is moving 12 feet per second and the other at 5 miles per hour. Which is moving faster? Answer: In one possible solution to compare speeds, students convert 12 feet per second to miles per hour.

(12 ft/sec)x(60sec/min)x(60min/hr)x(1mi/5280ft) equals approximately 8.182 miles per hour which is greater than 5 mph.

Graphical representations and data displays include, but are not limited to line graphs, circle graphs, histograms, multi-line graphs, scatterplots, and multi-bar graphs, utilizing appropriate scales for the axes.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer **5c** Computational Thinker		☑ Computational Thinking ☑ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
Quantities

N.Q.C Reason quantitatively and use units to solve problems.	Mathematical Practices	Example
N.Q.C.2 Define appropriate quantities for the purpose of descriptive modeling.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	**Example:** What quantities would be used to determine monthly income and expenses? **Example:** What quantities and measurements could be used to express the number of accidents in Wyoming? Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Modeling

Advanced Standards (+)/ STEM Pathway

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer **5a** Computational Thinker **6b** Creative Communicator		☑ **Computational Thinking** ☑ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
Quantities

N.Q.C Reason quantitatively and use units to solve problems.	Mathematical Practices	Example
N.Q.C.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Modeling	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	The margin of error and tolerance limit varies according to the measure, tool used, and context. **Example:** Determining the price of gas by estimating to the nearest cent is appropriate because you will not pay a fraction of a cent but the cost of gas is \$2.599/gallon. Adapted from: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer **5a** Computational Thinker **6b** Creative Communicator		☑ **Computational Thinking** ☑ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
The Complex Number System

N.CN.D Perform arithmetic operations with complex numbers.	Mathematical Practices
N.CN.D.1 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Complex numbers are made up of real and an imaginary numbers, a+b*i* , *a* and *b* are real numbers.

The imaginary number is *i.*

$i = \sqrt{-1}$ $\quad$ $i^2 = (\sqrt{-1})^2$

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
6c Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
The Complex Number System

N.CN.D Perform arithmetic operations with complex numbers.	Mathematical Practices
N.CN.D.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Simplify the following expression. Justify each step using the commutative, associative and distributive properties.

(3-2*i*)(-7+4*i*)

Solutions may vary: one solution follows:

(3-2*i*)(-7+4*i*)

3(-7+4*i*)-2*i*(-7+4*i*)	*Distributive Property*
-21+12*i*+14*i*-8i^2	*Distributive Property*
-21+(12*i*+14*i*)-8i^2	*Associative Property*
-21+*i*(12+14) -8i^2	*Distributive Property*
-21+26*i*-8i^2	*Computation*
-21+26*i*-8(-1)	i^2=-1
-21+26*i* +8	*Computation*
-21+8+26*i*	*Commutative Property*
-13+26*i*	*Computation*

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
The Complex Number System

N.CN.D Perform arithmetic operations with complex numbers.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
N.CN.D.3 Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
The Complex Number System

N.CN.E Represent complex numbers and their operations on the complex plane.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.CN.E.4 Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
The Complex Number System

N.CN.E Represent complex numbers and their operations on the complex plane.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.CN.E.5 Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, $(-1 + \sqrt{3}i)^3 = 8$ because $(-1 + \sqrt{3}i)$ has modulus 2 and argument 120°.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
The Complex Number System

N.CN.E Represent complex numbers and their operations on the complex plane.

Mathematical Practices

MP.1 **Make sense of problems and persevere in solving them.**
MP.2 **Reason abstractly and quantitatively.**
MP.3 **Construct viable arguments and critique the reasoning of others.**
MP.4 **Model with mathematics.**
MP.5 **Use appropriate tools strategically.**
MP.6 **Attend to precision.**
MP.7 **Look for and make use of structure.**
MP.8 **Look for and express regularity in repeated reasoning.**

Advanced Standards (+)/ STEM Pathway
N.CN.E.6 Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
The Complex Number System

N.CN.F Use complex numbers in polynomial identities and equations.	Mathematical Practices
N.CN.F.7 Solve quadratic equations with real coefficients that have complex solutions.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Within which number system can $x^2= -2$ be solved? Explain how you know.
Example: Solve $x^2+2x+2=0$ over the complex numbers.
Example: Find all solutions of $2x^2+5=2x$ and express them in the form *a+bi.*

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
6d Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
The Complex Number System

N.CN.F Use complex numbers in polynomial identities and equations.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.CN.F.8 Extend polynomial identities to the complex numbers. For example, rewrite $x^2 + 4$ as $(x + 2i)(x – 2i)$.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
The Complex Number System

N.CN.F Use complex numbers in polynomial identities and equations.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.CN.F.9 Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity

Vector and Matrix Quantities

N.VM.G Represent and model with vector quantities.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.VM.G.1 Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., **v** ,|**v**|, ||**v**||, v).

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Quantity
Vector and Matrix Quantities

N.VM.G Represent and model with vector quantities.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
N.VM.G.2 Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
Vector and Matrix Quantities

N.VM.G Represent and model with vector quantities.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.VM.G.3 Solve problems involving velocity and other quantities that can be represented by vectors.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
Vector and Matrix Quantities

N.VM.H Perform operations on vectors.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.VM.H.4 Add and subtract vectors.

A. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.

B. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.

C. Understand vector subtraction v – w as v + (–w), where (–w) is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Quantity
Vector and Matrix Quantities

N.VM.H Perform operations on vectors.

Mathematical Practices

MP.1 **Make sense of problems and persevere in solving them.**
MP.2 **Reason abstractly and quantitatively.**
MP.3 **Construct viable arguments and critique the reasoning of others.**
MP.4 **Model with mathematics.**
MP.5 **Use appropriate tools strategically.**
MP.6 **Attend to precision.**
MP.7 **Look for and make use of structure.**
MP.8 **Look for and express regularity in repeated reasoning.**

Advanced Standards (+)/ STEM Pathway

N.VM.H.5 Multiply a vector by a scalar.

A. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise.
B. Compute the magnitude of a scalar multiple c**v** using ||c**v**|| = |c|v. Compute the direction of c**v** knowing that when |c|v ≠ 0, the direction of c**v** is either along **v** (for c > 0) or against **v** (for c < 0).

Example

Example: $c(v_x, v_y) = (cv_1, cv_y)$

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Quantity
Vector and Matrix Quantities

N.VM.I Perform operations on matrices and use matrices in applications.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	**Example:** Represent payoffs or incidence relationships in a network.

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway
N.VM.I.6 Use matrices to represent and manipulate data.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Number and Quantity
Vector and Matrix Quantities

N.VM.I Perform operations on matrices and use matrices in applications.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
N.VM.I.7 Multiply matrices by scalars to produce new matrices .

Example

Example: When all of the payoffs in a game are doubled.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Quantity
Vector and Matrix Quantities

N.VM.I Perform operations on matrices and use matrices in applications.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway
N.VM.I.8 Add, subtract, and multiply matrices of appropriate dimensions.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
Vector and Matrix Quantities

N.VM.I Perform operations on matrices and use matrices in applications.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

N.VM.I.9 Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Quantity
Vector and Matrix Quantities

N.VM.I Perform operations on matrices and use matrices in applications.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

N.VM.I.10 Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Number and Quantity
Vector and Matrix Quantities

N.VM.I Perform operations on matrices and use matrices in applications.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

N.VM.I.11 Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Number and Quantity
Vector and Matrix Quantities

N.VM.I Perform operations on matrices and use matrices in applications.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

N.VM.I.12 Work with 2 X 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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HS - Number and Quantity Resources

Standard/Page Number	Resource/Link
N.RN.A.2 on page 264.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
N.RN.B.3 on page 265.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
N.Q.C.2 on page 266.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
N.Q.C.2 on page 267.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
N.Q.C.3 on page 268.	Adapted from: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
N.CN.D.2 on page 270.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
N.CN.F.7 on page 275.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
Grade Level Math Practices on page 261.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Mathematics | High School

Algebra

Expressions. An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the order of operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, p + 0.05p can be interpreted as the addition of a 5% tax to a price p. Rewriting p + 0.05p as 1.05p shows that adding a tax is the same as multiplying the price by a constant factor.

Algebraic manipulations are governed by the properties of operations and exponents, and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, p + 0.05p is the sum of the simpler expressions p and 0.05p. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure.

A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Equations and inequalities. An equation is a statement of equality between two expressions. Other than formulas, an equation with one or more variables seeks the value(s) of the variable that makes the expressions equal. The value(s) is the solution to the equation. An identity or formula, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.
An equation can often be solved by successively deducing from it one or more simpler equations. For example, one can add the same constant to both sides without changing the solutions, but squaring both sides might lead to extraneous solutions. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature and number of solutions.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of x + 1 = 0 is an integer, not a whole number; the solution of 2x + 1 = 0 is a rational number, not an integer; the solutions of x^2 – 2 = 0 are real numbers, not rational numbers; and the solutions of x^2 + 2 = 0 are complex numbers, not real numbers.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, A = ((b1+b2)/2)*h, can be solved for h using the same deductive process.
Inequalities can be solved by reasoning about the properties of inequality. Many, but not all, of the properties of equality continue to hold for inequalities and can be useful in solving them.

Connections to Functions and Modeling. Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Seeing Structure in Expressions

A.SSE.A Interpret the structure of expressions.	Mathematical Practices
A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context. **A.** Interpret parts of an expression, such as terms, factors, and coefficients. **B.** Interpret complicated expressions by viewing one or more of their parts as a single entity.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7** Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Example: Students should understand the vocabulary for the parts that make up the whole expression and be able to identify those parts and interpret their meaning in terms of a context.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

HS-PS2-4. Use mathematical representations to predict the gravitational and/or electrostatic forces between objects using Newton's Law of Gravitation and/or Coulomb's Law, respectively.

HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**3A-DA-12** Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ **Computational Thinking** ☐ **Financial Literacy**

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Seeing Structure in Expressions

A.SSE.A Interpret the structure of expressions.	Mathematical Practices
A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students should extract the greatest common factor (whether a constant, a variable, or a combination of each). If the remaining expression is quadratic, students should factor the expression further.

Example:

Factor:

$3x^3 + 9x^2 — 30x$

$3x(x^2 + 3x — 10)$

$3x(x — 2)(x + 5)$

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Seeing Structure in Expressions

A.SSE.B Write expressions in equivalent forms to solve problems.

A.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

A. Factor a quadratic expression to reveal the zeros of the function it defines.

B. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

C. Use the properties of exponents to transform expressions for exponential functions. Apply the concepts of decimal and scientific notation to solve real-world and mathematical problems.

   i. Multiply and divide numbers expressed in both decimal and scientific notation.

   ii. Add and subtract numbers in scientific notation with the same integer exponent.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students will use the properties of operations to create equivalent expressions.

Example: Express $2(x^2 – 2x – 3) – (x – 3)(x + 4)$ in factored form and use your answer to say for what values of x the expression is zero.

$2(x – 3)(x + 1) – (x – 3) (x + 4)$
$(x – 3)[2(x + 1) – (x + 4)$
$(x – 3) (2x + 2 – x – 4)$
$(x – 3) (x – 2)$
X = 2 or 3 when the expression's value is zero.

Example: Write the expression below as constant times a power of x and use your answer to decide whether the expression gets larger or smaller as x gets larger.

$(3x^4)(2x^3)^2/(x^2)^3$, $x \neq 0$ $(3x^4)(4x^6) / x^6$ is $12x^4$, which gets larger as *x* gets larger.

Example:
$2x^2 – 4x – 6$
$2(x^2 – 2x – 3)$
$2(x^2 – 2x + 1) – 3 – 1$
$2(x – 1)^2– 4$
The function has a minimum at (1, -4).

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-4. Use mathematical representations to predict the gravitational and/or electrostatic forces between objects using Newton's Law of Gravitation and/or Coulomb's Law, respectively.

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Cross-Disciplinary Connections

ISTE	Computer Science	
5c Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Seeing Structure in Expressions

A.SSE.B Write expressions in equivalent forms to solve problems.	Mathematical Practices
A.SSE.B.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Example: Calculate mortgage payments or saving for a vacation trip:

- In January, the Sanderlin family starts saving for a trip to Austria in August. The Sanderlin's expect their vacation to cost $5750. They start with $425. Each month they plan to deposit 25% more than the previous month. Will they have enough money for their trip?

Adapted from: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
5c Computational Thinker		☑ Computational Thinking ☑ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Arithmetic with Polynomials and Rational Expressions

A.APR.C Perform arithmetic operations on polynomials.	Mathematical Practices	Example
A.APR.C.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Arithmetic with Polynomials and Rational Expressions

A.APR.D Understand the relationship between zeros and factors of polynomials.

Mathematical Practices

A.APR.D.2 Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

The Remainder theorem says that if a polynomial p(x) is divided by x – a, then the remainder is the constant p(a). That is, p(x)=q(x)(x – a)+ p(a). So if p(a) = 0 then p(x) = q(x)(x-a).

Example: · Let p(x)= $x^5 - 3x^4 + 8x^2 - 9x + 30$. Evaluate p(-2).

What does your answer tell you about the factors of p(x)?

Answer: p(-2) = 0 so x+2 is a factor.

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Arithmetic with Polynomials and Rational Expressions

A.APR.D Understand the relationship between zeros and factors of polynomials.	Mathematical Practices
A.APR.D.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Arithmetic with Polynomials and Rational Expressions

A.APR.E Use polynomial identities to solve problems.	Mathematical Practices
A.APR.E.4 Prove polynomial identities and use them to describe numerical relationships.	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Arithmetic with Polynomials and Rational Expressions

A.APR.E Use polynomial identities to solve problems.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

A.APR.E.5 Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Arithmetic with Polynomials and Rational Expressions

A.APR.F Rewrite rational expressions.	Mathematical Practices	Example
A.APR.F.6 Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b (x) using inspection, long division, or, for the more complicated examples, a computer algebra system. (i.e. rewriting a rational expression as the quotient plus the remainder over divisor).	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	The polynomial $q(x)$ is called the quotient and the polynomial $r(x)$ is called the remainder. Expressing a rational expression in this form allows one to see different properties of the graph, such as horizontal asymptotes. **Examples:** • Find the quotient and remainder for the rational expression $\frac{x^3-3x^2+x-6}{x^2+2}$ and use them to write the expression in a different form. • Express $f(x)=\frac{2x+1}{x-1}$ in a form that reveals the horizontal asymptote of its graph. [Answer: $f(x)=\frac{2x+1}{x-1}=\frac{2(x-1)+3}{x-1}=2+\frac{3}{x-1}$, so the horizontal asymptote is $y = 2$.] Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS Wyoming 2018 Mathematics Content and Performance Standards

Algebra
Arithmetic with Polynomials and Rational Expressions

A.APR.F Rewrite rational expressions.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

A.APR.F.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Creating Equations

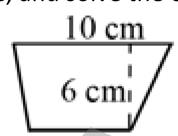
A.CED.G Create equations that describe numbers or relationships.	Mathematical Practices
A.CED.G.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Equations can represent real world and mathematical problems. Include equations and inequalities that arise when comparing the values of two different functions, such as one describing linear growth and one describing exponential growth.

Example: Given that the following trapezoid has area 54 cm², set up an equation to find the length of the base, and solve the equation.



Example: Lava coming from the eruption of a volcano follows a parabolic path. The height h in feet of a piece of lava t seconds after it is ejected from the volcano is given by $h(t) = -t^2 + 16t + 936$. After how many seconds does the lava reach its maximum height of 1000 feet?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

Cross-Disciplinary Connections

ISTE	Computer Science	
3d Knowledge Constructor **4d** Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra
Creating Equations

A.CED.G Create equations that describe numbers or relationships.	Mathematical Practices
A.CED.G.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. Modeling	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Wyoming Cross-Disciplinary Connections

Science

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

HS-ESS1-2 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

HS-ESS1-4 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Cross-Disciplinary Connections

ISTE	Computer Science	
3d Knowledge Constructor **4d** Innovative Designer **5c** Computational Thinker	**3A-DA-11** Create interactive data visualizations using software tools to help others better understand real-world phenomena.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra
Creating Equations

A.CED.G Create equations that describe numbers or relationships.	Mathematical Practices	Example
A.CED.G.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. Modeling	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	**Example:** A club is selling hats and jackets as a fundraiser. Their budget is $1500 and they want to order a least 250 items. They must buy at least as many hats as they buy jackets. Each hat costs $5 and each jacket costs $8. • Write a system of inequalities to represent the situation. • Graph the inequalities. • If the club buys 150 hats and 100 jackets, will the conditions be satisfied? • What is the maximum number of jackets they can buy and still meet the conditions? Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Advanced Standards (+)/ STEM Pathway

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer **5c** Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Algebra
Creating Equations

A.CED.G Create equations that describe numbers or relationships.

Mathematical Practices

A.CED.G.4
Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Modeling

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: The Pythagorean Theorem expresses the relation between the legs a and b of a right triangle and its hypotenuse c with the equation $a^2 + b^2 = c^2$.

- Why might the theorem need to be solved for c?
- Solve the equation for c and write a problem situation where this form of the equation might be useful.
- Solve $V = 4/3\pi r^3$ for radius r.

Example: Motion can be described by the formula below, where t = *time elapsed, u*=initial velocity, a = acceleration, and s = distance traveled $s = ut+½at^2$.

- Why might the equation need to be rewritten in terms of *a?*
- Rewrite the equation in terms of *a.*

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

HS-ESS1-2 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

HS-ESS1-4 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer		☑ **Computational Thinking**
5c Computational Thinker		☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Reasoning with Equations and Inequalities

A.REI.H Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.H.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Properties of operations can be used to change expressions on either side of the equation to equivalent expressions. In addition, adding the same term to both sides of an equation or multiplying both sides by a non-zero constant produces an equation with the same solutions. Other operations, such as squaring both sides, may produce equations that have extraneous solutions.

Example:
Explain why the equation $x/2 + 7/3 = 5$ has the same solutions as the equation $3x + 14 = 30$. Does this mean that $x/2 + 7/3$ is equal to $3x + 14$?

Example:
Show that $x = 2$ and $x = -3$ are solutions to the equation $x^2 + x = 6$. Write the equation in a form that shows these are the only solutions, explaining each step in your reasoning.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

CVE

CV12.44 College and career-ready students precisely follow a complex multistep procedure when performing technical tasks.

Cross-Disciplinary Connections

ISTE	Computer Science	
3d Knowledge Constructor		☑ **Computational Thinking**
4d Innovative Designer		☐ **Financial Literacy**
5c Computational Thinker		
6a,b,c,d Creative Communicator		

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Reasoning with Equations and Inequalities

A.REI.H Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.H.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Examples:

- $\sqrt{x+2}=5$
- $\frac{7}{8}\sqrt{2x-5}=21$
- $\frac{x+2}{x+3}=2$
- $\sqrt{3x-7}=-4$

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

CVE

CV12.44 College and career-ready students precisely follow a complex multistep procedure when performing technical tasks.

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Reasoning with Equations and Inequalities

A.REI.I Solve equations and inequalities in one variable.	Mathematical Practices
A.REI.I.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Advanced Standards (+)/ STEM Pathway

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
5a Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Reasoning with Equations and Inequalities

A.REI.I Solve equations and inequalities in one variable.

A.REI.I.4 Solve quadratic equations in one variable.

A. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions.

B. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

C. Derive the quadratic formula from the general form of a quadratic equation.

Example

Students should solve by factoring, completing the square, and using the quadratic formula. The zero product property is used to explain why the factors are set equal to zero. Students should relate the value of the discriminant to the type of root to expect. A natural extension would be to relate the type of solutions to $ax^2 + bx + c = 0$ to the behavior of the graph of $y = ax^2 + bx + c$.

Value of Discriminant	Nature of Roots	Nature of Graph
$b^2-4ac = 0$	1 real root	intersects x-axis once
$b^2-4ac > 0$	2 real roots	intersects x-axis twice
$b^2-4ac < 0$	2 complex roots	does not intersect x-axis

Examples: Are the roots of $2x^2 + 5 = 2x$ real or complex? How many roots does it have? Find all solutions of the equation.

Examples: What is the nature of the roots of $x^2 + 6x + 10 = 0$? Solve the equation using the quadratic formula and completing the square. How are the two methods related?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
5a Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Reasoning with Equations and Inequalities

A.REI.J Solve systems of equations.	Mathematical Practices
A.REI.J.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other, produces a system with the same solutions.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example:

Given that the sum of two numbers is 10 and their difference is 4, what are the numbers?

Explain how your answer can be deduced from the fact that they two numbers, x and y, satisfy the equations $x + y = 10$ and $x – y = 4$.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Reasoning with Equations and Inequalities

A.REI.J Solve systems of equations.	Mathematical Practices
A.REI.J.6 Estimate solutions graphically and determine algebraic solutions to linear systems, focusing on pairs of linear equations in two variables.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Advanced Standards (+)/ STEM Pathway

Example

Example:

Two friends are driving to the Grand Canyon in separate cars. Suzette has been there before and knows the way, but Andrea does not. During the trip Andrea gets ahead of Suzette and pulls over to wait for her. Suzette is traveling at a constant rate of 65 miles per hour. Andrea sees Suzette drive past. To catch up, Andrea accelerates at a constant rate. The distance in miles (d) that her car travels as a function of time in hours (t) since Suzette's car passed is given by $d = 3500t^2$.

- Write and solve a system of equations to determine how long it takes for Andrea to catch up with Suzette.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Reasoning with Equations and Inequalities

A.REI.J Solve systems of equations.	Mathematical Practices
A.REI.J.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example:

Given that the sum of two numbers is 10 and their difference is 4, what are the numbers?

Explain how your answer can be deduced from the fact that they two numbers, x and y, satisfy the equations $x + y = 10$ and $x – y = 4$.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **4d** Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Reasoning with Equations and Inequalities

A.REI.J Solve systems of equations.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

A.REI.J.8 Represent a system of linear equations as a single matrix equation in a vector variable.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Reasoning with Equations and Inequalities

A.REI.J Solve systems of equations.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

A.REI.J.9 Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Reasoning with Equations and Inequalities

A.REI.K Represent and solve equations and inequalities graphically.

Mathematical Practices

A.REI.K.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example:

Which of the following points is on the circle with equation $(x - 1)^2 + (y + 2)^2 = 5$?

a. (1, -2)

b. (2, 2)

c. (3, -1)

d. (3, 4)

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Algebra

Reasoning with Equations and Inequalities

A.REI.K Represent and solve equations and inequalities graphically.	Mathematical Practices
A.REI.K.11 Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Students need to understand that numerical solution methods (data in a table used to approximate an algebraic function) and graphical solution methods may produce approximate solutions, and algebraic solution methods produce precise solutions that can be represented graphically or numerically. Students may use graphing calculators or programs to generate tables of values, graph, or solve a variety of functions.

Example:
Given the following equations determine the x value that results in an equal output for both functions.

$f(x) = 3x - 2$

$g(x) = (x+3)^2 - 1$

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Algebra

Reasoning with Equations and Inequalities

A.REI.K Represent and solve equations and inequalities graphically.	Mathematical Practices
A.REI.K.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use graphing calculators, programs, or applets to model and find solutions for inequalities or systems of inequalities.

Example:

Graph the solution: $y \leq 2x + 3$.

Example:

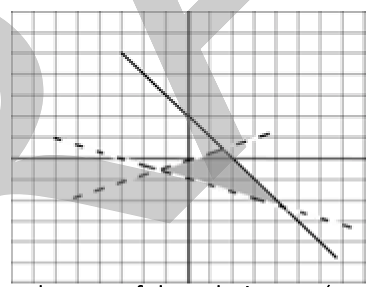
A publishing company publishes a total of no more than 100 magazines every year. At least 30 of these are women's magazines, but the company always publishes at least as many women's magazines as men's magazines. Find a system of inequalities that describes the possible number of men's and women's magazines that the company can produce each year consistent with these policies. Graph the solution set.

Example:

Graph the system of linear inequalities below and determine if (3, 2) is a solution to the system.

$$\begin{cases} x - 3y > 0 \\ x + y \leq 2 \\ x + 3y > -3 \end{cases}$$

Solution:



(3, 2) is not an element of the solution set (graphically or by substitution).

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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HS - Algebra Resources

Standard/Page Number	Resource/Link
A.SSE.A.1 on page 292.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.SSE.A.2 on page 293.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.SSE.B.3 on page 294.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.SSE.B.3 on page 295.	Adapted from: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.APR.D.2 on page 297.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.APR.F.6 on page 301.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.CED.G.1 on page 303.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.CED.G.3 on page 305.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.CED.G.4 on page 306.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.H.1 on page 307.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.H.2 on page 308.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.I.4 on page 310.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.J.5 on page 311.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

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HS - Algebra Resources

Standard/Page Number	Resource/Link
A.REI.J.6 on page 312.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.J.7 on page 313.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.K.10 on page 316.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.K.11 on page 317.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
A.REI.K.12 on page 318.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
Grade Level Math Practices on page 261.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

DRAFT

Mathematics | High School

Functions

Functions describe situations where one quantity determines another. For example, the return on $10,000 invested at an annualized percentage rate of 4.25% is a function of the length of time the money is invested. Because we continually make theories about dependencies between quantities in nature and society, functions are important tools in the construction of mathematical models.

The set of inputs to a function is called its domain. We often infer the domain to be all inputs for which the expression defining a function has a value, or for which the function makes sense in a given context.

In school mathematics, functions usually have numerical inputs from the domain and outputs forming the range that are often defined by an algebraic expression. For functions, each input maps to only one output. For example, the time in hours it takes for a car to drive 100 miles is a function of the car's speed in miles per hour, v; the rule T(v) = 100/v expresses this relationship algebraically and defines a function whose name is T.

A function can be described in various ways, such as by a graph (e.g., the trace of a seismograph); by a verbal rule, as in, "I'll give you a state, you give me the capital city;" by an algebraic expression like f(x) = a + bx; or by a recursive rule. The graph of a function is often a useful way of visualizing the relationship of the function models. Manipulating a mathematical expression for a function can further explain the functions properties.

Functions presented as expressions can model many important phenomena. Two important families of functions characterized by laws of growth are linear functions, which grow at a constant rate, and exponential functions, which grow at a constant percent rate. Linear functions with a constant term of zero describe proportional relationships.

A graphing utility or a computer algebra system can be used to experiment with properties of these functions and their graphs and to build computational models of functions, including recursively defined functions.

Connections to Expressions, Equations, Modeling, and Coordinates.

Determining an output value for a particular input involves evaluating an expression; finding inputs that yield a given output involves solving an equation. Questions about when two functions have the same value for the same input lead to equations, whose solutions can be visualized from the intersection of their graphs. Because functions describe relationships between quantities, they are frequently used in modeling. Sometimes functions are defined by a recursive process, which can be displayed effectively using a spreadsheet or other technology.

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Wyoming 2018 Mathematics Content and Performance Standards

Functions

Interpreting Functions

F.IF.A Understand the concept of a function and use function notation.	Mathematical Practices
F.IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: The domain of a function given by an algebraic expression, unless otherwise specified, is the largest possible domain.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Functions
Interpreting Functions

F.IF.A Understand the concept of a function and use function notation.	Mathematical Practices
F.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

The domain of a function given by an algebraic expression, unless otherwise specified, is the largest possible domain.

Example:

If f(x) = x2 + 4x—12, find f(2).

Example:

Let $f(x) = 2(x+3)^2$, find f(3), f(-1/2), f(a), and f(a-h).

If P(*t*) is the population of Tucson *t* years after 2000, interpret the statements P(0) = 487,000 and P(10)- P(9) = 5,900.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
4a Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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HS Wyoming 2018 Mathematics Content and Performance Standards

Functions
Interpreting Functions

F.IF.A Understand the concept of a function and use function notation.	Mathematical Practices
F.IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: The Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
4a Innovative Designer		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Functions

Interpreting Functions

F.IF.B Interpret functions that arise in application in terms of the context.

F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

Students may be given graphs to interpret or produce graphs given an expression or table for the function, by hand or using technology.

Example: A rocket is launched from 180 feet above the ground at time $t = 0$. *The function that models this situation is given by* $h = -16t^2 + 96t + 180$, *where t is measured in seconds and h is height above the ground measured in feet.*

- What is a reasonable domain restriction for *t in this context?*
- Determine the height of the rocket two seconds after it was launched.
- Determine the maximum height obtained by the rocket.
- Determine the time when the rocket is 100 feet above the ground.
- Determine the time at which the rocket hits the ground.
- How would you refine your answer to the first question based on your response to the second and fifth questions?

Example: Compare the graphs of $y = 3x^2$ and $y = 3x^3$.

Example: Let $R(x) = \frac{2}{\sqrt{x-2}}$. Find the domain of *R(x). Also find the range, zeros, and asymptotes of R(x).*

Example: Let $f(x) = 5x^3 - x^2 - 5x + 1$. Graph the function and identify end behavior and any intervals of constancy, increase, and decrease.

Example: Rain fell lightly at 3pm, then became heavier at 6pm. By 8pm the storm ended, with a total rainfall of 4 inches. No further rain fell for the rest of the day. Sketch a possible graph for the number of inches of rain as a function of time, from midday to midnight.

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE	Computer Science	
3d Knowledge Constructor **4a,d** Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Interpreting Functions

Functions

F.IF.B Interpret functions that arise in application in terms of the context.	Mathematical Practices
F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Students may explain orally, or in written format, the existing relationships. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

Wyoming Cross-Disciplinary Connections

Science

HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Cross-Disciplinary Connections

ISTE	Computer Science	
4a Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Functions

Interpreting Functions

F.IF.B Interpret functions that arise in application in terms of the context.

F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

The average rate of change of a function y = f(x) over an interval [a,b] is f(b) - f(a)/b — a

In addition to finding average rates of change from functions given symbolically, graphically, or in a table, Students may collect data from experiments or simulations (ex. falling ball, velocity of a car, etc.) and find average rates of change for the function modeling the situation.

Example: Use Table 1 to find the average rate of change of g over the intervals [-2, -1] and [0,2]:

x	*g(x)*
-2	2
-1	-1
0	-4
2	-10

Table 1

	Car 1	Car 2
D	t	t
10	4.472	1.742
20	6.3225	2.899
30	7.746	3.831
40	8.944	4.633
50	10	5.348

Table 2

Example: Table 2 shows the elapsed time when two different cars pass a 10, 20, 30, 40 and 50 meter mark on a test track.

- For car 1, what is the average velocity (change in distance divided by change in time) between the 0 and 10 meter mark? Between the 0 and 50 meter mark? Between the 20 and 30 meter mark? Analyze the data to describe the motion of car 1.
- How does the velocity of car 1 compare to that of car 2?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE	Computer Science	
4a,d Innovative Designer		☐ Computational Thinking ☐ Financial Literacy

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Functions

Interpreting Functions

F.IF.C Analyze functions using different representations.

F.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

A. Graph linear and quadratic functions and show intercepts, maxima, and minima.

B. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

C. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

E. Graph exponential and logarithmic functions, showing intercepts and end behavior

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

D. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

F. Graph trigonometric functions, showing period, midline, and amplitude.

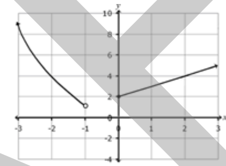
Example

Key characteristics include but are not limited to maxima, minima, intercepts, symmetry, end behavior, and asymptotes. Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to graph functions.

Example:

- Describe key characteristics of the graph of $f(x) = |x - 3| + 5$.
- Sketch the graph and identify the key characteristics of the function described below.

$$F(x) = \begin{cases} x + 2 \text{ for } x \geq 0 \\ -x^2 \text{ for } x < -1 \end{cases}$$



- Graph the function $f(x) = 2^x$ by creating a table of values. Identify the key characteristics of the graph.
- Graph $f(x) = 2 \tan x - 1$. Describe its domain, range, intercepts, and asymptotes.

Draw the graph of f(x) = sin x and f(x) = cos x. What are the similarities and differences between the two graphs?
Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6 Construct explanations and revise, as needed, based on evidence for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **4a,d** Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Functions

Interpreting Functions

F.IF.C Analyze functions using different representations.	Mathematical Practices
F.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. A. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **B.** Use the properties of exponents to interpret expressions for exponential functions.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
4a Innovative Designer		☐ **Computational Thinking** ☑ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Functions
Interpreting Functions

F.IF.C Analyze functions using different representations.

F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

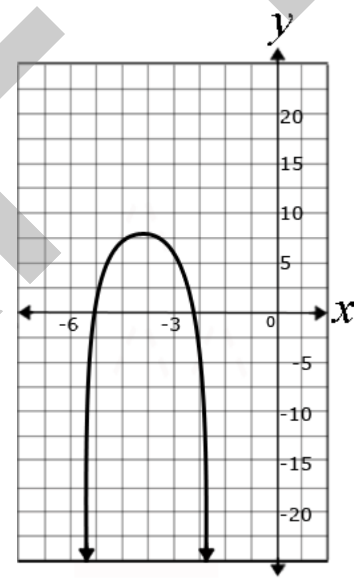
Example

For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Example:

- Examine the functions below. Which function has the larger maximum? How do you know?

$F(x) = -2x^2 — 8x + 20$



Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Functions
Building Functions

F.BF.D Build a function that models a relationship between two quantities.

F.BF.D.1 Write a function that describes a relationship between two quantities.

A. Determine an explicit expression, a recursive process, or steps for calculation from a context.
B. Combine standard function types using arithmetic operations.

Modeling

Advanced Standards (+)/ STEM Pathway

C. Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Students will analyze a given problem to determine the function expressed by identifying patterns in the function's rate of change. They will specify intervals of increase, decrease, constancy, and, if possible, relate them to the function's description in words or graphically. Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model functions .

Example:

- You buy a $20,000 car with an annual interest rate of 5 percent compounded annually and make monthly payments of $550. Express the amount remaining to be paid off as a function of the number of months, using a recursion equation.
- A cup of coffee is initially at a temperature of 97º F. The difference between its temperature and the room temperature of 70° F decreases by 8% each minute. Write a function describing the temperature of the coffee as a function of time.
- The radius of a circular oil slick after t hours is given in feet by $r = 10t^2 — 0.5t$, for $0 \le t \le 10$. Find the area of the oil slick as a function of time.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science

HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
4a Innovative Designer		☑ Computational Thinking ☑ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Functions
Building Functions

F.BF.D Build a function that models a relationship between two quantities.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

F.BF.D.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Functions
Building Functions

F.BF.E Build new functions from existing functions.	Mathematical Practices
F.BF.E.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

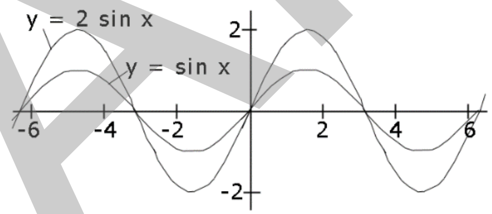
Students will apply transformations to functions and recognize functions as even and odd. Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to graph functions.

Example: Is $f(x) = x^3 - 3x^2 + 2x + 1$ even, odd, or neither? Explain your answer orally or in written format.

Example: Describe effect of varying the parameters a, h, and k have on the shape and position of the graph of $f(x) = a(x-h)^2 + k$

Example: Describe the effect of varying the parameters a, h, and k on the shape and position of the graph $f(x) = ab^{(x + h)} + k$, orally or in written format. What effect do values between 0 and 1 have? What effect do negative values have?

Example: Compare the shape and position of the graphs of y = sin x to y = 2 sin x.



Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
4a Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Functions

Building Functions

F.BF.E Build new functions from existing functions.	Mathematical Practices
F.BF.E.4 Find inverse functions. A. Write an expression for the inverse of a simple, invertible function f(x). Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, as f and g are inverse functions, if and only if, f(x) = y and g(y) = x, for all values of x in the domain of f and all values of y in the domain of g.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

B. Verify by composition that one function is the inverse of another.
C. Read values of an inverse function from a graph or a table, given that the function has an inverse.
D. Produce an invertible function from a non-invertible function by restricting the domain.

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model functions.

Examples:

- For the function $h(x) = (x - 2)^3$, defined on the domain of all real numbers, find the inverse function if it exists or explain why it doesn't exist.
- Graph h(x) and $h^{-1}(x)$ and explain how they relate to each other graphically.

Example: Find a domain for $f(x) = 3x^2 + 12x - 8$ on which it has an inverse. Explain why it is necessary to restrict the domain of the function.

Example: $f(x) = 2x^3$ or $f(x) = (x + 1) / (x - 1)$ for $x \neq 1$.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Functions
Building Functions

F.BF.E Build new functions from existing functions.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

F.BF.E.5 Build new functions from existing functions. Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Functions

Linear, Quadratic, and Exponential Models

F.LE.F Construct and compare linear, quadratic, and exponential models and solve problems.

F.LE.F.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.

A. Verify that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.
B. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
C. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and compare linear and exponential functions.
Example:
A cell phone company has three plans. Graph the equation for each plan, and analyze the change as the number of minutes used increases. When is it beneficial to enroll in Plan 1? Plan 2? Plan 3?
1. $59.95/month for 700 minutes and $0.25 for each additional minute.
2. $39.95/month for 400 minutes and $0.15 for each additional minute, and 3. $89.95/month for 1,400 minutes and $0.05 for each additional minute. A computer store sells about 200 computers at the price of $1,000 per computer. For each $50 increase in price, about ten fewer computers are sold. How much should the computer store charge per computer in order to maximize their profit?
Example: Students can investigate functions and graphs modeling different situations involving simple and compound interest.
Example: Students can compare interest rates with different periods of compounding (monthly, daily) and compare them with the corresponding annual percentage rate.
Example: Spreadsheets and applets can be used to explore and model different interest rates and loan terms.
Example: Students can use graphing calculators or programs, spreadsheets, or computer algebra systems to construct linear and exponential functions.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **5a** Computational Thinker **6a,b,c,d** Creative Communicator		☑ **Computational Thinking** ☑ **Financial Literacy**

Wyoming 2018 Mathematics Content and Performance Standards

Functions

Linear, Quadratic, and Exponential Models

F.LE.F Construct and compare linear, quadratic, and exponential models and solve problems.

Mathematical Practices

F.LE.F.2 Construct linear and exponential functions using a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

Modeling

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to construct linear and exponential functions.

Examples:

Determine an exponential function of the form $f(x) = ab^x$ using data points from the table. Graph the function and identify the key characteristics of the graph.

x	*f(x)*
0	1
1	3
3	27

Sara's starting salary is $32,500. Each year she receives a $700 raise. Write a sequence in explicit form to describe the situation.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

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Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE

4a,d Innovative Designer

5c Computational Thinker

Computer Science

☑ **Computational Thinking**

☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Linear, Quadratic, and Exponential Models

Functions

F.LE.F Construct and compare linear, quadratic, and exponential models and solve problems.	Mathematical Practices
F.LE.F.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Example:

- Contrast the growth of the $f(x)=x^3$ and $f(x)=3^x$.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

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Functions

Linear, Quadratic, and Exponential Models

F.LE.F Construct and compare linear, quadratic, and exponential models and solve problems.

F.LE.F.4 For exponential models, express as a logarithm the solution to $ab^{(ct)} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to analyze exponential models and evaluate logarithms.

Example:

Solve $200\,e^{0.04t} = 450$ for t.

Solution:

We first isolate the exponential part by dividing both sides of the equation by 200.

$e^{0.04t} = 2.25$

Now we take the natural logarithm of both sides.

$\ln e^{0.04t} = \ln 2.25$

The left hand side simplifies to 0.04t, by logarithmic identity 1.

$0.04t = \ln 2.25$

Lastly, divide both sides by 0.04.

$t = \ln(2.25) / 0.04$

$t \approx 20.3$

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Functions

Linear, Quadratic, and Exponential Models

F.LE.F Interpret expressions for functions in terms of the situation they model.	Mathematical Practices
F.LE.F.5 Interpret the parameters in a linear or exponential function in terms of a context. Modeling	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Example:

A function of the form $f(n) = P(1+r)^n$ is used to model the amount of money in a savings account that earns 3% interest, compounded annually, where n is the number of years since the initial deposit. What is the value of r? What is the meaning of the constant P in terms of the savings account? Explain either orally or in written format.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
4a,d Innovative Designer	**3B-DA-05** Use data analysis tools and techniques to identify patterns in data representing complex systems.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Functions
Trigonometric Functions

F.TF.H Extend the domain of trigonometric functions using the unit circle.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

F.TF.H.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Functions

Trigonometric Functions

F.TF.H Extend the domain of trigonometric functions using the unit circle.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

F.TF.H.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Functions
Trigonometric Functions

F.TF.H Extend the domain of trigonometric functions using the unit circle.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

F.TF.H.3 Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Functions Trigonometric Functions	F.TF.H Extend the domain of trigonometric functions using the unit circle.	Mathematical Practices	Example
		MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	**Wyoming Cross-Disciplinary Connections**

Advanced Standards (+)/ STEM Pathway

F.TF.H.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Functions

Trigonometric Functions

F.TF.I Model periodic phenomena with trigonometric functions.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

F.TF.I.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

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Functions
Trigonometric Functions

F.TF.I Model periodic phenomena with trigonometric functions.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

F.TF.I.6 Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Functions Trigonometric Functions	F.TF.I Model periodic phenomena with trigonometric functions.	Mathematical Practices
		MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

F.TF.I.7 Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Functions

Trigonometric Functions

F.TF.J Prove and apply trigonometric identities.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

F.TF.J.8 Prove the Pythagorean identity $(\sin A)^2 + (\cos A)^2 = 1$ and use it to find sin A, cos A, or tan A, given sin A, cos A, or tan A, and the quadrant of the angle.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Functions
Trigonometric Functions

F.TF.J Prove and apply trigonometric identities.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
F.TF.J.9 Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS - Functions Resources

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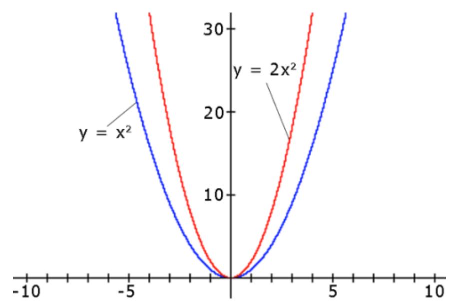
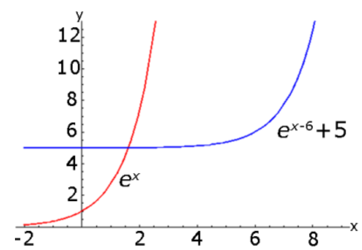
<tr><td>F.BF.D.1 on page 331.</td><td>http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/</td></tr>
<tr><td>F.BF.E.3 on page 333.</td><td>Example: Compare the shape and position of the graphs of $f(x) = x^2$ and $g(x) = 2x^2$, and explain the differences in terms of the algebraic expressions for the functions.


Example: Compare the shape and position of the graphs of $f(x) = e^x$ to $g(x) = e^{x-6}$, and explain the differences, orally or in written format, in terms of the algebraic expressions for the functions.


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HS - Functions Resources

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F.LE.F.5 on page 340.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
Grade Level Math Practices on page 261.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

DRAFT

Mathematics | High School

Geometry

An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.

Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate, that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)

During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs. Later in college some students develop Euclidean and other geometries carefully from a small set of axioms.

The concepts of congruence, similarity, and symmetry can be understood from the perspective of geometric transformation. Fundamental are the rigid motions: translations, rotations, reflections, and combinations of these, all of which are here assumed to preserve distance and angles (and therefore shapes generally). Reflections and rotations each explain a particular type of symmetry, and the symmetries of an object offer insight into its attributes—as when the reflective symmetry of an isosceles triangle assures that its base angles are congruent.

In the approach taken here, two geometric figures are defined to be congruent if there is a sequence of rigid motions that carries one onto the other. This is the principle of superposition. For triangles, congruence means the equality of all corresponding pairs of sides and all corresponding pairs of angles. Through experiences of drawing triangles from given conditions, students notice ways to specify enough measures in a triangle to ensure that all triangles drawn with those measures are congruent. Once these triangle congruence criteria (ASA, SAS, and SSS) are established using rigid motions, they can be used to prove theorems about triangles, quadrilaterals, and other geometric figures.

Similarity transformations (rigid motions followed by dilations) define similarity in the same way that rigid motions define congruence, thereby formalizing the similarity ideas of "same shape" and "scale factor" developed in the middle grades. These transformations lead to the criterion for triangle similarity that two pairs of corresponding angles are congruent.

The definitions of sine, cosine, and tangent for acute angles are founded on right triangles and similarity, and, with the Pythagorean Theorem, are fundamental in many real-world and theoretical situations. The Pythagorean Theorem is generalized to non-right triangles by the Law of Cosines. Together, the Laws of Sines and Cosines embody the triangle congruence criteria for the cases where three pieces of information suffice to completely solve a triangle. Furthermore, these laws yield two possible solutions in the ambiguous case, illustrating that Side-Side-Angle is not a congruence criterion.

Analytic geometry connects algebra and geometry, resulting in powerful methods of analysis and problem solving. A number line associates numbers with locations in one dimension while a pair of perpendicular axes associates pairs of numbers with locations in two dimensions.

Dynamic geometry environments provide students with experimental and modeling tools that allow them to investigate geometric phenomena in much the same way as computer algebra systems allow them to experiment with algebraic phenomena.

Connections to Equations. The correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof. Geometric transformations of the graphs of equations correspond to algebraic changes in their equations.

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Geometry Congruence

G.CO.A Experiment with transformations in the plane.	Mathematical Practices
G.CO.A.1 Apply precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Angle: the intersection of two non-collinear rays at a common endpoint.
Circle: the locus of all points in a plane equidistant from a given point at the center.
Perpendicular Line: lines that form right angles.
Parallel Line: lines that do not intersect.
Line Segment: a measurable part of a line that consists of 2 points and all the points between them.
Point: a location.
Line: is made up of points, it has no thickness or width.
Plane: flat surface made up of points that has no depth and extends indefinitely.

Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry Congruence

G.CO.A Experiment with transformations in the plane.	Mathematical Practices
G.CO A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Transformations: an operation that creates an image from an original figure or preimage
Rigid Motion: a transformation that creates an image that is congruent to the original figure

Example: Create various polygons that can be transformed using the properties of transformations with explanations. Students may use geometry software and/or manipulatives to model and compare transformations.

Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **4a** Innovative Designer	**3A-DA-12** Create computational models that represent the relationships among different elements of data collected from a	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

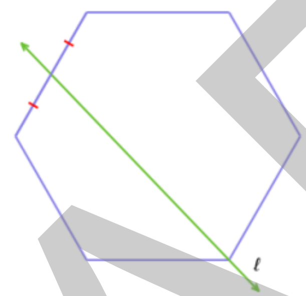
Geometry
Congruence

G.CO.A Experiment with transformations in the plane.	Mathematical Practices
G.CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Describe which transformations would and would not carry this regular polygon onto itself. (i.e. reflection across line l, rotation of 30° counterclockwise, rotation of 72° counterclockwise, rotation of 60° counterclockwise, etc.).



Source: https://www.ixl.com/math/geometry/transformations-that-carry-a-polygon-onto-itself

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**3A-DA-12** Create computational models that represent the relationships among different elements of data collected from a	☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry Congruence	G.CO.A Experiment with transformations in the plane.	Mathematical Practices	Example
	G.CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.	**Transformations:** an operation that creates an image from an original figure or preimage. **Rigid Motion:** a transformation that creates an image that is congruent to the original figure. **Example:** Explore effects of various transformations on angles, circles, perpendicular lines, parallel lines, and line segments. Students may use geometry software and/or manipulatives to model and compare transformations. Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Advanced Standards (+)/ STEM Pathway

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

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Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry
Congruence

G.CO.A Experiment with transformations in the plane.	Mathematical Practices
G.CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Students may use geometry software and/or manipulatives to model and compare transformations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **5c** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Congruence

G.CO.B Understand congruence in terms of rigid motions.	Mathematical Practices
G.CO.B.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Is ΔBCD congruent to ΔEFG? If so, describe a series of rigid motions that would transform ΔBCD to ΔEFG.

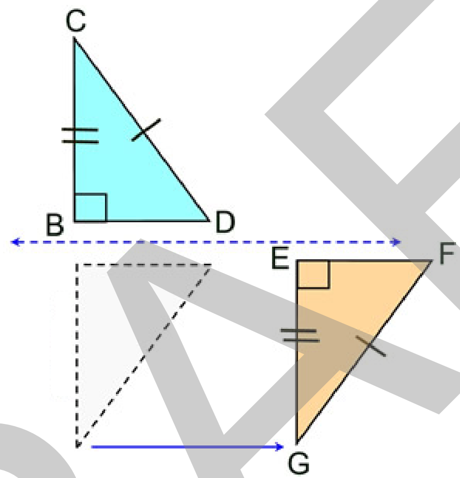

Image by MathBits.com

Wyoming Cross-Disciplinary Connections

ELA

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Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Congruence

G.CO.B Understand congruence in terms of rigid motions.	Mathematical Practices
G.CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

A **rigid motion** is a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are assumed to preserve distances and angle measures.

Congruence of triangles: two triangles are said to be congruent if one can be exactly superimposed on the other by a rigid motion, and the congruence theorems specify the conditions under which this can occur.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

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W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Congruence

G.CO.B Understand congruence in terms of rigid motions.

G.CO.B.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Congruence:
ASA: Angle Side Angle Triangle Congruence
SAS: Side Angle Side Triangle Congruence
SSS: Side Side Side Triangle Congruence

Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

ELA

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W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

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Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner	**3A-DA-12** Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

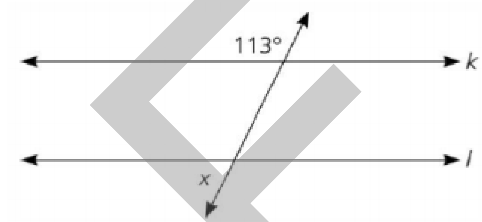
Geometry
Congruence

G.CO.C Prove geometric theorems.	Mathematical Practices
G.CO.C.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Use parallel lines cut by a transversal to find all the various type of angles with one angle is given. This can be done multiple ways without using algebraic expression.



Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Congruence

G.CO.C Prove geometric theorems.	Mathematical Practices
G.CO.C.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180 degrees; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Identify and describe all types of triangles.
Example: Construct angle bisectors of triangles.
Example: Find area and perimeter of triangles in real world context.
Example: Prove similarity exists between two triangles.
Example: Use the Triangle Theorems.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Congruence

G.CO.C Prove geometric theorems.	Mathematical Practices
G.CO.C.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Describe, classify and determine the relationships that exist between all parallelograms.
Example: Solve problems of real world nature and not for area and perimeter.
Example: Use coordinate geometry to find lengths.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

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Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Congruence

G.CO.D Make geometric constructions.	Mathematical Practices
G.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Construct a triangle given the lengths of two sides and the measure of the angle between the two sides.

Example: Construct the circumcenter of a given triangle.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
	3A-DA-12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Congruence

G.CO.D Make geometric constructions.	Mathematical Practices
G.CO.D.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use geometry software and/or manipulatives to model and compare transformations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
	3A-DA-12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.E Understand similarity in terms of similarity transformations.	Mathematical Practices
G.SRT.E.1 Understand similarity in terms of similarity transformations. Verify heuristically the properties of dilations given by a center and a scale factor. A. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. B. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Dilation is a transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor.

Students may use geometric simulation software to model transformations. Students may observe patterns and verify experimentally the properties of dilations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.E Understand similarity in terms of similarity transformations.

G.SRT.E.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

A **similarity transformation** is a rigid motion followed by dilation.

Students may use geometric simulation software to model transformations and demonstrate a sequence of transformations to show congruence or similarity of figures.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.E Understand similarity in terms of similarity transformations.	Mathematical Practices
G.SRT.E.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Similarity: the ratio of the lengths of corresponding sides.
Proportionality: having equivalent ratios.
AA: Angle Angle Triangle Congruence.

Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.F Prove Theorems involving similarity.	Mathematical Practices
G.SRT.F.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.F Prove theorems involving similarity.	Mathematical Practices
G.SRT.F.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Similarity postulates include SSS, SAS, and AA.

Congruence postulates include SSS, SAS, ASA, AAS, and H-L.

Students may use geometric simulation software to model transformations and demonstrate a sequence of transformations to show congruence or similarity of figures.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
4a Innovative Designer		☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.G Define trigonometric ratios and solve problems involving right triangles.

G.SRT.G.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

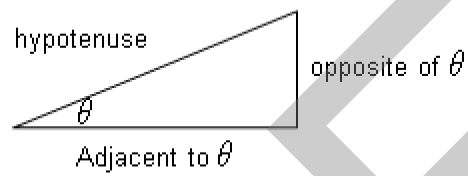
Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use applets to explore the range of values of the trigonometric ratios as θ ranges from 0 to 90 degrees.



$$\sin\theta = \frac{\text{opp.}}{\text{hyp.}} \quad \cos\theta = \frac{\text{adj.}}{\text{hyp.}} \quad \tan\theta = \frac{\text{opp.}}{\text{adj.}}$$

$$\csc\theta = \frac{\text{hyp.}}{\text{opp.}} \quad \sec\theta = \frac{\text{hyp.}}{\text{adj.}} \quad \cot\theta = \frac{\text{adj.}}{\text{opp.}}$$

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Source: http://www.pstcc.edu/facstaff/jwlamb/1910/unitcircletrigreview.pdf

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

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Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer		☐ **Computational Thinking**
6a,b,c,d Creative Communicator		☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

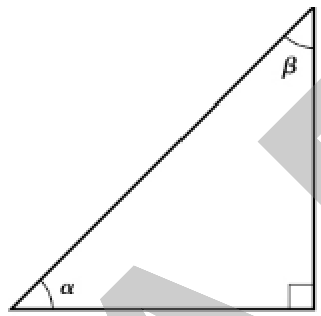
Similarity, Right Triangles, and Trigonometry

G.SRT.G Define trigonometric ratios and solve problems involving right triangles.	Mathematical Practices
G.SRT.G.7 Explain and use the relationship between the sine and cosine of complementary angles.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Explore the relationship between angles α and β as well as the relationship between sine and cosine of these angles.



$\sin\alpha = \cos\beta$
$\sin\beta = \cos\alpha$

Image: http://philschatz.com/algebra-trigonometry-book/contents/m51284.html

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

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Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer **6a,b,c,d** Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.G Define trigonometric ratios and solve problems involving right triangles.

Mathematical Practices

G.SRT.G.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

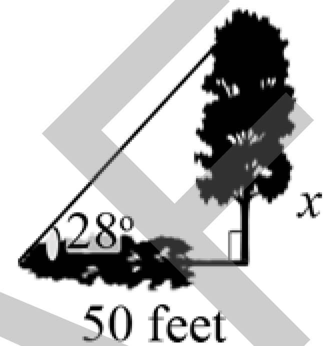
Modeling

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Find the height of a tree to the nearest tenth if the angle of elevation of the sun is 28° and the shadow of the tree is 50 ft.



Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
4d Innovative Designer		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.H Apply trigonometry to general triangles.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

G.SRT.H.9 Derive the formula A = (1/2)ab(sinC) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.H Apply trigonometry to general triangles.	Mathematical Practices
	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** **MP.8 Look for and express regularity in repeated reasoning.**

Advanced Standards (+)/ STEM Pathway
G.SRT.H.10 Prove the Laws of Sines and Cosines and use them to solve problems.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry

Similarity, Right Triangles, and Trigonometry

G.SRT.H Apply trigonometry to general triangles.

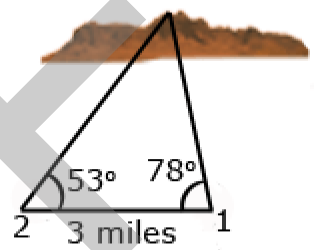
Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
G.SRT.H.11 Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Example

Example: Tara wants to fix the location of a mountain by taking measurements from two positions 3 miles apart. From the first position, the angle between the mountain and the second position is 78°. From the second position, the angle between the mountain and the first position is 53°. How can Tara determine the distance of the mountain from each position, and what is the distance from each position?



Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Circles

G.C.I Understand and apply theorems and circles.	Mathematical Practices	Example
G.C.I.1 Prove that all circles are similar.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

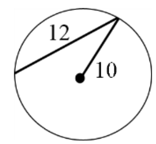
Geometry
Circles

G.C.I Understand and apply theorems and circles.	Mathematical Practices
G.C.I.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

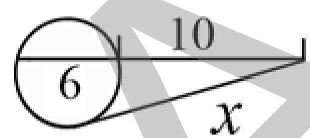
Advanced Standards (+)/ STEM Pathway

Example

Example: Given the circle below with radius of 10 and chord length of 12, find the distance from the chord to the center of the circle.



Example: Find the unknown length in the picture below.



Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ Computational Thinking ☐ Financial Literacy

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Geometry Circles

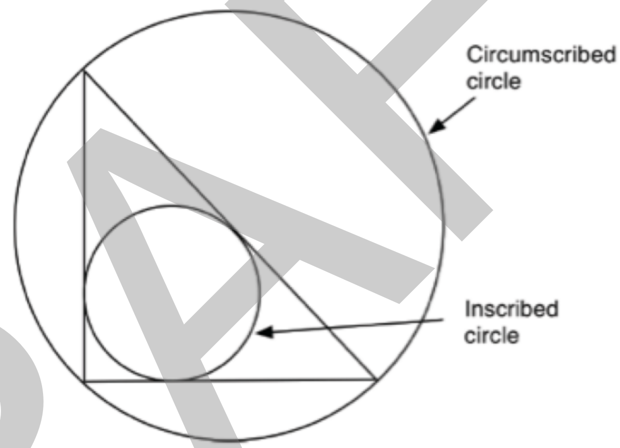
G.C.I Understand and apply theorems and circles.	Mathematical Practices
G.C.I.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Inscribed: a figure whose vertices are part of another figure.
Circle inscribed in a triangle: the circle touches each side of the triangle at exactly one point.
Quadrilateral inscribed in a circle: each vertex of the quadrilateral lies on the circle.

Example: Construct inscribed angles and other vocabulary terms for circle theorems.



Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Image: https://easingthehurrysyndrome.wordpress.com/2014/03/14/inscribed-circumscribed-right-

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Circles

G.C.I Understand and apply theorems and circles.	Mathematical Practices	Example
	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway
G.C.I.4 Construct a tangent line from a point outside a given circle to the circle.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Circles

G.C.J Find arc lengths and areas of sectors of circles.	Mathematical Practices
G.C.J.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Area of a Sector: the region bounded by two radii of the circle and that arc they intercept.
Arc Length: the length of an arc or a portion of the circle.

Example: Find the measures of angles, arcs, and arc lengths in given circle diagrams.

Source: https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Expressing Geometric Properties with Equations

G.GPE.K Translate between the geometric description and the equation for a conic section.

G.GPE.K.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use geometric simulation software to explore the connection between circles and the Pythagorean Theorem.

Example: Write an equation for a circle with a radius of 2 units and center at (1, 3).

Example: Write an equation for a circle given that the endpoints of the diameter are (-2, 7) and (4, -8).

Example: Find the center and radius of the circle $4x^2 + 4y^2 - 4x + 2y - 1 = 0$.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Expressing Geometric Properties with Equations

G.GPE.K Translate between the geometric description and the equation for a conic section.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
G.GPE.K.2 Derive the equation of a parabola given a focus and directrix.

Example

Example: Write and graph an equation for a parabola with focus (2, 3) and directrix *y = 1.*

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Expressing Geometric Properties with Equations

G.GPE.K Translate between the geometric description and the equation for a conic section.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
G.GPE.K.3 Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

Example

Example: Write an equation in standard form for an ellipse with foci at (0, 5) and (2, 0) and a center at the origin.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Expressing Geometric Properties with Equations

G.GPE.L Use coordinates to prove simple geometric theorems algebraically.	Mathematical Practices
G.GPE.L.4 Use coordinates to prove simple geometric theorems algebraically.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use geometric simulation software to model figures and prove simple geometric theorems.

Example:

Use slope and distance formula to verify the polygon formed by connecting the points (-3, -2), (5, 3), (9, 9), (1, 4) is a parallelogram.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Expressing Geometric Properties with Equations

G.GPE.L Use coordinates to prove simple geometric theorems algebraically.	Mathematical Practices
G.GPE.L.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**

Advanced Standards (+)/ STEM Pathway

Example

Lines can be horizontal, vertical, or neither.

Students may use a variety of different methods to construct a parallel or perpendicular line to a given line and calculate the slopes to compare the relationships.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

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W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry

Expressing Geometric Properties with Equations

G.GPE.L Use coordinates to prove simple geometric theorems algebraically.	Mathematical Practices
G.GPE.L.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**

Advanced Standards (+)/ STEM Pathway

Example

Students may use geometric simulation software to model figures or line segments.

Example:

Given A(3, 2) and B(6, 11),

- Find the point that divides the line segment AB two-thirds of the way from A to B. The point two-thirds of the way from A to B has *x-coordinate two-thirds of the way from 3 to 6 and y coordinate two-thirds of the way from 2 to 11.* So, (5, 8) is the point that is two-thirds from point A to point B.

Example:

Find the midpoint of line segment AB.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Expressing Geometric Properties with Equations

G.GPE.L Use coordinates to prove simple geometric theorems algebraically.

Mathematical Practices

G.GPE.L.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, (e.g., using the distance formula.)

Modeling

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example: Find the area and perimeter of the triangle with vertices A (-1,2), B (4,-3), and C (-2,-1).

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Geometric Measurement and Dimension

G.GMD.M Explain volume formulas and use them to solve problems.	Mathematical Practices
G.GMD.M.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Cavalieri's Principle: If two solids have the same height and the same cross-sectional area at every level, then they have the same volume.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

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W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Geometric Measurement and Dimension

G.GMD.M Explain volume formulas and use them to solve problems.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
G.GMD.M.2 Give an informal argument using Cavalieri's Principle for the formulas for the volume of a sphere and other solid figures.

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Geometric Measurement and Dimension

G.GMD.M Explain volume formulas and use them to solve problems.	Mathematical Practices
G.GMD.M.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	**MP.1 Make sense of problems and persevere in solving them.** **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Example: Missing measures can include but are not limited to slant height, altitude, height, diagonal of a prism, edge length, and radius.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Geometry

Geometric Measurement and Dimension

G.GMD.N Visualize relationships between two-dimensional and three-dimensional objects.	Mathematical Practices
G.GMD.N.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional object.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Students may use geometric simulation software to model figures and create cross sectional views.

Example:

Identify the shape of the vertical, horizontal, and other cross sections of a cylinder.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
	3A-DA-12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ **Computational Thinking** ☐ **Financial Literacy**

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Modeling with Geometry

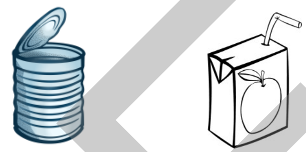
G.MG.O Apply geometric concepts in modeling situations.	Mathematical Practices
G.MG.O.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Example: Use measures of various shapes to find volume, height, or radius of various objects. For example compare the volumes of a can and box.



Images: Clipart

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
	3A-DA-12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Geometry

Modeling with Geometry

G.MG.O Apply geometric concepts in modeling situations.

Mathematical Practices

G.MG.O.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Example: If one city has a population of 20.7 million people and an area of 16,400 km^2 and another city has 23.7 million people and an area of 6,300 km^2, how many times as great is the population density of the first city to the second?

Adapted from: https://www.khanacademy.org/math/geometry/hs-geo-solids/hs-geo-density/e/surface-and-volume-density-word-problem

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Geometry
Modeling with Geometry

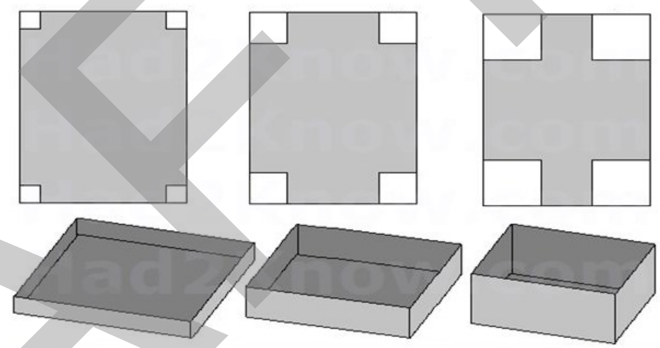
G.MG.O Apply geometric concepts in modeling situations.	Mathematical Practices
G.MG.O.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	**MP.1 Make sense of problems and persevere in solving them.** MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Example: An open-top box is to be made by cutting small squares from the corners of a 12-in. by 12-in. sheet of tin and bending the sides up. How large should the squares cut from the corners be to maximize the volume of the box?



Adapted from: http://slideplayer.com/slide/10086523/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
5a Computational Thinker	**3A-DA-12** Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

HS - Geometry Resources

Standard/Page Number	Resource/Link
G.CO .A.1 on page 353.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf
G.CO .A.2 on page 354.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf
G.CO .A.3 on page 355.	https://www.ixl.com/math/geometry/transformations-that-carry-a-polygon-onto-itself
G.CO.A.4 on page 356.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf
G.CO.A.5 on page 357.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.CO.B.6 on page 358.	Image by: MathBits.com
G.CO.B.7 on page 359.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.CO.B.8 on page 360.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf
G.CO.C.9 on page 361.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf
G.CO.C.10 on page 362.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.CO.C.11 on page 363.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.CO.D.12 on page 364.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.CO.D.13 on page 365.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.SRT.E.1 on page 366.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.SRT.E.2 on page 367.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.SRT.E.3 on page 368.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf

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HS - Geometry Resources

Standard/Page Number	Resource/Link
G.SRT.F.5 on page 370.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.SRT.G.6 on page 371.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/ http://www.pstcc.edu/facstaff/jwlamb/1910/unitcircletrigreview.pdf
G.SRT.G.7 on page 372.	Image: http://philschatz.com/algebra-trigonometry-book/contents/m51284.html
G.SRT.G.8 on page 373.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.SRT.H.11 on page 376.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.C.I.2 on page 378.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.C.I.3 on page 379.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf Image: https://easingthehurrysyndrome.wordpress.com/2014/03/14/inscribed-circumscribed-right-triangles/
G.C.J.5 on page 381.	https://www.doe.in.gov/sites/default/files/standards/mathematics/geometry-resource-guide.pdf
G.GPE.K.1 on page 382.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GPE.K.2 on page 383.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GPE.K.3 on page 384.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GPE.L.4 on page 385.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GPE.L.5 on page 386.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GPE.L.6 on page 387.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GPE.L.7 on page 388.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

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HS - Geometry Resources

Standard/Page Number	Resource/Link
G.GMD.M.1 on page 389.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GMD.M.3 on page 391.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.GMD.N.4 on page 392.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
G.MG.O.1 on page 393.	Images: Clipart
G.MG.O.2 on page 394.	Adapted from: https://www.khanacademy.org/math/geometry/hs-geo-solids/hs-geo-density/e/surface-and-volume-density-word-problem
G.MG.O.3 on page 395.	Adapted from: http://slideplayer.com/slide/10086523/
Grade Level Math Practices on page 261.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Mathematics | High School

Statistics and Probability

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take data into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat (uniform, or bell shaped), and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-life actions to be taken.

Randomization has two important uses in drawing statistical conclusions. First, collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account. Second, randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. A statistically significant outcome is one that is unlikely to be due to chance alone, and this can be evaluated only under the condition of randomness. The conditions under which data are collected are important in drawing conclusions from the data. In critically reviewing uses of statistics in public media and other reports, consideration is important for the study design, how the data were gathered, and the analyses employed as well as the data summaries and the conclusions drawn.

Random processes can be described mathematically by using a probability model: a list or description of the possible outcomes (the sample space), each of which is assigned a probability. In situations such as flipping a coin, rolling a number cube, or drawing a card, it might be reasonable to assume various outcomes are equally likely. In other situations, the probability of outcomes may be different. In a probability model, sample points represent outcomes and combine to make up events; probabilities of events can be computed by applying the Addition and Multiplication Rules. Interpreting these probabilities relies on an understanding of independence and conditional probability, which can be approached through the analysis of two-way tables.

Technology plays an important role in statistics and probability by making it possible to generate plots, linear regression models, correlation coefficients, and to simulate many possible outcomes, in a short amount of time.

Connections to Functions and Modeling. Functions may be used to describe data; if the data suggest a linear relationship, the relationship can be modeled with a regression line and its strength and direction can be expressed through a correlation coefficient.

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.A Summarize, represent, and interpret data on a single count or measurement variable.

S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots) by hand or using technology.

Modeling

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Wyoming Cross-Disciplinary Connections

Science

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex biotic and abiotic interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a modified ecosystem.

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner

4a Innovative Designer

5a,b Computational Thinker

Computer Science

3A-DA-12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.

☑ **Computational Thinking**

☑ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.A Summarize, represent, and interpret data on a single count or measurement variable.	Mathematical Practices
S.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Students may use spreadsheets, graphing calculators and statistical software for calculations, summaries, and comparisons of data sets.

Example: The two data sets below depict the housing prices sold in the King River area and Toby Ranch areas of Pinal County, Arizona. Based on the prices below which price range can be expected for a home purchased in Toby Ranch? In the King River area? In Pinal County?

- King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000}
- Toby Ranch homes {5 million, 154000, 250000, 250000, 200000, 160000, 190000}

Example: Given a set of test scores {99, 96, 94, 93, 90, 88, 86, 77, 70, 68}, find the mean, median and standard deviation. Explain how the values vary about the mean and median. What information does this give the teacher?

Example: Collect gas receipts and compare the distributions to grocery receipts.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **5a,b,c** Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.A Summarize, represent, and interpret data on a single count or measurement variable.

Mathematical Practices

S.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Modeling

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use spreadsheets, graphing calculators and statistical software to statistically identify outliers and analyze data sets with and without outliers as appropriate.

Example:

Hunting in Wyoming: The number of licenses available and number who applied for different game species for several years and is listed by hunting area. (Resident deer licenses in 2017: Antlered deer licenses by area (75, 142, 141, 80, …). Use this type of data to determine descriptive statistics (mean, median, standard deviation, range, …) number of antlered deer (or any deer, …) licenses available in an area. Could graph the data to discuss shape, etc.

*Reference graph on resource page.

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
3d Knowledge Constructor **5b** Computational Thinker **6a,b,c,d** Creative Communicator		☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.A Summarize, represent, and interpret data on a single count or measurement variable.

Mathematical Practices

- **MP.1** Make sense of problems and persevere in solving them.
- **MP.2** Reason abstractly and quantitatively.
- **MP.3** Construct viable arguments and critique the reasoning of others.
- **MP.4** Model with mathematics.
- **MP.5** Use appropriate tools strategically.
- **MP.6** Attend to precision.
- **MP.7** Look for and make use of structure.
- **MP.8** Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use the Empirical Rule, calculators, spreadsheets, and/or tables to estimate areas under the normal curve.

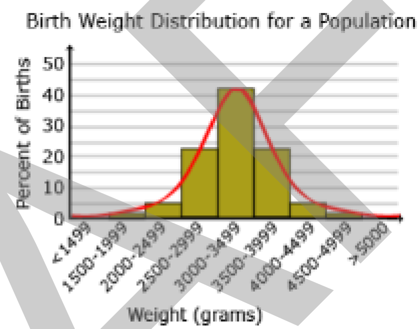
Modeling

Example

Students may use spreadsheets, graphing calculators, statistical software and tables to analyze the fit between a data set and normal distributions and estimate areas under the curve.

Example:

The bar graph below gives the birth weight of a population of 100 chimpanzees. The line shows how the weights are normally distributed about the mean, 3250 grams. Estimate the percent of baby chimps weighing 3000-3999 grams.



Example:

Determine which situation(s) is best modeled by a normal distribution. Explain your reasoning. o Annual income of a household in the U.S. o Weight of babies born in one year in the U.S.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **4d** Innovative Designer **5a,b,c** Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability
Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations in the data, and use inferential statistical techniques to show association.

Modeling

Example

Students may use spreadsheets, graphing calculators, and statistical software to create frequency tables and determine associations or trends in the data.

Example:

A two-way frequency table is shown below displaying the relationship between age and baldness. We took a sample of 100 male subjects, and determined who is or is not bald. We also recorded the age of the male subjects by categories.

Two-way Frequency Table

Bald	Age		Total
	Younger than 45	45 or older	
No	35	11	46
Yes	24	30	54
Total	59	41	100

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☑ **Computational Thinking**
5a,b,c Computational Thinker		☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

A. Use a function to describe data trends to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

C. Using technology, fit a least squares linear regression function for a scatter plot that suggests a linear association.

Advanced Standards (+)/ STEM Pathway

B. Informally assess the fit of a function by plotting and analyzing residuals.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Example

The residual in a regression model is the difference between the observed and the predicted y for some *x* (*y* the dependent variable and *x* the independent variable). So if we have a model $y = ax + b$ and a data point (x_i, y_i) the residual is for this point is $r_i = y_i — (ax_i + b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.

Example:

Measure the wrist and neck size of each person in your class and make a scatterplot. Find the least squares regression line. Calculate and interpret the correlation coefficient for this linear regression model. Graph the residuals and evaluate the fit of the linear equations.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Example:

Collect Grocery receipts and number of people in the family. Develop a scatterplot. Would you expect to find a correlation/relation? What factors may account for variability of the data? (Ex: people who shop daily vs. weekly or monthly)

Wyoming Cross-Disciplinary Connections

Science	ELA
HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	**W.9-10.2.d** Use precise language and domain-specific vocabulary to manage the complexity of the topic. **W.11-12.2.d** Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **4a,d** Innovative Designer **5a,b** Computational Thinker		☑ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.C Interpret linear models.	Mathematical Practices
S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. Modeling	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Students may use spreadsheets or graphing calculators to create representations of data sets and create linear models.

Example:

Lisa lights a candle and records its height in inches every hour. The results recorded as (time, height) are (0, 20), (1, 18.3), (2, 16.6), (3, 14.9), (4, 13.2), (5, 11.5), (7, 8.1), (9, 4.7), and (10, 3). Express the candle's height (h) as a function of time (t) and state the meaning of the slope and the intercept in terms of the burning candle.

Solution: h = -1.7t + 20, Slope: The candle's height decreases by 1.7 inches for each hour it is burning.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
3c Knowledge Constructor **5c** Computational Thinker **6a,b,c,d** Creative Communicator		☑ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.C Interpret linear models.	Mathematical Practices
S.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** **MP.5 Use appropriate tools strategically.** MP.6 Attend to precision. MP.7 Look for and make use of structure. **MP.8 Look for and express regularity in repeated reasoning.**

Modeling

Advanced Standards (+)/ STEM Pathway

Example

Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals and correlation coefficients.

Example:

Collect height, shoe-size, and wrist circumference data for each student. Determine the best way to display the data.

Answer the following questions:

- Is there a correlation between any two of the three indicators?
- Is there a correlation between all three indicators?
- What patterns and trends are apparent in the data?
- What inferences can be made from the data?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3c** Knowledge Constructor **5a,c** Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Interpreting Categorical and Quantitative Data

S.ID.C Interpret linear models.	Mathematical Practices
S.ID.C.9 Distinguish between correlation and causation. Modeling	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. **MP.3 Construct viable arguments and critique the reasoning of others.** **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Some data leads observers to believe that there is a cause and effect relationship when a strong relationship is observed. Students should be careful not to assume that correlation implies causation. The determination that one thing causes another requires a controlled randomized experiment.

Example:

Diane did a study for a health class about the effects of a student's end-of-year math test scores on height. Based on a graph of her data, she found that there was a direct relationship between students' math scores and height. She concluded that "doing well on your end-of-course math tests makes you tall." Is this conclusion justified? Explain any flaws in Diane's reasoning.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Cross-Disciplinary Connections

ISTE	Computer Science	
3d Knowledge Constructor **6a,b,c,d** Creative Communicator		☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Making Inferences and Justifying Conclusions

S.IC.D Understand and evaluate random processes underlying statistical experiments.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.IC.D.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
	3B-DA-06 Select data collection tools and techniques to generate data sets that support a claim or communicate information. **3B-DA-07** Evaluate the ability of models and simulations to test and support the refinement of hypotheses. **3B-AP-10** Use and adapt classic algorithms to solve computational problems.	☐ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

HS

Statistics and Probability

Making Inferences and Justifying Conclusions

S.IC.D Understand and evaluate random processes underlying statistical experiments.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
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MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.IC.D.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

Modeling

Example

Data--generating processes include (but are not limited to): flipping coins, spinning spinners, rolling a number cube, and simulations using the random number generators. Students may use graphing calculators, spreadsheet programs, or applets to conduct simulations and quickly perform large numbers of trials. The law of large numbers states that as the sample size increases, the experimental probability will approach the theoretical probability. Comparison of data from repetitions of the same experiment is part of the model building verification process.

Example:

Have multiple groups flip coins. One group flips a coin 5 times, one group flips a coin 20 times, and one group flips a coin 100 times.

- Which group's results will most likely approach the theoretical probability?
- A model says a spinning coin will fall heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Cross-Disciplinary Connections

ISTE	Computer Science	
3d Knowledge Constructor **4d** Innovative Designer **5a,b** Computational Thinker	**3B-DA-07** Evaluate the ability of models and simulations to test and support the refinement of hypotheses.	☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Making Inferences and Justifying Conclusions

S.IC.E Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.IC.E.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

Modeling

Example

Students should be able to explain techniques/applications for randomly selecting study subjects from a population and how those techniques/applications differ from those used to randomly assign existing subjects to control groups or experimental groups in a statistical experiment. In statistics, an observational study draws inferences about the possible effect of a treatment on subjects, where the assignment of subjects into a treated group versus a control group is outside the control of the investigator (for example, observing data on academic achievement and socio-economic status to see if there is a relationship between them). This is in contrast to controlled experiments, such as randomized controlled trials, where each subject is randomly assigned to a treated group or a control group before the start of the treatment.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

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Cross-Disciplinary Connections

ISTE	Computer Science	
3a,d Knowledge Constructor		☐ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

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Statistics and Probability

Making Inferences and Justifying Conclusions

S.IC .E Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
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MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.IC.E.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

Modeling

Example

Students may use computer generated simulation models based upon sample surveys results to estimate population statistics and margins of error.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.9-10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

W.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3a,d** Knowledge Constructor **5a,b** Computational Thinker **7b,c,d** Global Collaborator	**3A-DA-12** Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Making Inferences and Justifying Conclusions

S.IC.E Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Mathematical Practices

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MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.IC.E.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

Modeling

Example

Students may use computer generated simulation models to decide how likely it is that observed differences in a randomized experiment are due to chance. Treatment is a term used in the context of an experimental design to refer to any prescribed combination of values of explanatory variables.

Example: One wants to determine the effectiveness of weed killer. Two equal parcels of land in a neighborhood are treated; one with a placebo and one with weed killer to determine whether there is a significant difference in effectiveness in eliminating weeds.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.2.e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.9-10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

W.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

W.11-12.1.d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **5a,b,c** Computational Thinker	**3A-DA-12** Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	☑ **Computational Thinking** ☐ **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Making Inferences and Justifying Conclusions

S.IC.E Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
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MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.IC.E.6 Evaluate reports based on data.

Modeling

Example

Explanations can include but are not limited to sample size, biased survey sample, interval scale, unlabeled scale, uneven scale, and outliers that distort the line-of-best-fit. In a pictogram the symbol scale used can also be a source of distortion. As a strategy, collect reports published in the media and ask students to consider the source of the data, the design of the study, and the way the data are analyzed and displayed.

Example: A reporter used the two data sets below to calculate the mean housing price in Arizona as $629,000. Why is this calculation not representative of the typical housing price in Arizona? King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000} , Toby Ranch homes {5 million, 154000, 250000, 250000, 200000, 160000, 190000}.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

RI.9-10.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

RI.9-10.8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

SL.9-10.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

RI.11-12.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

CVE

CV12.3.2 College and career-ready students identify trends, forecast possibilities, and explore complex systems and issues.

Cross-Disciplinary Connections

ISTE

1c Empowered Learner
3a,b,c,d Knowledge Constructor
4a,d Innovative Designer
5a,b,c Computational Thinker
6a,b,c,d Creative Communicator
7b,c,d Global Collaborator

Computer Science

3B-DA-07 Evaluate the ability of models and simulations to test and support the refinement of hypotheses.

- [x] **Computational Thinking**
- [ ] **Financial Literacy**

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.F Understand independence and conditional probability and use them to interpret data.	Mathematical Practices
S.CP.F.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	MP.1 Make sense of problems and persevere in solving them. **MP.2 Reason abstractly and quantitatively.** MP.3 Construct viable arguments and critique the reasoning of others. **MP.4 Model with mathematics.** MP.5 Use appropriate tools strategically. **MP.6 Attend to precision.** **MP.7 Look for and make use of structure.** MP.8 Look for and express regularity in repeated reasoning.

Example

Intersection: The intersection of two sets A and B is the set of elements that are common to both set A and set B. It is denoted by A ∩ B and is read 'A intersection B.'

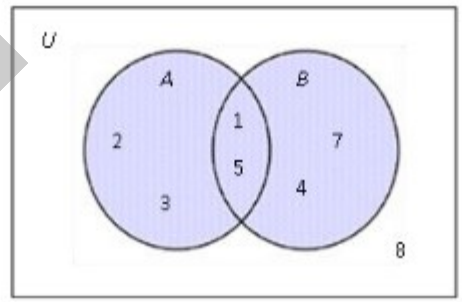
- A ∩ B in the diagram is {1, 5}, ∩ means BOTH/AND.

Union: The union of two sets A and B is the set of elements, which are in A or in B or in both. It is denoted by A u B and is read 'A union B.'

- A u B in the diagram is {1, 2, 3, 4, 5, 7} , u means: EITHER/OR/ANY, u could be both.

Complement: The complement of the set A u B is the set of elements that are members of the universal set U but are not in A u B. It is denoted by (A u B)'.

- (A u B)' in the diagram is {8}.



Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Advanced Standards (+)/ STEM Pathway

Cross-Disciplinary Connections

ISTE	Computer Science	
6a,b,c,d Creative Communicator		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.F Understand independence and conditional probability and use them to interpret data.	Mathematical Practices
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Advanced Standards (+)/ STEM Pathway

S.CP.F.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.F Understand independence and conditional probability and use them to interpret data.

Mathematical Practices

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MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.CP.F.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

Modeling

Example

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.F Understand independence and conditional probability and use them to interpret data.

Mathematical Practices

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MP.3 Construct viable arguments and critique the reasoning of others.
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MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.CP.F.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

Modeling

Example

Students may use spreadsheets, graphing calculators, and simulations to create frequency tables and conduct analyses to determine if events are independent or determine approximate conditional probabilities.

Example:

Collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner **3d** Knowledge Constructor **5b,c** Computational Thinker		☑ **Computational Thinking** ☐ **Financial Literacy**

DRAFT

HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.F Understand independence and conditional probability and use them to interpret data.

Mathematical Practices

S.CP.F.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

Modeling

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

Example

Example:

- What is the probability of drawing a heart from a standard deck of cards on a second draw, given that a heart was drawn on the first draw and not replaced? Are these events independent or dependent?
- At Johnson Middle School, the probability that a student takes computer science and French is 0.062. The probability that a student takes computer science is 0.43. What is the probability that a student takes French given that the student is taking computer science.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

ELA

W.9-10.2.d Use precise language and domain-specific vocabulary to manage the complexity of the topic.

W.11-12.2.d Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Cross-Disciplinary Connections

ISTE	Computer Science	
1c Empowered Learner		☑ **Computational Thinking**
3d Knowledge Constructor		☐ **Financial Literacy**
5b Computational Thinker		
6a,b,c,d Creative Communicator		

DRAFT

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.G Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Mathematical Practices

MP.1 **Make sense of problems and persevere in solving them.**
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 **Model with mathematics.**
MP.5 **Use appropriate tools strategically.**
MP.6 Attend to precision.
MP.7 **Look for and make use of structure.**
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.CP.G.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

Modeling

Example

Students could use graphing calculators, simulations, or applets to model probability experiments and interpret the outcomes.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Science

HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex biotic and abiotic interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a modified ecosystem.

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.G Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
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MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.CP.G.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

Modeling

Example

Students could use graphing calculators, simulations, or applets to model probability experiments and interpret the outcomes.

Example:

In a math class of 32 students, 18 are boys and 14 are girls. On a unit test, 5 boys and 7 girls made an A grade. If a student is chosen at random from the class, what is the probability of choosing a girl or an A student?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.G Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.CP.G.8 Apply the general Multiplication Rule in a uniform probability model, P(A and B) = [P(A)]x [P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.

Modeling

Example

Students could use graphing calculators, simulations, or applets to model probability experiments and interpret the outcomes.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Conditional Probability and the Rules of Probability

S.CP.G Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Mathematical Practices

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MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
S.CP.G.9 Use permutations and combinations to compute probabilities of compound events and solve problems.

Modeling

Example

Students may use calculators or computers to determine sample spaces and probabilities.

Example:

You and two friends go to the grocery store and each buys a soda. If there are five different kinds of soda, and each friend is equally likely to buy each variety, what is the probability that no one buys the same kind?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability
Using probability to Make Decisions

S.MD.H Calculate expected values and use them to solve problems.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.MD.H.1 Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.

Modeling

Example

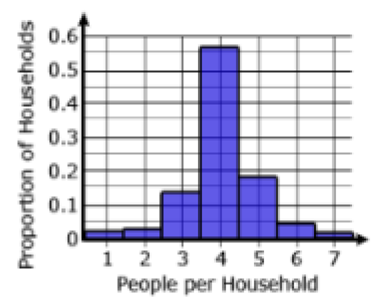
Students may use spreadsheets, graphing calculators and statistical software to represent data in multiple forms.

Example:

Suppose you are working for a contractor who is designing new homes. She wants to ensure that the home models match the demographics for the area. She asks you to research the size of households in the region in order to better inform the floor plans of the home.

Solution: A possible solution could be the result of research organized in a variety of forms. In this case, the results of the research are shown in a table and graph. The student has defined their variable as x as the number of people per household.

People per Household	Proportion of Households
1	0.026
2	0.031
3	0.132
4	0.567
5	0.181
6	0.048
7	0.015



Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

DRAFT

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability
Using probability to Make Decisions

S.MD.H Calculate expected values and use them to solve problems.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
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MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
S.MD.H.2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

Modeling

Example

Students may use spreadsheets or graphing calculators to complete calculations or create probability models. The expected value of an uncertain event is the sum of the possible points earned multiplied by each point's chance of occurring.

Example: In a game, you roll a six sided number cube numbered with 1, 2, 3, 4, 5 and 6. You earn 3 points if a 6 comes up, 6 points if a 2, 4 or 5 come up and nothing otherwise. Since there is a 1/6 chance of each number coming up, the outcomes, probabilities and payoffs look like this:

Outcome	Probability	Points
1	1/6	0 points
2	1/6	6 points
3	1/6	0 points
4	1/6	6 points
5	1/6	6 points
6	1/6	3 points

The expected value is the sum of the products of the probability and points earned for each outcome (the entries in the last two columns multiplied together):

$$\left(\frac{1}{6}\right)\bullet 0+\left(\frac{1}{6}\right)\bullet 6+\left(\frac{1}{6}\right)\bullet 0+\left(\frac{1}{6}\right)\bullet 6+\left(\frac{1}{6}\right)\bullet 6+\left(\frac{1}{6}\right)\bullet 3=3.50\text{points}$$

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Statistics and Probability
Using probability to Make Decisions

S.MD.H Calculate expected values and use them to solve problems.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway
S.MD.H.3 Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.

Modeling

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Example: For the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
		☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Using probability to Make Decisions

S.MD.H Calculate expected values and use them to solve problems.

Mathematical Practices

MP.1 **Make sense of problems and persevere in solving them.**
MP.2 Reason abstractly and quantitatively.
MP.3 **Construct viable arguments and critique the reasoning of others.**
MP.4 **Model with mathematics.**
MP.5 **Use appropriate tools strategically.**
MP.6 Attend to precision.
MP.7 **Look for and make use of structure.**
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.MD.H.4 Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

Modeling

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Example: Find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	
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Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Using probability to Make Decisions

S.MD.I Use probability to evaluate outcomes of decisions.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.MD.I.5 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

A. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.
B. Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.

Modeling

Example

Different types of insurance to be discussed include but are not limited to: health, automobile, property, rental, and life insurance. Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Example: Find the expected winnings from a state lottery ticket or a game at a fast food restaurant.

Example: Compare a high deductible versus a low deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS

Wyoming 2018 Mathematics Content and Performance Standards

Statistics and Probability

Using probability to Make Decisions

S.MD.I Calculate expected values and use them to solve problems.

Mathematical Practices

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
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MP.4 Model with mathematics.
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MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.MD.I.6 Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

Modeling

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

Cross-Disciplinary Connections

ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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Wyoming 2018 Mathematics Content and Performance Standards

HS

Statistics and Probability
Using probability to Make Decisions

S.MD.I Calculate expected values and use them to solve problems.

Mathematical Practices

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MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Advanced Standards (+)/ STEM Pathway

S.MD.I.7 Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Modeling

Example

Students may use graphing calculators or programs, spreadsheets, or computer algebra systems to model and interpret parameters in linear, quadratic or exponential functions.

Source: http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/

Wyoming Cross-Disciplinary Connections

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ISTE	Computer Science	☐ Computational Thinking ☐ Financial Literacy

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HS - Statistics and Probability Resources

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<tr><td>S.ID.A.3 on page 402.</td><td>Hunting in Wyoming:
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https://wgfd.wyo.gov/Hunting/Drawing-Odds</td></tr>
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S.IC.D.2 on page 410.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
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S.MD.I.6 on page 429.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
S.MD.I.7 on page 430.	http://www.azed.gov/standards-practices/k-12standards/mathematics-standards/
Grade Level Math Practices on page 261.	Source: www.k12.wa.us/corestandards/pubdocs/mpbygradelevel.pdf Adapted from Arizona Department of Education Mathematics Standards—2010

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Appendices/Resources

Appendix A: Glossaries and Resources

Appendix B: Computer Science Teacher's Association (CSTA) Standards

Appendix C: International Society for Technology in Education (ISTE) Standards

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2018 WYOMING SCIENCE EXTENDED

CONTENT AND PERFORMANCE STANDARDS

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TO BE FULLY IMPLEMENTED IN DISTRICTS BY THE BEGINNING OF SCHOOL YEAR 2021-2022

ACKNOWLEDGEMENT

The Wyoming State Board of Education would like to thank the Wyoming Department of Education, as well as educators, parents, students, community college representatives, business and industry representatives, community members, and the University of Wyoming representatives for their assistance with the development of these science extended standards.

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

For Students with the Most Significant Cognitive Disabilities

INTRODUCTION

The current federal mandate, Elementary and Secondary Education Act (ESEA) of 1965 and Every Student Succeeds Act (ESSA) of 2015 require that all students participate in all district and statewide assessments with appropriate accommodations, as necessary.

The Individuals with Disabilities Act of 2004 (IDEA 2004) requires students with the most significant cognitive disabilities be assessed in the same grades as regular education students and to have access to challenging, instructional opportunities linked to the State Standards. These instructional targets are defined in the Extended Content & Performance Standards.

RATIONALE

Wyoming has high academic expectations of all students as evidenced in the Wyoming Content and Performance Standards. The committee, which developed the Science Extended Standards for students with the most significant cognitive disabilities, recognizes the mission of science instruction as providing the essential skills that allow these students to achieve high academic expectations and to access the general academic curriculum. Instructional opportunities addressing the rigorous Extended Content Standards, combined with instructionally supportive assessments, provide targets which enable all students to achieve high standards of academic performance.

The basis of the Science Extended Content Standards is to provide a K-12 framework for instruction for students with the most significant cognitive disabilities (less than 1% of students) and to assist school districts, schools, and communities in developing and strengthening curriculum. These Standards specify the essential learning that these students must master. Teachers ensure that students achieve mastery by using a range of instructional strategies they select based on students' needs and grade-specific, linked Extended Content Standards and Benchmarks. The specifics of how students learn the knowledge and skills are determined at the district level.

Students with the most significant cognitive disabilities vary widely in their forms of communication and access skills. The basic skills crucial to successful science instruction are embedded at all benchmark levels. A teacher's instruction to these crucial skills is differentiated on an individual basis, dependent on the student's skills, ability, and communication level. Students with the most significant cognitive disabilities access challenging standards at varying levels of complexity and often through the use of a wide range of accommodations and assistive technology.

ORGANIZATION OF EXTENDED ACADEMIC STANDARDS

The Science Extended Content Standards specify the essential learning that must be mastered, by each grade and throughout the student's K-12 education. Kindergarten through fifth grade teachers, students, and parents work toward the achievement of grade-level specific academic benchmarks. Sixth through eighth grade and ninth through twelfth grade teachers, students, and parents work toward the achievement of the middle school grade-band and the high school grade-band academic benchmarks, respectively. Success at each benchmark level requires the effort and commitment of all who prepare for that level.

The Science Standards are organized into grades K, 1, 2, 3, 4, 5, and into grade spans: 6 – 8, and 9 – 12. They are presented in a three-column format. The first column shows the Performance Expectation (benchmark) for the general 2016 Science Standards. The second column is a statement of the extended science benchmark. The third column lists the Performance Level Descriptors (PLDs) in four levels and provides some examples for educators from which to draw. The PLDs define the consistency and levels of independence associated with the Benchmark as the cognitive complexity and performance of the skill increases from a Level 1 (most basic) to a Level 4 (more complex).

The standards are organized into four Domains: 1) Physical Science (PS), 2) Life Science (LS), 3) Earth and Space Science (ESS), and 4) Engineering, Technology, and Applications of Science (ETS). Each Science Extended Standard (SES) is an extension of the general Science Standards. In some instances, two Benchmarks have been combined or integrated and so are represented in the Benchmark column. Teachers should be informed of the requirements at the next level of Benchmarks, as they prepare instruction for the current grade level of individual students, in order that prerequisite skills are introduced and addressed over time. They must also be informed of the requirements at the previous level so they provide practice opportunities and application for skills that have already been mastered.

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ORGANIZATION OF STANDARDS

The 2018 Science Extended Standards are an extension of the 2016 Science Standards which were informed by *A Framework for K-12 Science Education* (National Research Council, 2012), the Next Generation Science Standards (National Academies Press, 2013), and the unique needs of Wyoming. They are distinct from prior science standards in that they integrate three dimensions of learning within each standard and have intentional connections across standards, grade bands, and subjects. The three dimensions are crosscutting concepts, disciplinary core ideas, and science and engineering practices.

2018 Wyoming Science Extended Content and Performance Standards

Physical Science	PS1 - Matter and Its Interactions	K	1	2	3	4	5	6-8	9-12
	PS2 - Motion and Stability: Forces and interactions	K	1	2	3	4	5	6-8	9-12
	PS3 - Energy	K	1	2	3	4	5	6-8	9-12
	PS4 - Waves and Their Applications in Technologies for Information Transfer	K	1	2	3	4	5	6-8	9-12
Life Science	LS1 - From Molecules to Organisms: Structure and Processes	K	1	2	3	4	5	6-8	9-12
	LS2 - Ecology: Interactions, Energy, and Dynamics	K	1	2	3	4	5	6-8	9-12
	LS3 - Heredity: Inheritance and Variation of Traits	K	1	2	3	4	5	6-8	9-12
	LS4 - Biological Evolution: Unity and Diversity	K	1	2	3	4	5	6-8	9-12
Earth & Space	ESS1 - Earth's Place in the Universe	K	1	2	3	4	5	6-8	9-12
	ESS2 - Earth's Systems	K	1	2	3	4	5	6-8	9-12
	ESS3 - Earth and Human Activity	K	1	2	3	4	5	6-8	9-12
ETS	ETS - Engineering, Technology, and Applications of Science	K	1	2	3	4	5	6-8	9-12

Grade Level

Science Benchmark

4-ESS1-1 means Grade 4, Earth & Space Science, Standard 1, Benchmark 1.

Science Standard

Performance Level Descriptors (PLDs)

PLDs help teachers assess the student's performance of the benchmark.

Level IV - Advanced, Level III - Proficient, Level II - Basic, Level I - Below Basic.

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. Clarification Statement: Examples of evidence from patterns (may include, but not limited to, Wyoming specific examples) could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.	SES-4-ESS1-1. Describe that landscapes can change.	**Level IV Students will:** Describe/communicate that landscapes can change over time. *Ex. Use a picture of river eroding the landscape, videos of lava flowing from volcanoes, etc.* **Level III Students will:** Describe that landscapes can change. *Ex. Use pictures of a volcano blowing up, land side, tsunami, etc.* **Level II Students will:** Make observations of landscape differences. *Ex. Compare pictures of different landscapes.* **Level I Students will:** Attend to a presentation of landscapes.

Clarification Statement

Provides further explanation or examples to support educators.

Symbol

Wyoming examples are given or can be considered in instruction.

Science Extended Benchmark

SES-4-ESS1-1 means Science Extended Standard, Grade 4, Earth & Space Science, Standard 1, Benchmark 1.

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS CONTENT REVIEW COMMITTEE (2017 – 2018)

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.	**SES-K-PS2-1. Identify the effects of pushes and pulls on the motion of an object.**	**Level IV Students will:** **Conduct an investigation to compare the effects of different strengths, or different directions, of pushes and pulls on the motion of an object**. *Ex. Make predictions about the motions of an object (e.g., What will happen if an object is pushed harder?).* *Ex. Guided investigation with items to show cause and effect when an object is pushed hard or soft, uphill, downhill.* **Level III Students will:** **Identify the effects of pushes and pulls on the motion of an object.** *Ex. People must push harder to move their bikes, skateboards, or scooters to go faster or as they go up a hill.* *Ex. Information about motion can be represented in pictures, illustrations, and simple charts.* **Level II Students will:** **Participate in activities that demonstrate how different objects move.** *Ex. People use pushes and pulls to move everyday objects such as skateboards, scooters, or wagons.* **Level I Students will:** **Attend to activities that demonstrate how objects move.** *Ex. Objects (e.g. toy cars, balls, etc.) can be moved through force.*
K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.	**SES-K-PS2-2. Identify changes in the speed of an object that occur with a push or pull.**	**Level IV Students will:** **Determine if a design solution works as intended to change the speed of an object with a push or a pull.** *Ex. Determine whether or not a marble moves through a course as intended.* **Level III Students will:** **Identify changes in the speed of an object that occur with a push or pull.** *Ex. Pushing or pulling on an object can change the speed.* **Level II Students will:** **Investigate changes in the speed of an object that occur with a push or pull.** *Ex. Push a marble down a ramp.* **Level I Students will:** **Attend to objects being pushed and pulled.** *Ex. A ball can be pushed or pulled.*

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 – Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.	**SES-K-PS3-1. Identify the effect of sunlight on Earth's surface.**	**Level IV Students will:** **Make observations to determine the effect of sunlight on Earth's surface.** *Ex.* Observe the differences in temperature and light using *objects (e.g. sand, soil, rocks, and water) that have been in and out of the sun.* **Level III Students will:** **Identify the effect of sunlight on Earth's surface.** *Ex. The sun provides heat and light to the Earth. (Impact terms e.g., Heat, light) The sun makes me warm.* *Ex. There are differences between night and day. (Qualitative Labels e.g., light, dark) The sun gives me light.* **Level II Students will:** **Identify the sun as a source of heat and light.** *Ex. Provided with a picture of the moon and the sun student can choose which provides heat.* *Ex. Given 2 pictures student chooses picture of daytime.* **Level I Students will:** **Attend to activities that demonstrate the effect of sunlight on the Earth's surface.**
K-PS3-2. Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.	**SES-K-PS3-2. Identify structures that will reduce the warming effect of sunlight.**	**Level IV Students will:** **Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.** *Ex. Use clay to build a shaded area.* **Level III Students will:** **Identify structures that will reduce the warming effect of sunlight.** *Ex. umbrella, tree shade, etc.* **Level II Students will:** **Recognize that certain structures reduce the warming effect of sunlight.** *Ex. Notice the difference in temperature under the shade and directly in the sun.* **Level I Students will:** **Attend to activities that demonstrate how structures reduce the warming effect of sunlight.**

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LS1 – From Molecules to Organisms: Structures & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. Clarification Statement: Examples of patterns could include that animals need to take in food but plants make their own food; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.	**SES-K-LS1-1. Describe the basic needs that animals have for survival.**	**Level IV Students will:** **Identify things in the environment that provide basic needs for plants and animals to survive.** *Ex. Some animals eat plants, plants need water and sun.* **Level III Students will:** **Describe the basic needs that animals have for survival.** *Ex. Animals need food, water, shelter.* **Level II Students will:** **Identify a basic need that living things require for survival.** *Ex. Show pictures of items that an animal may need to survive or not (shelter, food, air, water).* **Level I Students will:** **Attend to activities demonstrating the basic needs of living things.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time. Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.	**SES-K-ESS2-1. Identify local weather conditions.**	**Level IV Students will:** **Share observations of weather conditions using qualitative labels and quantitative labels**. *Ex. Daily weather charting.* **Level III Students will:** **Identify local weather conditions** *Ex. sunny, cloudy, rainy, and warm (Today is sunny and warm.)* **Level II Students will:** **Match materials appropriate for weather.** *Ex. clothing, recreation, or transportation for rain, snow, sun, etc.* **Level I Students will:** **Attend to activities that demonstrate changes in weather.**
K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.	**SES-K-ESS2-2.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not Applicable.**

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ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-ESS3-1. Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested and rangeland areas; and, grasses need sunlight so they often grow in meadows and prairies. Plants, animals, and their surroundings make up a system.	**SES-K-ESS3-1. Describe how animals meet their needs based on where they live.**	**Level IV Students will:** **Demonstrate the relationship between the needs of animals and the places they live.** *Ex. Draw a picture of an animal in their "home".* **Level III Students will:** **Describe how animals meet their needs based on where they live.** *Ex. Deer live in the forest because the forest provides food and shelter.* **Level II Students will:** **Match animals to the place they live.** *Ex. Deer to forest, Fish to water.* **Level I Students will:** **Attend to activities that demonstrate the relationship between animals and where they live.**
K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. Clarification Statement: Emphasis is on local forms of severe weather.	**SES-K-ESS3-2. Identify and communicate local forms of severe weather and their warning signals.**	**Level IV Students will:** **Identify, and communicate, local forms of severe weather and demonstrate an appropriate response.** *Ex. Depending on location this could include tornados/earthquakes, go to a secure area.* **Level III Students will:** **Identify, and communicate, local forms of severe weather and their warning signals.** *Ex. A siren would sound if a tornado is coming.* *Ex. An emergency broadcast system or alarm system as utilized on media (TV, radio, computer, phone).* **Level II Students will:** **Recognize local forms of severe weather.** *Ex. tornados, earthquakes, storms, blizzards, etc.* **Level I Students will:** **Attend to activities that demonstrate local forms of severe weather.**
K -ESS3-3. Communicate solutions that will manage the impact of humans on the land, water, air, and/or other living things in the local environment. Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.	**SES-K-ESS3-3.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not Applicable.**

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K-2-ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	**SES-K-2-ETS1-1. Identify appropriate tool(s) when presented with a problem.**	**Level IV Students will:** **Represent a tool, existing or nonexistent, to solve a given problem.** **Level III Students will:** **Identify appropriate tool(s) when presented with a problem.** *Ex. Would you brush your teeth with a toothbrush or a screwdriver?* **Level II Students will:** **Match the tool to the use.** *Ex. toothbrush - teeth, screwdriver- screw, hammer – nail, etc.* **Level I Students will:** **Attend to activities that demonstrate tools being used to solve problems.**
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	**SES-K-2-ETS1-2. Identify the shape of an object and its function.**	**Level IV Students will:** **Represent how the shape of an object helps it function as needed to solve a given problem.** *Ex. Show how a spoon will work better than a fork to eat soup because it is rounded.* **Level III Students will:** **Identify the shape of an object and its function.** *Ex. A ball is round so it can roll.* *Ex: A tire is round so it can roll.* **Level II Students will:** **Match an object with a shape.** *Ex. A ball is a circle, a block is a square.* **Level I Students will:** **Attend to activities that demonstrate how the shape of objects help it function as needed to solve a given problem.**
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**SES-K-2-ETS1-3. Identify the differences of two objects designed to solve the same problem.**	**Level IV Students will:** **Test and compare the differences of two objects designed to solve the same problem.** *Ex. Try to eat soup with a fork and a spoon and communicate the results.* *Ex. Compare shoes with laces to shoes with Velcro.* **Level III Students will:** **Identify the differences of two objects designed to solve the same problem.** *Ex. Discuss the differences between using a fork or a spoon to eat soup.* **Level II Students will:** **Match the tool to solve the given problem.** *Ex. spoon with soup, fork with meat, hammer with nail, screwdriver and screw, etc.* **Level I Students will:** **Attend to activities that compare two objects designed to solve the same problem.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.	**SES-1-PS4-1. Demonstrate that a material can produce sound through vibration.**	**Level IV Students will:** **Conduct an investigation to demonstrate that various materials can produce different sounds through vibration.** *Ex. When plucking a string or flicking a ruler, notice the different sounds; utilize technology that shows sound waves when you make a sound.* **Level III Students will:** **Demonstrate that a material can produce sound through vibration.** *Ex. With a tuning fork, rubber band, or container of water sitting on drum - pound the drum and watch the vibrations in the water, etc.* **Level II Students will:** **Recognize that vibration can cause sound.** *Ex. Listening to different sounds made by vibrating materials* **Level I Students will:** **Attend to activities that demonstrate how sounds can be made through vibrating materials.**
1-PS4-2. Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated. Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.	**SES-1-PS4-2. Demonstrate and communicate that objects in darkness can be seen with a light source.**	**Level IV Students will:** **Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** **Level III Students will:** **Demonstrate, and communicate, that objects in darkness can be seen with a light source.** *Ex. Communicate that they cannot see all properties of an object in the dark need to shine a light on a dark object.* **Level II Students will:** **Identify that objects can be seen when provided with a light source.** *Ex: Have students look into a dark box and identify that they cannot see an object, vs. when light is available they can see an object in the box.* **Level I Students will:** **Attend to activities that demonstrate that objects can be seen with a light source.**

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PS4 – Waves and Their Applications in Technologies for Information Transfer (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-PS4-3. Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light. Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).	**SES-1-PS4-3. Identify a material that will allow a beam of light to shine through.**	**Level IV Students will:** **Demonstrate how different materials change the path of a beam of light.** *Ex. Transparent, translucent, opaque, reflective items and how they change/do not change the path of a beam of light.* **Level III Students will:** **Identify a material that will allow a beam of light to shine through.** *Ex. glass, plastic bag, cardboard, wax paper, clear plastic, etc.* **Level II Students will:** **Investigate how different materials change the path of a beam of light.** *Ex. glass, plastic bag, cardboard, clear plastic, etc.* **Level I Students will:** **Attend to activities that demonstrate how different materials change the path of a beam of light.**
1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.	**SES-1-PS4-4. Identify multiple devices that communicate over a distance.**	**Level IV Students will:** **Create a device that communicates over a distance.** *Ex. paper cup and string "telephones", drum beat pattern, flashlight signal, etc.* **Level III Students will:** **Identify multiple devices that communicate over a distance.** *Ex. doorbell, phone, whistle, stoplight, school bell system, etc.* **Level II Students will:** **Identify one device that uses sound to communicate over a distance.** **Level I Students will:** **Attend to activities that demonstrate how devices communicate over a distance.**

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LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, pine cone scales, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.	**SES-1-LS1-1. Identify an object used by humans that mimics an animal's or a plant's external parts.**	**Level IV Students will:** **Compare the animal/plant external parts to the human object and how they serve similar purposes.** *Ex. bike helmet-turtle shell, clothing- fur, purse- kangaroo pouch, umbrella- leaves, etc.* **Level III Students will:** **Identify an object used by humans that mimics an animal's or a plant's external parts.** *Ex. Bike helmet-turtle shell, clothing- fur, purse- kangaroo pouch, umbrella- leaves, cultural examples may be included here.* **Level II Students will:** **Match the animal/plant external part to the human object that serves a similar purpose.** *Ex. Bike helmet-turtle shell, clothing- fur, purse- kangaroo pouch, umbrella- leaves, cultural examples may be included here.* **Level I Students will:** **Attend to activities that compare an animal's or plant's external parts to human objects that solve problems.**
1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).	**SES-1-LS1-2. Identify behavior of parents and offspring that help the offspring survive.**	**Level IV Students will:** **Determine similarities of different parent and offspring behavior to ensure survival when being exposed to text and media.** *Ex. Show different clips of parents feeding offspring and notice that offspring and parents are different in the way that the offspring needs the parent to be fed and parents can get their own food for survival.* **Level III Students will:** **Identify behavior of parents and offspring that help the offspring survive.** *Ex. Baby birds chirp and parent birds feed them.* **Level II Students will:** **Match pictures of offspring behaviors to their parents' response to ensure survival.** *Ex. parent with bottle- baby crying, bird with worm- chick chirping, etc.* **Level I Students will:** **Attend to activities that demonstrate the connection between offspring behaviors, to parent responses, that ensure survival.**

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LS3 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.	**SES-1-LS3-1. Given a variety of choices, match images of parents and their offspring.**	**Level IV Students will:** **Observe and communicate how adults and their offspring are alike but are not identical.** *Ex. Baby chicks and chickens both have feathers but the baby chick is yellow and the adult chicken is white.* **Level III Students will:** **Given a variety of choices, match images of parents and their offspring.** *Ex. chicken/chick, horse/foal, human/baby, cow/calf, cat/kitten, dog/pup, etc.* **Level II Students will:** **Given two choices, match the offspring to the correct parent.** *Ex. horse and cow /calf, human and cat/ baby, dog and horse/pup, etc.* **Level I Students will:** **Attend to activities that demonstrate how adult animals are similar but not identical to their offspring.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

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ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted. Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.	**SES-1-ESS1-1. Identify which objects are found in the sky during the day and at night.**	**Level IV Students will:** **Demonstrate how the moon, sun and stars can be observed at different times of the day and night.** *Ex. This could include sorting image cards, a model, or a description.* **Level III Students will:** **Identify which objects are found in the sky during the day and at night.** *Ex. The sun is seen during the day, the stars are seen at night.* **Level II Students will:** **Distinguish between daytime sky and nighttime sky** *Ex. Show two pictures, sort pictures of day and night.* **Level I Students will:** **Attend to activities that demonstrate how objects found in the sky are different during the day and night.**
1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year. Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.	**SES-1-ESS1-2.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**

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K-2-ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	**SES-K-2-ETS1-1. Identify appropriate tool(s) when presented with a problem.**	**Level IV Students will:** **Represent a tool, existing or nonexistent, to solve a given problem.** **Level III Students will:** **Identify appropriate tool(s) when presented with a problem.** *Ex. Would you brush your teeth with a toothbrush or a screwdriver?* **Level II Students will:** **Match the tool to the use.** *Ex. toothbrush - teeth, screwdriver- screw, hammer – nail, etc.* **Level I Students will:** **Attend to activities that demonstrate tools being used to solve problems.**
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	**SES-K-2-ETS1-2. Identify the shape of an object and its function.**	**Level IV Students will:** **Represent how the shape of an object helps it function as needed to solve a given problem.** *Ex. Show how a spoon will work better than a fork to eat soup because it is rounded.* *Ex. Compare shoes with laces to shoes with Velcro.* **Level III Students will:** **Identify the shape of an object and its function.** *Ex. A ball is round so it can roll.* *Ex: A tire is round so it can roll.* **Level II Students will:** **Match an object with a shape.** *Ex. A ball is a circle, a block and a square.* **Level I Students will:** **Attend to activities that demonstrate how the shape of objects help it function as needed to solve a given problem.**
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**SES-K-2-ETS1-3. Identify the differences of two objects designed to solve the same problem.**	**Level IV Students will:** **Test and compare the differences of two objects designed to solve the same problem.** *Ex. Try to eat soup with a fork and a spoon and communicate the results.* **Level III Students will:** **Identify the differences of two objects designed to solve the same problem.** *Ex. Discuss the differences between using a fork or a spoon to eat soup.* **Level II Students will:** **Match the tool to solve the given problem.** *Ex. spoon with soup, fork with meat, hammer with nail, screwdriver and screw, etc.* **Level I Students will:** **Attend to activities that compare two objects designed to solve the same problem.**

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PS1 – Matter and Its Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.	**SES-2-PS1-1. Describe a material based on its observable properties.**	**Level IV Students will:** **Compare different materials based on their observable properties.** *Ex. Feel the properties of a rock, cotton, slime, and communicate similar and different properties.* **Level III Students will:** **Describe a material based on its observable properties.** *Ex. Feel a rock and describe the properties felt.* **Level II Students will:** **Identify different properties of materials.** *Ex. smooth, rough, porous, etc.* **Level I Students will:** **Attend to activities that demonstrate observable properties of materials.**
2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.	**SES-2-PS1-2. Determine the material that is best suited for an intended purpose.**	**Level IV Students will:** **Investigate, and communicate, the properties of a material that makes it best suited for an intended purpose.** *Ex A cloth is absorbent so it will soak up water. A brick is hard so it is good to build with.* **Level III Students will:** **Determine the material that is best suited for an intended purpose.** *Ex. cotton ball/ bricks- house, brick/paper towel-spill, etc.* **Level II Students will:** **Sort different materials by their properties.** *Ex. strength-nails, flexibility-rubber band, hardness- brick, texture-sandpaper, absorbency-paper towel, etc.* **Level I Students will:** **Attend to activities that demonstrate materials being used for their intended purpose.**

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PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.	**SES-2-PS1-3. Demonstrate that smaller pieces can make a larger object.**	**Level IV Students will:** **Demonstrate that one object can be taken apart and made into a new object.** *Ex. Such as using smaller geometric shapes and creating a different shape; using four squares to make a rectangle.* **Level III Students will:** **Demonstrate that smaller pieces can make a larger object.** *Ex. Can be a computer generated item, or puzzle pieces of three pieces or more.* **Level II Students will:** **Explore that smaller pieces can make an object.** *Ex. Can be a computer-generated item, Unifix cubes, Legos, puzzle, etc.* **Level I Students will:** **Attend to activities that demonstrate that smaller pieces can make a larger object.**
2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.	**SES-2-PS1-4. Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot, and identify an item that changes with heating or cooling.**	**Level IV Students will:** **Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot, and communicate some properties that changed.** *Ex. Water being frozen and then returned to water is an example of a reversible change; pancake batter cannot be reversed after cooking. Boiling an egg cannot be reversed after heating.* **Level III Students will:** **Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot, and identify an item that changes with heating or cooling.** *Ex. See level IV for ideas.* **Level II Students will:** **Participate in a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot.** **Level I Students will:** **Attend to a guided investigation which demonstrates how some changes caused by heating and cooling can be reversed and some cannot.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS2 – Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.	**SES-2-LS2-1. Participate in a guided investigation to determine if plants need water to grow, and communicate any observable changes.**	**Level IV Students will:** **Participate in a guided investigation to determine if plants need water to grow, and communicate that plants need water to grow.** *Ex. Do not water a plant and have a control plant that does get water.* **Level III Students will:** **Participate in a guided investigation to determine if plants need water to grow, and communicate any observable changes.** *Ex. The plant changed color, the plant wilted, the plant no longer grows, etc.* **Level II Students will:** **Participate in a guided investigation to determine if plants need water to grow.** **Level I Students will:** **Attend to a guided investigation to determine if plants need water to grow.**
2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. Clarification Statement: Examples could include the natural structure of an animal that helps it disperse seeds (e.g., hair that snares seeds, squirrel cheek pouches that transport seeds) or that helps it pollinate plants (e.g., bees have fuzzy bodies to which pollen sticks, hummingbirds' bodies transport pollen).	**SES-2-LS2-2. Participate in activities that demonstrate pollination or seeding, and communicate a way that seeds are dispersed.**	**Level IV Students will:** **Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.** *Ex. Use a cotton ball to represent bees pollinate flowers, play to act out pollination, play to pretend to be birds dropping seeds, etc.* **Level III Students will:** **Participate in activities that demonstrate pollination or seeding, and communicate a way that seeds are dispersed.** *Ex. dandelion seeds float in the air, seeds caught on socks, animals spread seeds, etc.* **Level II Students will:** **Participate in activities that demonstrate pollination or seeding.** **Level I Students will:** **Attend to, or participate in, activities that demonstrate pollination or seeding.**

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LS4 – Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.	**SES-2-LS4-1. Make a model of an animal in its habitat.**	**Level IV Students will:** **Model, and describe, the habitat of an animal.** *Ex. Draw a picture of a monkey in the jungle and what would need to be in the jungle for the monkey to survive.* **Level III Students will:** **Make a model of an animal in its habitat.** *Ex. Can be done with characters, drawings, clay, or any medium.* **Level II Students will:** **Match an animal to its correct habitat.** *Ex. fish - water; bear – woods, etc.* **Level I Students will:** **Attend to activities that demonstrate diversity of life in different habitats.**

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly. Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.	**SES-2-ESS1-1.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.** **Covered in ESS2-1**	**Not applicable**

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ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.	**SES-2-ESS2-1. Participate in activities that demonstrate a design made to slow or prevent water from passing, and communicate the changes.**	**Level IV Students will:** **Develop a simple model that demonstrates a design made to slow or prevent water from passing.** *Ex. Toothpicks in sand to mimic a beaver dam.* **Level III Students will:** **Participate in activities that demonstrate a design made to slow or prevent water from passing, and communicate changes.** *Ex. Different barriers changing the amount of water flowing through a course.* **Level II Students will:** **Participate in activities that demonstrate a design made to slow or prevent water from passing.** **Level I Students will:** **Attend to activities that demonstrate a design made to slow or prevent water from passing.**
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.	**SES-2-ESS2-2. Given a visual representation, communicate the difference between bodies of water and landforms.**	**Level IV Students will:** **Develop a model that represents the natural world to differentiate between landforms and water.** *Ex. Can include using clay, drawing, diagram, etc.* **Level III Students will:** **Given a visual representation, communicate the difference between bodies of water and landforms.** *Ex. map, globe, pictures, etc.* **Level II Students will:** **Identify a body of water or a land form.** *Ex. Point to the picture of a lake when given the choice between a lake and a mountain.* **Level I Students will:** **Attend to activities that model representations of landforms and bodies of water.**
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid, liquid, or gas.	**SES-2-ESS2-3. Participate in a guided investigation and identify different states of matter (ice/solid, water/liquid, and steam/gas).**	**Level IV Students will:** **Participate in a guided investigation which demonstrates states of matter (ice/solid, water/liquid and steam/gas) and communicate the changes.** *Ex. Water being frozen and then boiled goes from ice/solid to water/liquid to steam/gas.* **Level III Students will:** **Participate in a guided investigation and identify different states of matter (ice/solid, water/liquid, and steam/gas).** **Level II Students will:** **Participate in a guided investigation which demonstrates states of matter (ice/solid, water/liquid, and steam/gas)** **Level I Students will:** **Attend to a guided investigation which demonstrates ice/solid, water/liquid, and steam/gas.**

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K-2-ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	**SES-K-2-ETS1-1. Identify appropriate tool(s) when presented with a problem.**	**Level IV Students will:** **Represent a tool, existing or nonexistent, to solve a given problem.** **Level III Students will:** **Identify appropriate tool(s) when presented with a problem.** *Ex. Would you brush your teeth with a toothbrush or a screwdriver?* **Level II Students will:** **Match the tool to the use.** *Ex. toothbrush - teeth, screwdriver - screw, hammer – nail, etc.* **Level I Students will:** **Attend to activities that demonstrate tools being used to solve problems.**
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	**SES-K-2-ETS1-2. Identify the shape of an object and its function.**	**Level IV Students will:** **Represent how the shape of an object helps it function as needed to solve a given problem.** *Ex. Show how a spoon will work better than a fork to eat soup because it is rounded.* **Level III Students will:** **Identify the shape of an object and its function.** *Ex. A ball is round so it can roll.* *Ex: A tire is round so it can roll.* **Level II Students will:** **Match an object with a shape.** *Ex. A ball is a circle, a block and a square.* **Level I Students will:** **Attend to activities that demonstrate how the shape of objects help it function as needed to solve a given problem.**
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**SES-K-2-ETS1-3. Identify the differences of two objects designed to solve the same problem.**	**Level IV Students will:** **Test and compare the differences of two objects designed to solve the same problem.** *Ex. Try to eat soup with a fork and a spoon and communicate the results.* *Ex. Compare shoes with laces to shoes with Velcro.* **Level III Students will:** **Identify the differences of two objects designed to solve the same problem.** *Ex. Discuss the differences between using a fork or a spoon to eat soup.* **Level II Students will:** **Match the tool to solve the given problem.** *Ex. Spoon with soup, fork with meat, Hammer with nail, screwdriver and screw, etc.* **Level I Students will:** **Attend to activities that compare two objects designed to solve the same problem.**

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PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.	**SES-3-PS2-1. Demonstrate how the direction, or speed, of an object will change due to an outside force.**	**Level IV Students will:** **Predict, and demonstrate, how the direction, or speed, of an object will change due to an outside force.** *Ex. Student states that if I push the toy car it will move forward.* **Level III Students will:** **Demonstrate how the direction, or speed, of an object will change due to an outside force.** *Ex. Pushes a toy car slowly; pushes a toy car quickly; turns a toy car, moves an object side to side, etc.* **Level II Students will:** **Apply appropriate forces that move, stop, or start an object in a given direction.** *Ex. Stops and starts a toy car.* **Level I Students will:** **Identify a force (push or pull) that changes the motion of an object.** *Ex. Teacher demonstrates pushing and pulling an object; presents pictures of pushing or pulling objects.*
3-PS2-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.	**SES-3-PS2-2. Make observations about the pattern(s) of an objects motion to predict future motion.**	**Level IV Students will:** **Make observations on an object's motion to provide evidence that a pattern can be used to predict future motion.** *Ex. Throw a ball into the air - student will predict the future motion.* **Level III Students will:** **Make observations about the pattern(s) of an object's motion to predict future motion.** *Ex. Shown a picture of an adult preparing to push a child in a swing - student predicts the motion produced by the push of the swing.* *Ex: The sun rising and setting* **Level II Students will:** **Describe a pattern of an object's motion.** *Ex. A bouncing ball goes up and down, a swing goes back and forth, etc.* **Level I Students will:** **Attend to activities that demonstrate an object's pattern of motion.** *Ex. Given a stationary object and object moving back and forth, student will observe an object's pattern of motion.*

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PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paper clips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.	**SES-3-PS2-3. Demonstrate the effects of a magnetic, or electric, interaction between two objects not in contact with each other.**	**Level IV Students will:** **Ask questions based on observations of a magnetic, or electric, interaction between two objects not in contact with each other.** *Ex. Student will ask, "Why does my hair stick to the balloon?"* **Level III Students will:** **Demonstrate the effects of a magnetic, or electric, interaction between two objects not in contact with each other.** *Ex. Student rubs a balloon on head to show static electricity.* *Ex. Student moves paper clips with magnets.* **Level II Students will:** **Explore magnetic, or electric, interactions between two objects not in contact with each other.** *Ex. Student will manipulate the magnet to show interaction.* **Level I Students will:** **Attend to the presence of magnetic or electric interactions between two objects not in contact with each other.** *Ex. Student attends to presentation of magnetic, or electric, interactions such as those listed above.*
3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets. Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.	**SES-3-PS2-4. Given a simple design problem, explore ways to solve the problem using magnets.**	**Level IV Students will:** **Given a simple design problem, communicate ways to solve the problem using magnets, and present the solution.** *Ex. When given two or more items and a magnet, student will investigate which items will be held to a surface with magnetic force, and communicate the solution.* **Level III Students will:** **Given a simple design problem, explore ways to solve the problem using magnets.** *Ex. Given two or more items such as a paper and pen with a magnet, student will investigate which items will be held to a surface with magnetic force.* **Level II Students will:** **Demonstrate how magnets can be used.** *Ex. Student will use magnets to stick to appropriate surface.* **Level I Students will:** **Attend to examples of how magnets can be used.** *Ex. Paper being held on the refrigerator by a magnet vs. paper laying on the floor.*

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LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. Clarification Statement: Changes organisms go through during their life form a pattern.	**SES-3-LS1-1. Use a model to demonstrate the life cycle of an organism.**	**Level IV Students will:** **Create a model of a simple life cycle.** *Ex. egg, tadpole, frog; egg, chick, chicken; baby, youth, adult, etc.* **Level III Students will:** **Use a model to demonstrate the life cycle of an organism.** *Ex. Arrange pictures of a frog life cycle.* **Level II Students will:** **Identify two steps of the life cycle.** *Ex. Point to the picture of tadpole and an adult frog.* **Level I Students will:** **Attend to teacher arranging pictures of the life cycle.** *Ex. Frog life cycle*

LS2 – Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS2-1. Construct an argument that some animals form groups that help members survive.	**SES-3-LS2-1. Use a model to demonstrate that some animals form groups.**	**Level IV Students will:** **Create a model to demonstrate that some species of animals form groups and some do not.** *Ex. Given several animal figures, students manipulate and group.* **Level III Students will:** **Use a model to demonstrate that some animals form groups.** *Ex. point to pictures of antelope, bison, mountain lions, bears, etc.* **Level II Students will:** **Recognize groups of animals vs. individual animals.** *Ex. individual antelope vs herd of antelope* **Level I Students will:** **Attend to pictures of different groups of animals.** *Ex. individual antelope vs. herd of antelope*

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LS3 – Heredity: Inheritance and Variation of Traits

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.	**SES-3-LS3-1. Use evidence to show how offspring inherit physical traits that resemble those of their parents.**	**Level IV Students will:** **Provide evidence of specific traits that offspring inherit from their parents and that these traits can vary.** *Ex. Student is asked to find, or state, an example of offspring that resemble their parents but have variations such as: eye color, fur color, size, etc.* **Level III Students will:** **Use evidence to show how offspring inherit physical traits that resemble those of their parents.** *Ex. Teacher provides several pictures of a bear and a cub, a cat and a kitten, etc. and students identify the physical feature(s) that the adult and offspring share.* **Level II Students will:** **Match offspring that resemble their parents.** *Ex. Match a baby chick with a chicken.* **Level I Students will:** **Attend to teacher matching offspring to parent.** *Ex. Teacher matches pictures of different species, offspring to parents.*
3-LS3-2. Use evidence to support the explanation that observable traits can be influenced by the environment. Clarification Statement: Environmental factors that vary for organisms of the same type (e.g., amount of food, amount of water, and amount of exercise an animal gets, chemicals in the water) may influence organisms' observable traits.	**SES-3-LS3-2. Make observations about how an organism's observable traits can be influenced by the environment.**	**Level IV Students will:** **Communicate how an organism's observable traits have been affected by the environment.** *Ex. Given pictures of animals, choose one to demonstrate the concept.* **Level III Students will:** **Make observations about how an organism's observable traits can be influenced by the environment.** *Ex. Picture of rabbit in winter and rabbit in summer (color of fur).* **Level II Students will:** **Identify pictures of how an organism's observable traits can be influenced by the environment.** *Ex. Student matches pictures of organisms to environment such as a white rabbit to snowy environment, etc.* **Level I Students will:** **Attend to teacher presentation about how observable traits can be influenced by the environment.**

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LS4 – Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.	**SES-3-LS4-1. Identify fossils as the remains of plants and animals that lived long ago.**	**Level IV Students will:** **Using data from fossils, describe the environment the organism may have lived in long ago.** *Ex. Fossils of marine life are found where there once was water.* **Level III Students will:** **Identify fossils as the remains of plants and animals that lived long ago.** *Ex. Students can press leaves into soft playdough to leave an impression. The leaf will die but the impression will remain.* **Level II Students will:** **Recognize a fossil.** *Ex. Given a rock and a fossil, student will recognize the fossil.* *EX. Hide fossils in a sand box and have students dig for them.* **Level I Students will:** **Attend to information presented about fossils.** *Ex. The book* **"***Curious About Fossils" by Kate Waters explains why and where fossils form and looks at the colorful lives and important discoveries of some of the great early fossil hunters and collectors.*
3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.	**SES-3-LS4-2. Use models to identify characteristics that help organisms survive.**	**Level IV Students will:** **Make a model that demonstrates how the characteristics of an organism help the organism survive.** **Level III Students will:** **Use models to identify characteristics that help organisms survive.** *Ex. Identify thorns on a rose as a survival characteristic, camouflage of animals.* **Level II Students will:** **Match pictures of characteristics that help organisms survive.** *Ex. picture of rose and thorn, teeth and lion, etc.* **Level I Students will:** **Attend to presentation of characteristics which help organisms survive.**

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LS4 – Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. Clarification Statement: Examples of evidence could include needs and traits of the organisms and characteristics of the habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.	**SES-3-LS4-3. Determine whether or not an organism is able to survive in a given environment.**	**Level IV Students will:** **Use evidence to determine that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.** *Ex. pictures of fish in a desert; palm tree in the arctic, etc.* **Level III Students will:** **Determine whether or not an organism is able to survive in a given environment.** *Ex. Match multiple pictures of organisms to environments.* **Level II Students will:** **Match an organism to their environment.** *Ex. Match a picture of an animal to its environment, or vice versa.* **Level I Students will:** **Attend to presentation of matching organisms to their environment.**
3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.	**SES-3-LS4-4. Identify what happens to organisms when there is a major environmental change.**	**Level IV Students will:** **Predict what happens to an organism when there is a major environmental change.** **Level III Students will:** **Identify what happens to organisms when there is a major environmental change.** *Ex. Animals will evacuate area during a forest fire.* **Level II Students will:** **Identify major environmental changes.** *Ex. pictures of campfire vs. forest fire; pictures of major flood, clear cut forest, etc.* **Level I Students will:** **Attend to a presentation of pictures of major environmental changes.**

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ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.	**SES-3-ESS2-1. Use a model to communicate typical weather conditions expected during a particular season.**	**Level IV Students will:** **Make a model that communicates typical weather conditions expected during a particular season.** *Ex. Draw a picture of winter.* **Level III Students will:** **Use a model to communicate typical weather conditions expected during a particular season.** *Ex. Given a variety of weather conditions, student will communicate the correct season.* **Level II Students will:** **Match weather conditions to corresponding season.** *Ex. Match picture of snow to winter.* **Level I Students will:** **Attend to a presentation of weather conditions and their corresponding season.**
3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.	**SES-3-ESS2-2. Describe the local climate.**	**Level IV Students will:** **Compare local climate to the climate of another region.** *Ex. Compare Cheyenne to Maui.* **Level III Students will:** **Describe the local climate.** **Level II Students will:** **Select appropriate representations of the local climate.** *Ex. Select pictures representing local climate.* *Ex. Wyoming is windy, dry, snows in winter, etc.* **Level I Students will:** **Attend to a presentation about the local climate.**

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ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.	**SES-3-ESS3-1. Communicate a solution that reduces the impacts of weather.**	**Level IV Students will:** **Create a solution that reduces the impact of a weather condition upon their environment.** *Ex. Draw a picture of a snow-fence around their school or home.* **Level III Students will:** **Communicate a solution that reduces the impacts of weather.** *Ex. Given a weather condition, provide a solution (coat for cold).* **Level II Students will:** **Match a solution that reduces the impact of weather.** *Ex. match umbrella to rain, match coat to cold weather, etc.* **Level I Students will:** **Attend to a presentation of solutions that reduce the impact of weather.**

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3-5 ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	**SES-3-5-ETS1-1. Given a solution to a simple design problem, students are able to identify materials needed to solve a simple design problem, provided a variety of materials.**	**Level IV Students will:** **Define a solution for a simple design problem that reflects a need or a want.** **Level III Students will:** **Given a solution to a simple design problem, students are able to identify materials needed to solve a simple design problem, provided a variety of materials.** *Ex. Create a pollinator by selecting from a variety of materials such as cotton balls, q tips, pipe cleaners, rubber bands, paper, etc.* **Level II Students will:** **Match the appropriate materials for a project given a list of possible materials to complete a simple design problem.** *Ex. Matching scissors to cut paper, tape or glue to adhere materials together.* **Level I Students will:** **Attend to activities that demonstrate finding a solution to a simple design problem.**
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	**SES-3-5-ETS1-2. Generate more than one possible solution to a problem.**	**Level IV Students will:** **Generate more than one possible solution to a problem, and communicate which solution is most likely to meet the criteria.** **Level III Students will:** **Generate more than one possible solution to a problem.** **Level II Students will:** **Match a solution to the problem that best meets criteria of the problem.** *Ex. Given images of different scenarios, student chooses the best solution.* **Level I Students will:** **Attend to activities that compare possible solutions to a problem.**
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	**SES-3-5-ETS1-3. Determine whether or not an engineering design product meets criteria, and communicate failure point(s).**	**Level IV Students will:** **Determine whether or not the engineering design product meets criteria, communicate failure point(s), and provide possible improvements.** **Level III Students will:** **Determine whether or not an engineering design product meets criteria, and communicate failure point(s).** **Level II Students will:** **Determine whether or not an engineering design product meets criteria.** **Level I Students will:** **Attend to activities that carry out fair tests in which failure points in an engineering design product are compared and improved.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 – Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.	**SES-4-PS3-1. Demonstrate how the speed of an object is related to the energy of the object.**	**Level IV Students will:** **Construct an explanation to demonstrate how the higher speed of an object is related to the higher energy of that object.** *Ex. Demonstrate and explain how pushing toy car with a light push, vs. pushing a toy car with hard push, affects the speed the toy car travels.* **Level III Students will:** **Demonstrate how the speed of an object is related to the energy of the object.** *Ex. Student will show how pushing toy car with a light push, vs. pushing a toy car with hard push, affects the speed the toy car travels.* **Level II Students will:** **Identify example(s) that show how the energy of an object affects the speed of the object.** *Ex. Student will identify the object exhibiting greater energy and speed, from an adult pushing a toy car with a light push, vs. pushing a toy car with hard push.* **Level I Students will:** **Attend to a presentation of an object exhibiting greater energy and thus greater speed.** *Ex. Student will attend to demonstration of pushing toy car with a light push vs. pushing a toy car with hard push.*
4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	**SES-4-PS3-2. Make observations to describe that heat energy can be transferred from place to place.**	**Level IV Students will:** **Make observations to provide evidence that heat energy can be transferred from place to place.** *Ex. Student explains that campfire is a source of heat that can warm hands, cook marshmallow, warm area around fire, etc.* **Level III Students will:** **Make observations to describe that heat energy can be transferred from place to place.** *Ex. Given a picture of a campfire, someone roasting a marshmallow and someone warming their hands, student will state observations about the transfer of heat occurring in the picture.* **Level II Students will:** **Identify hot and cold items.** *Ex. Given a heating pad and ice pack, students will identify which is hot and which is cold.* **Level I Students will:** **Attend to a presentation that heat energy can be transferred from place to place.**

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PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.	**SES-4-PS3-3. Demonstrate how a change in energy occurs when objects collide.**	**Level IV Students will:** **Predict, and demonstrate, how the speed of an object will change the energy of a collision.** *Ex. Student states if the cars are moving faster, then there will be a bigger collision, then precedes to demonstrate with toy cars.* **Level III Students will:** **Demonstrate how a change in energy occurs when objects collide.** *Ex. As a result of change in speed, a change of energy occurs when objects collide.* *Ex. Cause two cars to crash moving towards each other at a slow speed, then cause a collision using a faster toy speed.* **Level II Students will:** **Apply appropriate forces that move, stop, or start an object by collision.** *Ex. Stops and starts toy cars by collision.* **Level I Students will:** **Attend to the collision of objects.** *Ex. Student observes a demonstration of a collision with toy cars.*
4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.	**SE-4-PS3-4. Identify devices that use different types of energy.**	**Level IV Students will:** **Create a device that uses energy.** *Ex. pinwheel, solar oven Pringles can, catapult, pulley, marble run, puff mobile, etc.* **Level III Students will:** **Identify devices that use different types of energy** *Ex. flash light, lamp, refrigerator, toys, electronic devices, etc.* **Level II Students will:** **Sort objects that require energy and those that do not require energy.** **Level I Students will:** **Attend to a presentation showing devices that use different types of energy.**

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PS4 – Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.	**SES-4-PS4-1. Use a model to show what a wave looks like.**	**Level IV Students will:** **Use a model to demonstrate different wave patterns.** *Ex: Make two different wave shapes.* *Ex: Move a rope faster vs slower; taller or shorter, etc.* *Ex. Slinky movements* **Level III Students will:** **Use a model to show what a wave looks like.** *Ex. Draw a picture of a wave shape.* *Ex: Move a rope back and forth to model a wave.* *Ex: Student moves water in a tub to make waves; moves a rope up and down, etc.* **Level II Students will:** **Identify a wave.** **Level I Students will:** **Attend to a demonstration of wave movement.** *Ex. Water is moved in a tub to make waves.*
4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	**SES-4-PS4-2. Use a model to demonstrate that light reflects from some objects.**	**Level IV Students will:** **Describe/communicate ways that some objects reflect light.** *Ex. Student communicates that a mirror reflects light while cardboard does not.* **Level III Students will:** **Use a model to demonstrate that light reflects from some objects.** *Ex. Student shows that a mirror can reflect light.* **Level II Students will:** **Explore ways to reflect light off of different objects.** *Ex. Student uses flashlight and objects to see what reflects light.* **Level I Students will:** **Attend to demonstration of light reflecting off an object.** *Ex. Teacher uses flashlight and mirror to reflect light.*

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PS4 – Waves and Their Applications in Technologies for Information Transfer (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information. Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse Code to send text.	**SES-4-PS4-3. Use a method to send or receive information.**	**Level IV Students will:** **Generate a signal to transfer information.** *Ex. Student will clap three times to get a drink of water.* **Level III Students will:** **Use a method to send or receive information.** *Ex. Student will tap a drum once to start, twice to stop.* **Level II Students will:** **Respond to the signal of transfer of information.** *Ex. Student starts and stops according teacher signal with drum.* **Level I Students will:** **Attend to the teacher modeling a transfer of information.** *Ex. A drum, buzzer, bell, etc. is used to signal start and stop.*

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LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.	**SES-4-LS1-1. Use a model to demonstrate that plants and animals have structures that support their survival.**	**Level IV Students will:** **Make a model that demonstrates how a structure functions to help an organism survive.** *Ex. Draw a picture of an organism, identifying structure(s) that help the organism to survive.* **Level III Students will:** **Use a model to demonstrate that plants and animals have structures that support their survival.** *Ex. Given a picture, ask student what parts of a plant (or animal) helps it survive.* **Level II Students will:** **Match structures for survival to an organism.** *Ex. leaves to a plant, thorns to a plant, feathers to a bird, etc.* **Level I Students will:** **Attend to a demonstration of plant and animal structures that support their survival.** *Ex. Pictures of leaves on a plant, fur on an animal, etc.*
4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. Clarification Statement: Emphasis is on systems of information transfer.	**SES-4-LS1-2. Use a model to describe that animals respond to different types of stimuli.**	**Level IV Students will:** **Use a model to describe that animals receive different types of information, through their senses, to their brain.** *Ex. Sequence pictures of how sound travels from the ear to the brain.* **Level III Students will:** **Use a model to describe that animals respond different types of stimuli.** *Ex. A snake feels vibrations through its skin; a hawk sees prey with its eyes; dogs hear a car passing by; etc.* **Level II Students will:** **Match different senses to the receptor organ.** *Ex. Match pictures of sound to ear, light to eyes, etc.* **Level I Students will:** **Attend to a presentation of different senses matched to receptor organ.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. Clarification Statement: Examples of evidence from patterns (may include, but not limited to, Wyoming specific examples) could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.	**SES-4-ESS1-1. Describe that landscapes can change.**	**Level IV Students will:** **Describe/communicate that landscapes can change over time.** *Ex. Use a picture of river eroding the landscape, videos of lava flowing from volcanoes, etc.* **Level III Students will:** **Describe that landscapes can change.** *Ex. Use pictures of a volcano blowing up, land side, tsunami, etc.* **Level II Students will:** **Make observations of landscape differences.** *Ex. Compare pictures of different landscapes.* **Level I Students will:** **Attend to a presentation of landscapes.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.	**SES-4-ESS2-1. Use a model to describe an erosion event.**	**Level IV Students will:** **Model an erosion event.** *Ex. Use a stream table, pan of sand, drawing, or other materials to model an erosion event, etc.* **Level III Students will:** **Use a model to describe an erosion event.** *Ex. Use a stream table, pan of sand, or other materials to describe an erosion event.* **Level II Students will:** **Explore how water and wind cause erosion.** *Ex. Use a stream table, pan of sand, or other materials to explore erosion event.* **Level I Students will:** **Attend to a demonstration of erosion by water or wind.**
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features. Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.	**SES-4-ESS2-2. Recognize different kinds of information, from maps, that describe Earth's features.**	**Level IV Students will:** **Create a model that shows different map features.** *Ex. Create a map (out of clay, paper, craft materials, etc.) that shows mountains.* **Level III Students will:** **Recognize different kinds of information, from maps, that describe Earth's features.** *Ex. Using a map, point to different features (mountains, lake, ocean, etc.)* **Level II Students will:** **Identify a feature on a map.** *Ex. mountain on a 3-D map* **Level I Students will:** **Attend to a presentation of map features.**

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ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment. Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources could include fossil fuels and fissile materials.	**SES-4-ESS3-1. Describe different types of energy resources.**	**Level IV Students will:** **Describe/communicate how energy resources are used.** *Ex. Use pictures/videos of energy resources such as wind, water, sunlight, etc.* **Level III Students will:** **Describe different types of energy resources.** *Ex. Use pictures/videos of energy resources such as wind, water, sunlight, etc.* **Level II Students will:** **Identify energy resources.** *Ex. Use pictures/videos of energy resources such as wind, water, sunlight, etc.* **Level I Students will:** **Attend to a presentation of examples of energy resources.**
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.	**SES-4-ESS3-2. Recognize the impacts of natural Earth processes on humans.**	**Level IV Students will:** **Describe how humans prepare for a potential impact of a natural Earth process.** *Ex. Use pictures/videos/drawings of hail, thunderstorms, flooding, etc.* **Level III Students will:** **Recognize the impacts of natural Earth processes on humans.** *Ex. Match pictures of Earth process to its impact on humans, such as a fire that destroys a home, a flood that covers neighborhoods, hail that dented a car, etc.* **Level II Students will:** **Identify natural Earth processes.** *Ex. Use pictures/videos of hail, thunderstorms, flooding, etc.* **Level I Students will:** **Attend to a presentation of natural Earth processes.** *Ex. Show pictures/videos of hail, thunderstorms, flooding, etc.*

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3-5 ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	**SES-3-5-ETS1-1. Given a solution to a simple design problem, students are able to identify materials needed to solve a simple design problem, provided a variety of materials.**	**Level IV Students will:** **Define a solution for a simple design problem that reflects a need or a want.** **Level III Students will:** **Given a solution to a simple design problem, students are able to identify materials needed to solve a simple design problem, provided a variety of materials.** *Ex. Create a pollinator by selecting from a variety of materials such as cotton balls, q tips, pipe cleaners, rubber bands, paper, etc.* **Level II Students will:** **Match the appropriate materials for a project given a list of possible materials to complete a simple design problem.** *Ex. Matching scissors to cut paper, tape or glue to adhere materials together.* **Level I Students will:** **Attend to activities that demonstrate finding a solution to a simple design problem.**
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	**SES-3-5-ETS1-2. Generate more than one possible solution to a problem.**	**Level IV Students will:** **Generate more than one possible solution to a problem, and communicate which solution is most likely to meet the criteria.** **Level III Students will:** **Generate more than one possible solution to a problem.** **Level II Students will:** **Match a solution to the problem that best meets criteria of the problem.** *Ex. Given images of different scenarios, student chooses the best solution.* **Level I Students will:** **Attend to activities that compare possible solutions to a problem.**
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	**SES-3-5-ETS1-3. Determine whether or not an engineering design product meets criteria, and communicate failure point(s).**	**Level IV Students will:** **Determine whether or not the engineering design product meets criteria, communicate failure point(s), and provide possible improvements.** **Level III Students will:** **Determine whether or not an engineering design product meets criteria, and communicate failure point(s).** **Level II Students will:** **Determine whether or not an engineering design product meets criteria.** **Level I Students will:** **Attend to activities that carry out fair tests in which failure points in an engineering design product are compared and improved.**

PS1 – Matter and Its Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.	**SES-5-PS1-1. Use a model to describe that matter is made of smaller particles.**	**Level IV Students will:** **Describe one or more examples of objects made of smaller parts.** *Ex. Student draws an object made of smaller parts.* **Level III Students will:** **Use a model to describe that matter is made of smaller particles.** *Ex. Given a rice crispy treat communicate how it is made of smaller parts.* **Level II Students will:** **Identify objects made from smaller parts.** *Ex. Student will choose between two pictures such as bricks to make a house, etc.* **Level I Students will:** **Attend to a demonstration of objects made of smaller parts.** *Ex. Crumbling a sugar cube; taking apart Legos, or deconstructing a block wall, etc.*
5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.	**SES-5-PS1-2. Demonstrate that a solid that melts has the same mass in its liquid form.**	**Level IV Students will:** **Measure quantities to provide evidence that a solid that melts has the same mass in its liquid form.** *Ex. Student provides evidence that when the same mass of ice on both sides of a balance scale, after melting one side, has the same mass as the other side.* **Level III Students will:** **Demonstrate that a solid that melts has the same mass in its liquid form.** *Ex. Using the same mass of ice on both sides of a balance scale, after melting one side, show that it has the same mass.* *Ex. An ice cube on a scale, then later the same ice cube on a scale (after it has melted).* **Level II Students will:** **Assist in balancing objects on a double-pan balance scale.** *Ex. balancing blocks, etc.* **Level I Students will:** **Attend to demonstration of balancing objects on a double-pan balance scale.** *Ex. Teacher balances the mass of a block.*

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PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-PS1-3. Make observations and measurements to identify materials based on their properties. Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, luster, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.	**SES-5-PS1-3. Make observations to identify materials based on their properties.**	**Level IV Students will:** **Compare objects by organizing them according to their properties.** *Ex. Sort objects according to taste, color, texture, etc.* **Level III Students will:** **Make observations to identify materials based on their properties.** *Ex. Salt and sugar to be identified by taste, salt and pepper by color, vinegar and water by smell, sand paper and copy paper by touch.* **Level II Students will:** **Identify properties of materials.** *Ex. Teacher asks which one is soft, hard, sweet, sour, etc.* **Level I Students will:** **Explore different properties of materials.** *Ex. Taste the salt, feel the fur, smell the vinegar, etc.*
5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances. Clarification Statement: Determination of the new substance is based on the properties of the resulting substance, which could include quantitative (e.g. weight) and qualitative properties (e.g. state of matter, color, texture, and odor).	**SES-5-PS1-4. Determine whether mixing two substances results in a new substance.**	**Level IV Students will:** **Determine, and communicate, which mixtures results in a new substance.** *Ex. Student will mix vinegar and baking soda and mix water and baking soda; the student determines which mixture resulted in a new substance by its properties.* **Level III Students will:** **Determine whether mixing two substances results in a new substance.** *Ex. Present an array of pictures with some having a new substance produced and others not having a new substance produced.* *Ex. Present demonstrations of chemical vs. physical reactions.* **Level II Students will:** **Observe, and determine, which two substances, when mixed, results in a new substance.** *Ex. Teacher will mix a sugar cube in water and Alka-Seltzer in water; student will express which two substances, when mixed, resulted in a new substance (Alka-Seltzer produces a new substance, gas).* **Level I Students will:** **Attend to teacher mixing two substances which results in a new substance, and mixing two substances which results in no new substance.** *Ex. Mix Alka-Seltzer with water and mix salt in water.*

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PS2 - Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.	**SES-5-PS2-1. Demonstrate that gravity pulls an object to the Earth.**	**Level IV Students will:** **Describe that gravity pulls objects to the Earth.** *Ex. Student communicates what is pulling the object.* **Level III Students will:** **Demonstrate that gravity pulls an object to the Earth.** *Ex. Student drops a ball.* **Level II Students will:** **Explore gravity by dropping different objects.** *Ex. Student drops several objects.* **Level I Students will:** **Attend to others dropping objects to demonstrate gravity.** *Ex. Teacher drops several objects.*

PS3 - Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. Clarification Statement: Examples of models could include diagrams, and flow charts.	**SES-5-PS3-1. Use models to describe that plants capture energy from sunlight.**	**Level IV Students will:** **Use a model to describe that energy in animals' food was once energy from the sun.** *Ex. Using a picture of an animal eating the plant, student will communicate that the energy transfers from plant to animal.* **Level III Students will:** **Use models to describe that plants capture energy from sunlight.** *Ex. Use a plant or picture of a plant to communicate that a plant's energy comes from the sun.* **Level II Students will:** **Identify that plants need sunlight to grow.** *Ex. Given plants or pictures of plants in light and dark, student will identify those in light.* **Level I Students will:** **Attend to pictures of plants with the sun and pictures of plants without sun.** *Ex. Picture of a plant in light and a picture of a plant in dark (plant in dark should be dying).*

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LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-LS1-1. Support an argument that plants get the materials they need for growth primarily from air and water. Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.	**SES-5-LS1-1. Participate in an experiment to determine what happens when plants do not have water or air.**	**Level IV Students will:** **Design and conduct an experiment to determine what happens when plants do not have water or air.** *Ex. Grow plants in different conditions to determine what happens, in an open bag and in a closed bag, with and without water, etc.* **Level III Students will:** **Participate in an experiment to determine what happens when plants do not have water or air.** **Level II Students will:** **Identify that plants need water and air.** *Ex. The students will identify pictures of healthy plants vs. pictures of dying plants along with which ones received/did not receive water and air.* **Level I Students will:** **Attend to a presentation of what happens when plants do not have water or air.** *Ex. Presentation of pictures of plants being watered/getting air, looking healthy. A presentation of plants not being watered/not getting air, looking unhealthy.*

LS2 - Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.	**SES-5-LS2-1. Use a model to describe a food chain with multiple organisms.**	**Level IV Students will:** **Develop a model to describe a food chain with multiple organisms.** *Ex. Draw an example of a food chain.* **Level III Students will:** **Use a model to describe a food chain with multiple organisms.** *Ex. Given pictures the student puts diagrams in the correct order to form a food chain.* **Level II Students will:** **Match the organism to the matter that is associated with the organism in the food chain.** *Ex. grass to cow, worm to bird, mouse to hawk, etc.* **Level I Students will:** **Attend to a presentation of a food chain with multiple organisms.**

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ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	**SES-5-ESS1-1. Identify the relationship between apparent brightness and relative distance.**	**Level IV Students will:** **Use a model to describe differences in apparent brightness due to relative distances.** *Ex. Student will demonstrate by using a model, like one flashlight being closer and one further away, to describe that the closer flashlight appears brighter.* **Level III Students will:** **Identify the relationship between apparent brightness and relative distance.** *Ex. Use a model, such as one flashlight being closer and one further away.* *Ex: Headlights on a car appear to get brighter as the car gets closer.* *Ex: The sun appears brighter than other stars because Earth is closer to the sun than it is to other stars.* **Level II Students will:** **Explore the difference in apparent brightness due to relative distances.** *Ex. Use a model like one flashlight being closer and one further away.* **Level I Students will:** **Attend to a demonstration using a model to compare differences in apparent brightness due to their relative distances.** *Ex. Use a model like one flashlight being closer and one further away.*
5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.	**SES-5-ESS1-2. Investigate changes in shadows and/or daily changes in day and night.**	**Level IV Students will:** **Using a model, describe changes in shadows and/or daily changes in day and night.** *Ex. Moving a flashlight around an object to show shadow changes.* *Ex: Drawings/outlines of shadows at different times of day.* **Level III Students will:** **Investigate changes in shadows and/or daily changes in day and night.** *Ex: Outline shadows on butcher paper at different times of day.* *Ex: Use a flashlight to produce shadows.* **Level II Students will:** **Observe changes in shadows and/or daily changes in day and night.** *Ex. Students can match a sequence of pictures to show how shadows change throughout the day.* **Level I Students will:** **Attend to a demonstration that shows changes in shadows and/or daily changes in day and night.** *Ex. Teacher utilization of video (or other media) of how shadows change throughout the day.*

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ESS 2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.	**SES-5-ESS2-1. Given a model, show how one of Earth's spheres (geosphere, biosphere, hydrosphere, and/or atmosphere) interacts with another sphere.**	**Level IV Students will:** **Use a model to describe how one of Earth's spheres (geosphere, biosphere, hydrosphere, and/or atmosphere) interacts with another sphere.** *Ex. Draw or find pictures of a river running over the Earth, an animal drinking water out of a river.* **Level III Students will:** **Given a model, show how one of Earth's spheres (geosphere, biosphere, hydrosphere, and/or atmosphere) interacts with another sphere.** *Ex. Given an example (pictures/videos/other media) of a river running over the Earth, an animal drinking water out of a river, person breathing air, students indicate which spheres are interacting.* **Level II Students will:** **Identify each of the Earth's spheres (geosphere, biosphere, hydrosphere, and atmosphere).** *Ex. Students identify Earth's spheres through pictures or other media.* **Level I Students will:** **Attend to presentation of each of the Earth's spheres (geosphere, biosphere, hydrosphere, and atmosphere).** *Ex. Show pictures or other media to show examples of each of the four spheres.*
5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	**SES-5-ESS2-2. Identify the types of bodies of water by amounts and distribution of water on Earth.**	**Level IV Students will:** **Describe that different bodies of water contain different amounts of water.** *Ex. Compare two bodies of water by amount of water (ocean holds more water than a pond).* *Ex: Identify qualitative amounts of water, in different bodies of water.* **Level III Students will:** **Identify the types of bodies of water by amounts and distribution of water on Earth.** *Ex: Identify bodies of water by amounts of water (oceans, lakes, ponds, puddles).* **Level II Students will:** **Identify the difference between land and water.** *Ex. Students identify difference between land and bodies of water through pictures or other media.* **Level I Students will:** **Attend to presentation of different bodies of water.** *Ex. Show pictures, or use other media, to show examples of different bodies of water (lake, ocean, river, pond, puddle).*

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ESS 3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to conserve Earth's resources and environment.	**SES-5-ESS3-1. Describe a way to reuse or recycle a resource.**	**Level IV Students will:** **Describe ways reusing or recycling a resource is a benefit.** *Ex. Refilling my water bottle saves me money, is convenient, reduces trash, etc.* **Level III Students will:** **Describe a way to reuse or recycle a resource.** *Ex. Use a cardboard box to make a fort, place empty plastic bottle in a recycle bin.* **Level II Students will:** **Explore ways to reuse or recycle a resource.** *Ex. Teacher led brainstorming about ways to reuse or recycle a pop bottle.* **Level I Students will:** **Attend to others reusing or recycling a resource.** *Ex. Throw scratch paper into recycle bin, refilling a water bottle.*

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3-5 ETS1 - Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	**SES-3-5-ETS1-1. Given a solution to a simple design problem, students are able to identify materials needed to solve a simple design problem, provided a variety of materials.**	**Level IV Students will:** **Define a solution for a simple design problem that reflects a need or a want.** **Level III Students will:** **Given a solution to a simple design, problem students are able to identify materials needed to solve a simple design problem, provided a variety of materials.** *Ex. Create a pollinator by selecting from a variety of materials such as cotton balls, q tips, pipe cleaners, rubber bands, paper, etc.* **Level II Students will:** **Match the appropriate materials for a project given a list of possible materials to complete a simple design problem.** *Ex. Matching scissors to cut paper, tape or glue to adhere materials together.* **Level I Students will:** **Attend to activities that demonstrate finding a solution to a simple design problem.**
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	**SES-3-5-ETS1-2. Generate more than one possible solution to a problem.**	**Level IV Students will:** **Generate more than one possible solution to a problem, and communicate which solution is most likely to meet the criteria.** **Level III Students will:** **Generate more than one possible solution to a problem.** **Level II Students will:** **Match a solution to the problem that best meets criteria of the problem.** *Ex. Given images of different scenarios, student chooses the best solution.* **Level I Students will:** **Attend to activities that compare possible solutions to a problem.**
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	**SES-3-5-ETS1-3. Determine whether or not an engineering design product meets criteria, and communicate failure point(s).**	**Level IV Students will:** **Determine whether or not the engineering design product meets criteria, communicate failure point(s), and provide possible improvements.** **Level III Students will:** **Determine whether or not an engineering design product meets criteria, and communicate failure point(s).** **Level II Students will:** **Determine whether or not an engineering design product meets criteria.** **Level I Students will:** **Attend to activities that carry out fair tests in which failure points in an engineering design product are compared and improved.**

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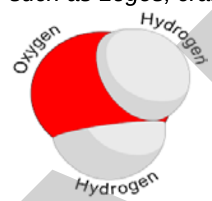
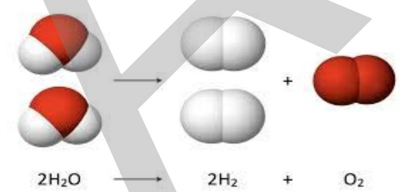
2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS1 – Matter and Its Interactions

<table>
<tr><th>2016 Wyoming Science Benchmarks</th><th>2018 Wyoming Science Extended Benchmarks</th><th>Instructional Performance Level Descriptors</th></tr>
<tr>
<td>MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.
Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.</td>
<td>SES-MS-PS1-1. Model how simple parts can be put together to make more complex structures.</td>
<td>Level IV Students will:
Model how simple parts can be put together to make a common chemical molecule.
Ex. Student creates a 3-dimensional model of a molecule that is based on a provided diagram. (Example of a simple molecule could be H_2O.) Student may provide various materials to select from such as Legos, craft materials, etc.


Ex. Based on the provided diagram, student creates a visual representation of a common chemical molecule.


Level III Students will:
Model how simple parts can be put together to make more complex structures.
Ex. Combine individual Lego pieces to assemble a more complex object.
Ex. ball and stick models
Ex. Student engages with items such as manipulatives.

Level II Students will:
Select two common objects that can be combined to make a familiar, complex structure.
Ex. Select between cereal, milk, tennis shoes, toothbrush and a frog to identify which objects can be combined for breakfast.
Ex. Select ingredients to make a sandwich.

Level I Students will:
Attend to lessons modeling simple parts being put together to make complex structures.</td>
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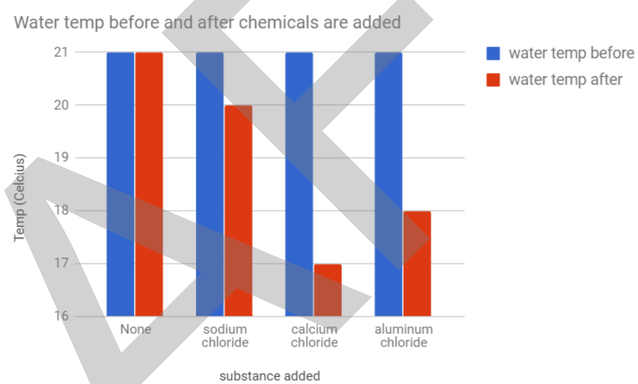
PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.	**SES-MS-PS1-2. Make observations of substances interacting to determine if a chemical reaction has occurred.**	**Level IV Students will:** **Analyze data to determine if a chemical reaction has occurred.** *Ex. Analyze a data (table or graph) showing water temperature before and after various substances are added. Students could be asked to select the data that shows a chemical change has occurred.*  **Level III Students will:** **Make observations of substances interacting to determine if a chemical reaction has occurred.** *Ex. Alka-Seltzer tablet interacts with various substances. Students analyze the reaction to determine if a chemical reaction took place. (Looking for the presence of gas produced as an indicator of a chemical reaction)* *Ex. Burning match (chemical change) vs ice melting (physical change).* *Ex. Burning paper (chemical change) vs folding paper (physical change).* **Level II Students will:** **Identify changes in objects.** *Ex. Students view a set of "after" pictures and identify which one is different than the "before" picture.* **Level I Students will:** **Attend to multiple chemical reactions.** *Ex. Student attends to a video, or demonstration, of chemical reactions.*

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PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels. Wyoming examples could include, but are not limited to, changing oil into plastic or fibers, trona into synthetic rubber, etc.	**SES-MS-PS1-3. Distinguish between natural and synthetic materials.**	**Level IV Students will:** **Demonstrate understanding that some synthetic materials are made from natural materials.** *Ex. Coal is changed into energy.* *Ex. Plastic and fibers come from oil.* *Ex. Make homemade glue from milk. (simple recipes can be found online)* **Level III Students will:** **Distinguish between natural and synthetic materials.** *Ex. Identify a tree as natural and a plastic water bottle as synthetic.* **Level II Students will:** **Identify an object that can be found in nature.** *Ex. Present students with multiple objects. The students identify which objects are natural.* **Level I Students will:** **Engage with intentional examples of natural and synthetic materials.** *Ex. Feeling grass and feeling carpet.*
MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.	**SES-MS-PS1-4. Describe the relationship between changes in temperature, kinetic energy, and changes in states of matter for water.**	**Level IV Students will:** **Predict what will happen if you add energy to water or take energy away.** *Ex. Describe water in various scenarios and ask student to predict what state of matter the water will be.* **Level III Students will:** **Describe the relationship between changes in temperature, kinetic energy, and changes in states of matter for water.** *Ex. Ice is colder and has less kinetic energy than liquid water. Steam is warmer and has more kinetic energy than liquid water.* **Level II Students will:** **Identify a state of matter for water.** *Ex. Student can identify a state of matter for water (solid, liquid or gas) from examples or from a group of pictures.* **Level I Students will:** **Engage with solids and liquids.** *Ex. Students could interact with ice cubes and liquid water.*

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PS1 – Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms that represent atoms.	**SES-MS-PS1-5. Show that the amount of a substance used in a reaction does not change even if the new substance looks different.**	**Level IV Students will:** **Use a model to demonstrate that the total mass does not change in a chemical reaction.** *Ex. Utilize PhET Balancing Reactions or Reactants, Products, & Leftovers animations/demonstrations can be found here* https://phet.colorado.edu/en/simulations/category/new **Level III Students will:** **Show that the amount of a substance used in a reaction does not change even if the new substance looks different.** *Ex. Making borax slime, or from Elmer's glue & contact solution.* **Level II Students will:** **Indicate the number of objects that are put into a container is the same number that can be taken out.** *Ex. One ball is placed in a clear container. Student can express that only one ball comes back out of the container.* **Level I Students will:** **Attend to tasks and/or demonstrations showing that what goes into a container is the same as what comes out.**
MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.	**SES-MS-PS1-6. Participate in a design project to keep thermal energy in a substance or container.** **(SES-MS-PS3-3 is included in this extended standard.)**	**Level IV Students will:** **Compare two different material choices for keeping thermal energy in a system.** *Ex. Students use a digital thermometer to measure the temperature of an uninsulated container and compare it to a container with insulation chosen by the student.* **Level III Students will** **Participate in a design project to keep thermal energy in a substance or container.** *Ex. Wrap a bottle of hot water in a hat, mittens, or other options that they select.* **Level II Students will:** **Select an item that can prevent thermal energy transfer.** *Ex. Hot mitt keeps heat out when grabbing a hot object.* *Ex. Coat keeps heat inside.* **Level I Students will:** **Engage with something warm.** *Ex. Hold or touch a heating pad, hand warmers, or warm rice bag.*

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PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.	**SES-MS-PS2-1. Investigate, and describe, the direction of motion of two colliding objects of equal and of unequal masses.**	**Level IV Students will:** **Predict the resulting direction of motion of two colliding objects of equal and of unequal masses).** *Ex. Predict which direction a car with less mass will travel after a collision with a car of greater mass.* **Level III Students will:** **Investigate, and describe, the direction of motion of two colliding objects of equal and unequal masses.** *Ex. Describes the direction of motion of the car with less mass after a collision with a car of greater mass.* **Level II Students will:** **Produce collisions between two objects of equal and of unequal masses.** *Ex. Use toy cars to create a variety of collisions, stationary and moving.* *Ex. Direct someone else to create collisions between objects.* **Level I Students will:** **Observe collisions between two objects.** *Ex. View collisions between two objects (of equal and unequal masses) in the classroom or on video.*
MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.	**SES-MS-PS2-2 is incorporated into SES-MS- PS2-1 by including equal and unequal mass.**	**Not Applicable.**

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PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.	**SES-MS-PS2-3. Ask questions about the strength of magnetic forces.**	**Level IV Students will:** **Ask and investigate how magnetic forces can be changed.** *Ex. Students investigate how distance, size, or numbers of magnets affect the force between them.* **Level III Students will:** **Ask questions about the strength of magnetic forces.** *Ex. Students wonder how distance, size, or numbers of magnets affect the force between them.* **Level II Students will:** **Play with magnets.** **Level I Students will:** **Attend to interactions between magnets.** Teacher note: Magnets can be placed in larger items to make it easier for students with limited dexterity. Magnets can also be attached to gloves and then the gloves placed on the student.
MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the sun, and orbital periods of objects within the solar system.	**SES-MS-PS2-4. Use surroundings and information provided to predict the effects of gravity.**	**Level IV Students will:** **Provide evidence to support the claim that all objects are effected by gravity.** *Ex. Student generated example of gravity acting on an object.* **Level III Students will:** **Use surroundings and information provided to predict the effects of gravity.** *Ex. Show students pictures of a ball on the floor, on a table, and above the table. Students must select which picture shows the effect gravity will have on the ball when pushed off the table.* **Level II Students will:** **Compare the effects of gravity on different items in the classroom.** *Ex. Flat paper, crumpled paper, soccer ball, feathers, etc.* **Level I Students will:** **Attend to an item being dropped.**

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PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.	**SES-MS-PS2-5. Investigate an object that has a static charge.**	**Level IV Students will:** **Investigate the effects of increasing the static charge on an object.** *Ex. Student tries to make the greatest number of balloons stick together using static applied with a cloth or a material chosen by the student.* **Level III Students will:** **Investigate an object that has a static charge.** *Ex. Student investigates that two balloons with static will repel whereas a balloon with static and a balloon without static will attract.* **Level II Students will:** **Apply a static charge to an object, or tell someone how to apply the static charge.** *Ex. Charge a comb and touch to hair.* **Level I Students will:** **Attend to an object that has a static charge.** *Ex. A balloon charged with static will stick to a wall.*

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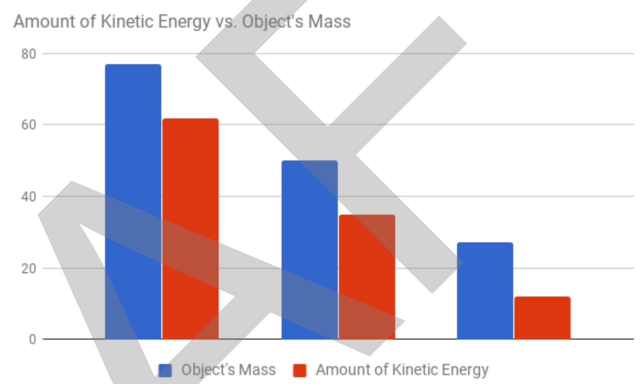
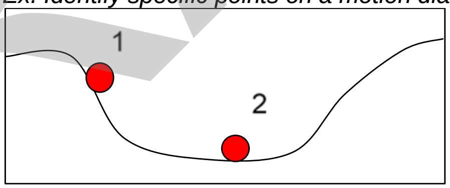
PS3 – Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include: riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a whiffle ball versus a tennis ball.	**SES-MS-PS3-1. Identify changes in kinetic energy on a labeled diagram.**	**Level IV Students will:** **Identify changes in kinetic energy by analyzing a bar graph.** *Ex. The blue bar represents an object's mass and the red bar represents the amount of kinetic energy.*  **Level III Students will:** **Identify changes in kinetic energy on a labeled diagram.** *Ex. Identify specific points on a motion diagram where kinetic energy is increasing or decreasing.*  *(diagram by Jessica DeFreece)* **Level II Students will:** **Experience changes in speed.** *Ex. Rolling objects down a ramp, on a flat surface, or up a slope.* **Level I Students will:** **Attend to a lesson about kinetic energy.** *Ex. Picture or video of a roller coaster.* *Ex. Ball rolling down a ramp.*

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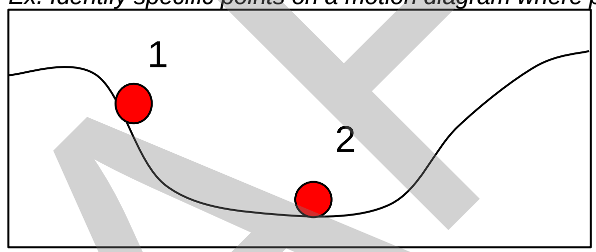
2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.	**SES-MS-PS3-2. Identify differing amounts of potential energy on a labeled diagram.**	**Level IV Students will:** **Order a group of objects from least to greatest amount of potential energy.** *Ex. skateboard on a hill, a book held above your head, etc.* **Level III Students will:** **Identify differing amounts of potential energy on a labeled diagram.** *Ex. Identify specific points on a motion diagram where potential energy is increasing or decreasing.*  *(diagram designed by Jessica DeFreece)* **Level II Students will:** **Participate in a discussion about position and potential energy.** *Ex. Book at varying heights on a bookshelf.* *Ex. Roller coaster at varying positions on a hill.* *Ex. Student on a swing.* **Level I Students will:** **Attend to a lesson about potential energy.**
MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. Clarification Statement: Examples of devices could include an insulated box, a natural system (e.g., a compost bin), a solar cooker, and a Styrofoam cup.	**SES-MS-PS3-3 is Incorporated into SES-MS-PS1-6.**	**Not Applicable.**

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PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. Clarification Statement: Examples of experiments could include: comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.	**SES-MS-PS3-4. Is incorporated into SES-MS-PS1-4.**	**Not Applicable.**
MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.	**SES-MS-PS3-5. Demonstrate how kinetic energy is transferred between objects.**	**Level IV Students will:** **Design their own demonstration to support the claim that energy can be transferred from one object to another.** *Ex. Students select materials to show how energy is transferred.* **Level III Students will:** **Demonstrate how kinetic energy is transferred between objects.** *Ex. This could be as simple as placing warmed hands on a desk and feeling the difference between the warmed spot and the remaining cold desk.* *Ex. Use a Newton's cradle to demonstrate transfer of kinetic energy.* **Level II Students will:** **Identify common objects that will transfer energy to them.** *Ex. A hot slide, or a picture of a pan on a stove, could be selected as objects that can transfer energy to them.* **Level I Students will:** **Attend to a demonstration of transfer of kinetic energy.** *Ex. Students watch a demonstration of one object being used to heat another object.*

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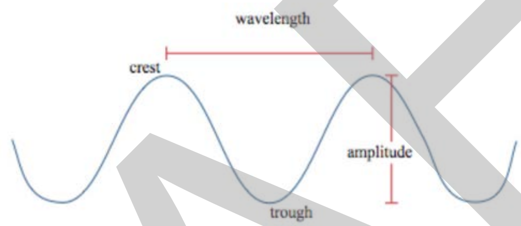
2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4 – Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS4-1. Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave. Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.	**SES-MS-PS4-1. Identify larger amplitude waves as having more energy.**	**Level IV Students will:** **Measure the amplitude of two different waves to communicate the difference in energy quantitatively.** **Level III Students will:** **Identify larger amplitude waves as having more energy.** Ex.  **Level II Students will:** **Select the larger amplitude of two wave patterns.** **Level I Students will:** **Attend to a diagram of waves.** *Ex. Student traces a wave pattern with their fingers or their eyes.*
MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. Clarification Statement: Emphasis is on both electromagnetic and mechanical waves. Examples of models could include: drawings, simulations, and written descriptions.	**SES-MS-PS4-2. Describe how light waves behave when interacting with various materials.**	**Level IV Students will:** **Select an object that reflects light, a material that absorbs light, and a substance that light can be transmitted through.** **Level III Students will:** **Describe how light waves behave when interacting with various materials.** *Ex. Students can reflect light with mirrors.* *Ex. Students shine light on black fabric and white fabric to observe absorption.* **Level II Students will:** **Observe a laser light interacting with different liquids.** *Ex. Shine laser light on a container while pouring the liquid into a different container. Good liquids include milk, water, or cooking oil.* **Level I Students will:** **Observe light being reflected.**

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PS4 – Waves and Their Applications in Technologies for Information Transfer (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in Wi-Fi devices, and conversion of stored binary patterns to make sound or text on a computer screen.	**SES-MS-PS4-3. Select an electronic means and a non-digital means of sending information.**	**Level IV Students will:** **Evaluate different ways to send information.** **Level III Students will:** **Select an electronic means and a non-digital means of sending information.** *Ex. Electronic examples may include email, text, assistive communication device, etc.* *Ex. Non-digital examples include handwriting on the board, written letter, or note.* **Level II Students will:** **Identify methods that people use to communicate.** **Level I Students will:** **Attend to demonstrations of different ways to send information.** *Ex. music on the radio, images, text, or symbols*

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LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.	**SES-MS-LS1-1. Identify the difference between living and nonliving things.**	**Level IV Students will:** **Discuss what living things need/can do, and why non-living things are non-living.** *Ex. Birds are living because they move, breathe, eat, etc. Rocks are not living because they do not need to eat, move, etc.* **Level III Students will:** **Identify differences between a living and nonliving thing.** *Ex. Can defend their choices for living things or non-living things when given a picture and asked to classify objects.* **Level II Students will:** **Classify objects as living or nonliving.** *Ex. Given a picture the student can classify multiple objects within a picture that are living or nonliving (picture of a landscape: living-trees, grass, bird, etc,; nonliving-rocks, water, car, etc.).* **Level I Students will:** **Identify living vs. nonliving things.** *Ex. When given a card of a cat and a card of a car, can identify that the cat is the living thing.*
MS-LS1-2. Develop and use models to describe the parts, functions, and basic processes of cells. Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. Basic processes of a cell should include, but are not limited to, cell growth and reproduction.	**SES-MS-LS1-2. Explore, and identify, the structure and function of major parts of a cell.** Clarification of major structures: Limited to nucleus, cell membrane, cell wall, and chloroplast	**Level IV Students will:** **Identify the difference between plant and animal cells.** *Ex. When given a list of the differences, students will be able to identify whether it is a plant or an animal.* *Ex. When given a picture of a plant and animal cell, student can identify which structures are different between the two.* *Ex. When given models of the two cells, students will be able to determine which is the animal and which is the plant.* **Level III Students will:** **Explore, and identify, the structure and function of major parts of a cell.** *Ex. Given labeled pictures of the major parts of a cell, and cards with the different functions, student can match the correct part and function.* **Level II Students will:** **Identify major structures within a plant cell.** *Ex. Have examples of plant cells and have students identity by pointing, nodding, verbalizing to identify the major structures.* *Ex. Add nucleus, cell membrane, cell wall, and chloroplast to word wall.* **Level I Students will:** **Attend to a lesson about cells and their function.** *Ex. Story will be read aloud, showing pictures, teacher will emphasize and define the word cell.*

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LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.	**SES-MS-LS1-3. Model that a body system is made up of interacting organs.**	**Level IV Students will:** **Describe how various body systems interact.** **Level III Students will:** **Model that a body system is made up of interacting organs.** *Ex. Given pictures of organs, students can model correct placement of the organ into a body system.* **Level II Students will:** **Identify organs within various body systems.** Ex. Given a picture of an organ, can identify it correctly through verbal, matching, etc. (picture of stomach, identifies as stomach). *Ex. Given a picture of an organ system, can identify organs when asked (teacher asks where is the brain, student points to it).* *Ex. When given a body system and pictures of the various organs, student can identify the organs within the system.* **Level I Students will:** **Attend to the lesson about the various organs within a body system.** *Ex. Show a picture of a heart and talk about how it stands for love but also is the body's major organ for moving blood throughout the body.*
MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include: nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.	**SES-MS-LS1-4. Identify the characteristics of plants and behaviors of animals that support successful reproduction.**	**Level IV Students will:** **Explain how a behavior, or structure, supports reproductive success.** *Ex. The white part of a dandelion helps the seed move to a new location.* *Ex. The strongest elk reproduces more-can defend the babies better.* **Level III Students will:** **Identify the characteristics of plants, and behaviors of animals, that support successful reproduction.** *Ex. plumage, strength, bright colors attracting bees, butterflies for pollination* *Ex. seed structures, defenses, etc.* **Level II Students will:** **With prompting and support, discuss indicators of successful reproduction.** *Ex. Given a scenario of a pile of seeds vs spread out seeds, student identifies that spread out seed would more successful.* *Ex. Given a scenario of a pack of 4 cubs where 2 make it to adulthood, and a pack of 4 cubs were 4 make it to adulthood, student identifies the 4 cubs are most successful.* **Level I Students will:** **Attend to a lesson about a plant vs. an animal.** *Ex. Show various characteristics of a plant and of an animal.*

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LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.	**SES-MS-LS1-5. Identify environmental conditions needed for successful growth of organisms.**	**Level IV Students will:** **Describe an ideal environment for various organisms.** *Ex. Given an organism, can describe what would need to be in an environment for it to survive.* **Level III Students will:** **Identify environmental conditions needed for successful growth of organisms.** *Ex. Given pictures of two environments, students can identify which would be better for an animal to survive in (for a fish, lake with plants vs a forest; for a tree, open field vs. a city with little amounts of dirt).* **Level II Students will:** **Identify the basic needs of an animal and a plant.** *Ex. Animal: food, water, shelter; Plant: water, light, space, etc.* **Level I Students will:** **Attend to a lesson about successful growth.** *Ex. Watches a time-lapse video of a tree growing from seed to tree.*
MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.	**SES-MS-LS1-6. Model what a plant uses, what it creates, and what the plant releases during photosynthesis.**	**Level IV Students will:** **Design an experiment to determine what would occur to a plant if one of the needed aspects of photosynthesis was missing.** *Ex. Student can test what happens to the plant if it was in a dark box (missing sunlight).* *Ex. Student can test what happens to the plant if it was in a closed plastic bag (missing carbon dioxide)* *Ex. Student can test what would happen if the plant wasn't watered (missing water).* *Ex. Student can pose the situation, then watch a demonstration or video of it occurring.* **Level III Students will:** **Model what a plant uses, what it creates, and what the plant releases during photosynthesis.** *Ex. Given a picture of a plant, and cards with vocab words, can place carbon dioxide, water, and sunlight as what the plant uses, sugar as what is made, and oxygen as what is released.* **Level II Students will:** **Discuss/identify the specific things that are required in order for photosynthesis to occur.** *Ex. When talking about what a plant needs to grow, students identify water, sunlight, and carbon dioxide.* *Ex. Discuss a diagram outlining the steps of photosynthesis.* **Level I Students will:** **Attend to a lesson on photosynthesis.** *Ex. Watch video of the photosynthesis process.*

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LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS1-7. Develop a model to describe how food molecules (sugar) are rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.	**SES-MS-LS1-7. Recognize that food is used to produce energy for organisms to live.**	**Level IV Students will:** **Explain that food is broken down into smaller parts during digestion, and those smaller parts provide energy for organisms.** *Ex. Create a simple diagram of the process of eating, chewing, digestion.* *Ex. Verbally describe the process of eating, chewing, digestion.* Teacher note: Digestion is an important term but not necessary to achieve level IV. **Level III Students will:** **Recognize that food is used to produce energy for organisms to live.** *Ex. Student generates a list of ways that organisms use energy; examples include growth, movement, or thinking/learning.* **Level II Students will:** **Identify items that are eaten to give energy to humans.** *Ex. Pick out food items from a set of examples provided.* **Level I Students will:** **Attend to lessons about gaining energy through eating.** *Ex.* Listen to a story about the relationship between food and energy.
MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	**SES-MS-LS1-8. Identify situations which require a reactive behavior for survival.**	**Level IV Students will:** **Identify that the brain, and behaviors associated with memory, allow animals to survive.** Ex. *If an animal eats something that makes it sick, it will avoid that food in the future.* **Level III Students will:** **Identify situations which require a reactive behavior for survival.** *Ex. Shown a picture with zebra and a nearby cheetah, and a picture of zebra by themselves, student would choose the picture with the cheetah as requiring reactive behavior.* **Level II Students will:** **Identify reactive behaviors that allow animals to survive.** *Ex. When shown a picture of a hot object, they would indicate "Don't touch".* **Level I Students will:** **React to a stimulus within their environment.** *Ex. Student identifies fear when discussing/shown a spider.* *Ex. Student identifies hunger when discussing/shown food.*

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS2 – Ecosystems: Interactions, Energy, and Dynamics

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2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources. Emphasis should include, but is not limited to, Wyoming ecosystems and examples, such as native trout populations, deer and antelope populations, wolf populations, bitterroot, sagebrush, Indian Paintbrush, macroinvertebrates, etc.	**SES-MS-LS2-1. Recognize the effects of resource availability on individuals and on populations.**	**Level IV Students will:** **Analyze data related to the relationship between resource availability and population size.** *Ex. Predator/Prey population graphs like the number of rabbits related to number of coyotes.* **Level III Students will:** **Recognize the effects of resource availability on individuals and on populations.** *Ex. Student recognizes that if there are a lot of owls, but only a small amount of mice, some of the owls will starve/die.* **Level II Students will:** **List living and nonliving resources in an ecosystem.** *Ex. Given a picture, student can identify the living and non-living resources.* **Level I Students will:** **Attends to lessons about resources, and the impact on organism populations.**
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.	**SES-MS-LS2-2. Identify ways that organisms interact with each other within an ecosystem.**	**Level IV Students will:** **Identify relationships within a group of organisms.** *Ex. When prompted, student can give an example of a predatory relationship.* *Ex. When shown a picture of a group of organisms, student can identify the different types of relationships.* **Level III Students will:** **Identify ways that organisms interact with each other within an ecosystem.** *Ex. Wolf hunting deer (predatory relationship).* *Ex. Two types of birds both eat from the same berry bush (competition)* *Ex. Clownfish and sea anemone (mutualism)* Teacher Note: Could build on matches from Level II, but expands to include relationship vocabulary. **Level II Students will:** **Identify organisms that interact with each other.** *Ex. Match pictures of organisms that interact.* **Level I Students will:** **Attend to a lesson about different organisms interacting.** *Ex. Story about bees pollinating flowers.*

LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.	**SES-MS-LS2-3. Explain that energy moves among living and non-living parts of an ecosystem.**	**Level IV Students will:** **Model an energy flow sequence.** *Ex. sun, plant, human eating plant, human running, etc.* **Level III Students will:** **Explain that energy moves among living and non-living parts of an ecosystem.** *Ex. Plants get energy from the sun. Animals get energy from eating plants or other animals.* **Level II Students will:** **Recognize that people and animals eat.** *Ex. Show picture of a child playing with a ball and picture of a child eating. Student can identify which child is eating.* *Ex. Student helps feed a classroom pet.* **Level I Students will:** **Attend to a lesson about animals eating different things.** *Ex. Some animals eat plants, some animals eat other animals, and some animals eat both plants and animals.*
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems. Wyoming examples could include, but are not limited to, mountain pine beetles, excess precipitation, drought and fires, invasive species, Wyoming species, habitat change, etc.	**SES-MS-LS2-4. Recognize how changes to an ecosystem affect populations.**	**Level IV Students will:** **Explain how a specific change in an environment affects more than one population.** *Ex. Forest fire may harm rabbit populations, but may help some plants and trees grow better.* **Level III Students will:** **Recognize how changes to an ecosystem affect populations.** *Ex. Drought decreases food source for consumers.* **Level II Students will:** **Select events in nature that can affect populations.** *Ex. Picture cards that show a flood, fire, drought, insect infestation.* **Level I Students will:** **Attend to information presented on humans helping the environment.** *Ex. Video clip of humans picking up trash, planting trees, building a birdhouse.*

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LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services. Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and societal considerations.	**SES-MS-LS2-5. Identify an action that maintains or improves ecosystems and biodiversity.**	**Level IV Students will:** **Communicate the effects of an action that improves ecosystems or biodiversity.** *Ex. Students could show the many different effects of planting trees in a forest.* **Level III Students will:** **Identify an action that maintains or improves ecosystems and biodiversity.** *Ex. Putting straw, rocks, or plants on the side of the road prevents erosion.* **Level II Students will:** **Distinguish between images that show high biodiversity and low biodiversity.** *Ex. Image of rainforest with various plants and animals vs. picture of desert setting.* **Level I Students will:** **Attend to a lesson about biodiversity.**

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LS3 – Heredity Inheritance and Variations of Traits

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.	**SES-MS-LS3-1. Explain that organisms have differences in their traits that can affect their survival.**	**Level IV Students will:** **Identify changes in an organism that would lead to changes in the chance of survival for the organism.** *Ex. Student selects an animal they are familiar with and predicts how they would survive if they had very different traits. What would happen if a grizzly bear had scales like a fish rather than fur?* **Level III Students will:** **Explain that organisms have differences in their traits that can affect their survival.** *Ex. A thicker fur coat will help an organism survive in a cold environment.* *Ex. An albino mouse is more likely to be captured by a hawk.* **Level II Students will:** **Select a beneficial environment for an organism based on its physical traits.** *Ex. An animal with a thick fur coat would live in a cold environment.* *Ex. An animal with fins lives in the water.* **Level I Students will:** **Attend to a lesson about physical traits of organisms.** *Ex. Students participate in a lab with sensory objects such as soft fur, scaly skins, feathers, rough hair.*
MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.	**SES-MS-LS3-2. Students will investigate, and identify, features of living organisms that come from their parents.**	**Level IV Students will:** **Students will use a model (Punnett Square) to describe results in offspring with genetic variation.** *Ex. Using a four-square, have student complete the square and discuss the dominant and recessive traits.* **Level III Students will:** **Students will investigate, and identify, features of living organisms that come from their parents.** *Ex. Have parents complete a chart of personal traits. Students will then compare their own traits with those of their parents to find similarities and differences.* *Ex. Students will match traits of animals with their offspring.* **Level II Students will:** **Identify similarities and differences between plant and animal parents and their offspring.** *Ex. eye color, hair/fur color, height, leaf shape, or other markings, etc.* **Level I Students will:** **Attend to, and recognize, that organisms differ within the same species.** *Ex. Show pictures of dogs, chickens, horses, oaks, and flowers that differ in color and size.*

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LS4 Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.	**SES-MS-LS4-1. Compare fossils with plants and animals that exist today.**	**Level IV Students will:** **Using a model of a fossil record, identify extinction points of a fossil organism.** **Level III Students will:** **Compare fossils with plants and animals that exist today.** *Ex. Students can press leaves into soft playdough to leave an impression. The leaf will die but the impression will remain.* **Level II Students will:** **Examine various fossils.** *Ex. Hide fossils in a sand box and have students dig for them.* **Level I Students will:** **Attend to information presented about fossils.** *Ex. The book "Curious about Fossils" by Kate Waters explains why/where fossils form and looks at the lives and important discoveries of some of the great early fossil hunters and collectors.*
MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.	**SES-MS-LS4-2. Identify anatomical similarities between modern organisms and fossil organisms.**	**Level IV Students will:** **Analyze a fossil, or fossil image, and explain which modern animal they believe would be closely related.** *Ex. Wyoming has an abundance of well-preserved fish fossils and students could interact with actual samples and point out structures that are also found in modern fish.* **Level III Students will:** **Identify anatomical similarities between modern organisms and fossil organisms.** *Ex. Compare a fossilized wing to a wing from a modern animal.* *Ex. Compare a fossilized fish to modern fish.* **Level II Students will:** **View images of anatomical structures in modern organisms that are commonly found in fossil remains.** *Ex. Fern leaf, x-rays of vertebrate skeletons, feathers, shells, etc.* **Level I Students will:** **Attend to a lesson about modern organisms and fossilized items.**
MS-LS4-3. This benchmark was removed by the 2016 Science Standards Review Committee	**None**	

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LS4 Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population affect individuals' probability of surviving and reproducing in a specific environment. Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations. It is important to look at both positive and negative effects that variations of traits may have on individuals.	**SES-MS-LS4-4. Incorporated in SES-MS-LS3-1.**	**Not Applicable.**
MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the positive and negative impacts these technologies have on society as well as the technologies leading to these scientific discoveries.	**SES-MS-LS4-5. Identify desirable traits that can be passed on to offspring.**	**Level IV Students will:** **Communicate a specific example of how humans have selected a desirable trait in an organism.** *Ex. When students are presented information about how an animal or plant species has changed over time, students can communicate the traits that were desired.* **Level III Students will:** **Identify desirable traits that can be passed on to offspring.** *Ex. Students can view a picture of an organism and identify traits that would be desirable. For example, when looking at a picture of a chicken they would select a picture of a basket of eggs rather than a glass/carton of milk.* *Ex. When looking at a picture of a corn plant they select the image with the larger ears of corn.* **Level II Students will:** **Recognize the concept that parents pass traits to their offspring.** *Ex. Match a golden retriever puppy to a golden retriever parent.* *Ex. Match a small pine tree to a large pine tree, rather than a large aspen tree.* **Level I Students will:** **Attend to a lesson about organisms with traits that humans have influenced.** *Ex. black lab, a poodle, cattle, horses, wheat, etc.*

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LS4 Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.	**SES-MS-LS4-6. Demonstrate understanding that natural selection changes distribution of traits in a population over time.**	**Level IV Students will:** **Use a graph that shows how a specific trait changes in distribution over time, and predict how the trait distribution will change in the future.** *Ex. Human height over time.* *Ex. Changes in natural peaches from 4000 BC compared to the genetically modified modern peach.* **Level III Students will:** **Demonstrate understanding that natural selection changes distribution of traits in a population over time.** *Ex. Introduction of a predator will increase the number of fast individuals in prey population over time as the number of slower individuals is decreased.* **Level II Students will:** **Identify traits that are beneficial for different organisms.** *Ex. Computer simulation of rabbit survival based on coat color and predation.* **Level I Students will:** **Attend to images of populations that include individuals with different traits.** *Ex. Picture of the many breeds of dogs.*

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ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. Clarification Statement: Examples of models can be physical, graphical, or conceptual.	**SES-MS-ESS1-1. Model the Earth-sun-moon positions for lunar phases, eclipses of the sun and moon, and seasons.**	**Level IV Students will:** **Model the Earth-sun-moon positions and visual effects for lunar phases, eclipses of the sun and moon, and seasons.** *Ex. When provided with a diagram with the Earth, sun, and blank moon positions, can correctly identify and shade the lunar phases. (shade=dark/unseen part of the moon)* *Ex. Student can place and label the order of the sun, moon, and Earth in the correct order to represent an eclipse of the sun and moon, and shades the general area where the umbra/penumbra are cast. (Ex-solar eclipse, shades the side of the Earth closest to the moon; lunar eclipse, shades the space behind the Earth or the side of the moon closest to the Earth)* **Level III Students will:** **Model the Earth-sun-moon positions for lunar phases, eclipses of the sun and moon, and seasons.** *Ex. Place pictures of the moon phases (with light and dark side shown) in the correct locations in relation to the sun and Earth.* *Ex. Place pictures of the sun, moon, and Earth in the correct order to represent an eclipse of the sun and an eclipse of the moon.* **Level II Students will:** **Label the Earth-sun-moon positions for lunar phases and eclipses of the sun and moon, and seasons.** *Ex. When provided with a diagram of lunar phases (with light and dark side shown), can identify/label the moon phases in their positions around the Earth in relation to the sun.* *Ex. When provided with a diagram of a solar eclipse and a lunar eclipse, can identify/label the sun, moon, and Earth.* **Level I Students will:** **Observe/participate in demonstrations showing Earth-sun-moon positions for lunar phases and eclipses of the sun and moon, and seasons.** *Ex. Holds the representation of the Earth while the teacher or another student moves the moon around it in relation to the sun to demonstrate phase positions.* *Ex. Holds a flashlight while the teacher or another student places the moon or Earth to demonstrate solar and lunar eclipse positions.*

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ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).	**SES-MS-ESS1-2. Model that the solar system is a collection of many varied objects, held together by gravity, that move in predictable ways.** Teacher note: varied objects can include the sun, planets, moon, asteroid belt, etc.	**Level IV Students will:** **Model, and identify, the object that is the source of gravity influencing the predictable movement patterns.** *Ex. Student can identify that the sun is the source of gravity for the planets' orbital patterns.* *Ex. The Earth is the source of gravity for the moon's orbital pattern.* **Level III Students will:** **Model that the solar system is a collection of many varied objects, held together by gravity, that move in predictable ways.** *Ex. Model the orbit patterns of objects within the solar system.* **Level II Students will:** **Model the movement of space objects, around a center object, to represent the force of gravity.** *Ex. Student swings a styrofoam ball above their head.* *Ex. Student moves a ball on a string that is pinned to a foam board.* **Level I Students will:** **Attend to a lesson about space object movement.** *Ex. Watch a simulation of orbit patterns.*
MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.	**SES-MS-ESS1-3. Identify categories of solar system objects (e.g., planets, meteors, asteroids, comets, and moon).**	**Level IV Students will:** **Compare categories of solar system objects by distance and orbit period (e.g., planets, meteors, asteroids, comets).** *Ex. Student identifies that Mars is closer to the sun and has shorter orbital period than Jupiter.* **Level III Students will:** **Identify categories of solar system objects (e.g., planets, meteors, asteroids, comets, moons).** *Ex. Given a picture, student can differentiate between the various objects.* **Level II Students will:** **Identify the planets in our solar system.** **Level I Students will:** **Attend to a lesson about our solar system.** *Ex. Watches a video about the solar system.*

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ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS1-4. Construct a scientific explanation based on evidence from rocks and rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.	**SES-MS-ESS1-4. Organize, or model, evidence from rocks and rock strata within the geologic time scale to demonstrate Earth's history.**	**Level IV Students will:** **Organize past formation of Earth's continents using evidence on a map.** *Ex. Reconstruct Pangaea by placing the continents correctly through matching similar fossils, mountain chains, and organisms.* **Level III Students will:** **Organize, or model, evidence from rocks and rock strata within the geologic time scale to demonstrate Earth's history.** *Ex. Provided with 3 geologic columns, can match the different levels and place them in order next to each other.* **Level II Students will:** **Identify the order, from youngest to oldest, layer in a rock strata occurred.** *Ex. Given a bottle with colored sand in layers, can identify which layer would have to be put in the bottle first, next, to last. (Bottom layer goes in first, then works way up to top.)* **Level I Students will:** **Identify various strata that is the same or different.** *Ex. Provided with pictures showing various "rock strata", can identify which ones are the same and which ones are different.*

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ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS -ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.	**SES-MS-ESS2-1. Model the cycling processes involved in the creation of various rock forms.**	**Level IV Students will:** **Model the rock cycle in order of rock forms and processes.** *Ex. Given labeled picture cards, student will place them in the correct cycle order.* **Level III Students will:** **Model the cycling processes involved in the creation of various rock forms.** *Ex. Given a rock cycle with types of rocks already placed (igneous, sedimentary, metamorphic, magma) the student will place labeled pictures of the processes in the correct locations.* **Level II Students will:** **Compare the different rock forms.** Ex. Given a piece of granite and a piece of basalt, identify that the granite is rough and the basalt is smooth. **Level I Students will:** **Attend/Interact with rocks.** *Ex. Student feels a rock.* *Ex. Student looks at different rocks.*
MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.	**SES-MS-ESS2-2. Identify geoscience processes that can change Earth's surface over short time scales or long time scales.**	**Level IV Students will:** **Identify how a geoscience process changes the Earth's surface over short time scales and longtime scales.** *Ex. Student identifies that a river creates a canyon.* *Ex. Student identifies that plate movement creates mountains.* *Ex. Student identifies that lava, ash, and debris from a volcanic eruption changes the surface around it.* **Level III Students will:** **Identify geoscience processes that can change Earth's surface over short time scales or long time scales.** *Ex. Student identifies that a volcanic eruption changes the surface in a short time scale.* *Ex. Student identifies that formation of a mountain range changes the surface over a long time scale.* **Level II Students will:** **Identify scenarios where a surface change has occurred.** *Ex. Given before and after pictures of various scenarios, student can identify which ones involve a surface change. (Given a before and after picture of an earthquake, student identifies a change. Given a before and after picture of a rainstorm, student identifies that the surface has not changed.)* **Level I Students will:** **Attend to a lesson about geoscience processes causing surface changes.** *Ex. Watches a time-lapse video of plate motions.* *Ex. Watches a video of a meteor impact.*

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ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).	**SES-MS-ESS2-3. Compare locations of fossils, rocks, continental shapes, and structures as evidence of past plate motions.**	**Level IV Students will:** **Organize evidence of past formation of Earth's continents using a map.** *Ex. Reconstruct Pangaea by placing the continents correctly through matching similar fossils, mountain chains, and continental shapes, and indicate that similar fossils and mountain ranges could mean they were once near each other.* **Level III Students will:** **Compare locations of fossils, rocks, continental shapes, and structures as evidence of past plate motions.** *Ex. Given a world map with fossils, mountain ranges, and continents outlined, students can identify where similarities occur.* **Level II Students will:** **Recognize that plates move and change Earth's surface.** *Ex. Student recognizes that plates can move toward, away from, or slide past each other.* *Ex. Using pieces of paper, can recognize that there is change when the papers (plates) are moved toward, away from, or slide past each other.* **Level I Students will:** **Attend to a lesson about past plate motions, and evidence that supports the movement.** *Ex. Watches a video about Pangaea.*
MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.	**SES-MS-ESS2-4. Identify the processes involved in the cycling of Earth's water.**	**Level IV Students will:** **Model the water cycle in correct order of processes.** *Ex. Given labeled picture cards, student can place in the correct cycle order.* **Level III Students will:** **Identify the processes involved in the cycling Earth's water.** *Ex. Given a process picture card, can label or match the process name. (e.g., picture of rain, snow, sleet, hail=precipitation; picture of cloud=condensation; etc.)* **Level II Students will:** **Identify the direction in which water moves through the water cycle.** *Ex. Given a labeled water cycle picture, can indicate the direction the cycle goes in. (draws arrow from evaporation to condensation)* **Level I Students will:** **Attend to a lesson about the water cycle.** *Ex. Watch a demonstration or video showing the water cycle.*

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ESS2 – Earth's Systems (cont.)

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2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).	**SES-MS-ESS2-5. Utilize data to compare weather conditions in different locations on the same day.** Teacher notes: Examples of data can be provided to students (such as weather maps, diagrams, and visualizations).	**Level IV Students will:** **Collect data to compare how weather conditions changed in different locations on multiple days.** *Ex. Student uses a week's worth of weather reports for 2 cities and compares how each one changed over the period of a week. (can include: city 1 got hotter, started sunny, then rainy; city 2 got colder, started rainy then became snowy)* **Level III Students will:** **Utilize data to compare weather conditions in different locations on the same day.** *Ex. Given weather reports for their city and San Francisco, CA, student can identify how they are different. (can include: which one is hotter, precipitation, cloud coverage, wind, etc.)* **Level II Students will:** **Identify different weather conditions.** *Ex. Given a picture of a sunny place, can identify it as hot, sunny, etc.* *Ex. Given a picture of a rainy place, can identify it as cloudy, rain, cold, etc.* *Ex. Identify current weather outside.* **Level I Students will:** **Attend to a lesson about weather.** *Ex. Watches a video about various weather conditions.*
MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.	**SES-MS-ESS2-6. Identify how latitude and altitude influence climate.**	**Level IV Students will:** **Identify how climate patterns vary based on latitude, altitude, and geographic land distributions.** *Ex. Student communicates that a mountain at a higher latitude is colder than a mountain at a lower latitude due to angle of sunlight.* **Level III Students will:** **Identify how latitude and altitude influence climate.** *Ex. Student uses a map to identify that closer to the equator (lower latitude) is warmer than further away from the equator (higher latitude).* *Ex. Student uses a map with altitude and temperature to identify that the higher the altitude the colder it is.* **Level II Students will:** **Compare various climates.** *Ex. Experiences virtual field trips (with observable aspects such as temp, humidity, etc.) and identify how they are different.* *Ex. Discuss climate for their area.* **Level I Students will:** **Attend to a lesson about climate.** *Ex. Virtual field trips to various climates.*

ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).	**SES-MS-ESS3-1. Identify how the levels of Earth's resources can change over time.**	**Level IV Students will:** **Propose a solution in response to the possibility of the depletion of Earth's resources.** *Ex. Voice ideas during a discussion on the depletion of groundwater, minerals, or energy.* *Ex. Devise an idea regarding alternative energy sources.* *Ex. Voice ideas for solving a decreasing food availability.* **Level III Students will:** **Identify how the levels of Earth's resources can change over time.** *Ex. Increase in population sizes results in more organisms using vehicles, which decreases the levels of petroleum available.* *Ex. Flood can cause an increase in groundwater.* *Ex. Increase in population would decrease food availability.* **Level II Students will:** **Recognizes that there are multiple uses for Earth's resources.** *Ex. groundwater- drinking, watering, doing laundry, etc.* *Ex. minerals- tools, jewelry, soap, cleaners, etc.* *Ex. energy- gasoline, electricity, etc.* *Ex. food- corn for fuel, food, etc.* **Level I Students will:** **Attend to a lesson about Earth's different resources.** *Ex. Watch a video about coal.*

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ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).	**SES-MS-ESS3-2. Recognize that some natural hazards (e.g., volcanic eruptions, severe weather) can be predicted while others are not currently predictable.**	**Level IV Students will:** **Identify how technology is increasing the predictability of natural hazards (e.g., volcanic eruptions, severe weather).** *Ex. Student identifies what technology is used and how it has changed in predicting natural hazards.* **Level III Students will:** **Recognize that some natural hazards (e.g., volcanic eruptions, severe weather) can be predicted while others are not currently predictable.** *Ex. Classify predictable natural hazards compared to unpredictable natural hazards.* **Level II Students will:** **Identify natural hazards and the characteristics of them.** *Ex. Given pictures, can identify each natural hazard. (Ex: picture of a tornado, student identifies as tornado)* **Level I Students will:** **Attend to lessons about natural hazards.** *Ex. Watch a video about tornadoes.*
MS-ESS3-3. Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment. Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could manage that impact. Examples of human impacts can include conservation techniques, water usage (such as municipal withdrawals, industrial applications, and irrigation), land usage (such as urban development, recreation, agriculture, or reclamation), and pollution.	**SES-MS-ESS3-3. Model ways that humans can minimize their impact on the environment.**	**Level IV Students will:** **Develop and execute a plan to minimize their impact on their current environment.** *Ex. They can set up recycling bins at school and/or at home.* **Level III Students will:** **Model ways that humans can minimize their impact on the environment.** *Ex. recycling, turning off water when brushing teeth, carpooling, etc.* **Level II Students will:** **Recognize the ways that humans impact their environment.** *Ex. pollution, deforestation, irrigation, water conservation, etc.* **Level I Students will:** **Attend to a lesson about humans interacting with their environment.**

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ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ESS3-4. Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems. Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of changing human populations and the consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.	**SES-MS-ESS3-4. Is incorporated into SES-MS-ESS3-1.**	**Not Applicable.**
MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused changes in global temperatures over time. Clarification Statement: Examples of factors include natural processes and human activities. Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases, and the frequency and rates of natural processes and human activities.	**SES-MS-ESS3-5. Recognize natural processes, and human activities, that may impact global temperatures.**	**Level IV Students will:** **Identify effects of an increase in global temperatures.** *Ex. temperatures rise, glaciers melt, polar bear's natural habitat decreases* **Level III Students will:** **Recognize natural processes, and human activities, that may impact global temperatures.** *Ex. ocean currents, prevailing winds, gas levels in the atmosphere, human use of fossil fuels, etc.* **Level II Students will:** **Identify the impact of increasing temperatures.** *Ex. Student applies warm water to an ice cube and observes/identifies the ice melts.* *Ex. Students observe a plant under a heat lamp and a plant in the sun. Observes/identifies the plant under the heat lamp needs more water or dies.* *Ex. Temperature changes inside of a car relative to outside conditions.* **Level I Students will:** **Attend to a lesson about increasing global temperatures.**

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ETS1 – Engineering, Technology, & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. Clarification Statement: Example problems could include citing and designing a retirement home, a hospice building, or a new Junior High School within the city.	**SES-MS-ETS1-1. Describe a problem that needs to be solved.**	**Level IV Students will:** **Develop possible solutions for a selected problem.** **Level III Students will:** **Describe a problem that needs to be solved.** *Ex. Brainstorm with student's challenges they face in their school or home.* **Level II Students will:** **Recognize a problem that can be solved when presented with a specific scenario.** *Ex. Given pictures of a ball, broken shovel, and a bucket, student selects the broken shovel as being the problem that can be solved.* **Level I Students will:** **Attend to a visualization of a problem and its solution.** *Ex. Teacher skit that includes a teacher's reaction to a problem and the teacher finding a solution to the problem.*
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. Clarification Statement: Preliminary building designs could involve overall dimensions, number of rooms, entries & exits, orientation to permit solar energy collection. Criteria and constraints could include these design elements or those of another project.	**SES-MS-ETS1-2. Evaluate solutions to given problems.**	**Level IV Students will:** **Explain why one design solution is better than another.** **Level III Students will:** **Evaluate solutions to given problems.** *Ex. Students are presented with a scenario such as a student in a wheelchair that is struggling with a set of steps into a building. Students then select the best solution from a set of images.* **Level II Students will:** **Recognize a problem that can be solved when presented with a specific scenario.** *Ex. Given a picture of a car with a flat tire, the student can identify the flat tire as a problem.* **Level I Students will:** **Attends to a visualization of a problem and its solution.** *Ex. Teacher skit that includes a teacher's reaction to a problem and the teacher finding a solution to the problem.*

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ETS1 – Engineering, Technology, & Applications of Science (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. Clarification Statement: Tests could include building capacity, heating efficiency, use of hazardous materials, meeting ADA requirements, or earthquake survival.	**SES-MS-ETS1-3. Analyze results from the testing of possible solutions.**	**Level IV Students will:** **Identify what characteristics caused the best solution to be better than the rest.** **Level III Students will:** **Analyze results from the testing of possible solutions.** **Level II Students will:** **Identify which solution was better than the other(s).** **Level I Students will:** **Attend to a story about how making choices can affect an outcome.** Teacher note: Examples purposely not provided so that students have the opportunity to identify problems that matter to them personally.
MS-ETS1-4. Develop a model for a proposed object, tool, or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design. Clarification Statement: The object, tool or process could include a bicycle, a bridge, a smart furnace, or an auto airbag system. Test data could be collected from tests of a model object, or from test data for a similar object, tools, or process found on the internet.	**SES-MS-ETS1-4. Create an object or tool from materials provided.**	**Level IV Students will:** **Identify an improvement possibility for an existing object or tool.** **Level III Students will:** **Create an object or tool from materials provided.** **Level II Students will:** **Identify the purpose of objects or tools.** **Level I Students will:** **Attend to a lesson about using objects or tools.**

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ETS2 - Engineering, Technology, Science, and Society

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
MS-ETS2-1. Ask questions about a common household appliance, collect data to reverse-engineer the appliance and learn how it's design has evolved, describe how scientific discoveries, technological advances, and engineering design played significant roles in its development, and explore how science, engineering and technology might be used together or individually in producing improved versions of the appliance. Clarification Statement: Examples of household appliances could include radios, heaters, food processors, refrigerators, and washing machines.	**SES-MS-ETS2-1. Ask questions about common household, or classroom, appliances.**	**Level IV Students will:** **Identify ways common household, or classroom appliances, have improved human lives.** **Level III Students will:** **Ask questions about common household, or classroom, appliances.** *Ex. How does the pencil sharpener work?* *Ex. Who created the refrigerator?* **Level II Students will:** **Identify common household, or classroom, appliances.** *Ex. dishwasher, radio, pencil sharpener, lamp.* **Level I Students will:** **Attend to lessons about use of appliances.**
MS-ETS2-2. Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual property rights might constrain future development. Clarification Statement: The model could be mathematical, tabular, or graphic. Examples of impacted activities could include agriculture, medicine, energy production and water resources. Constraints on human impacts could include balancing costs, benefits, and risks to society.	**SES-MS-ETS2-2. Identify consequences of human choices.**	**Level IV Students will:** **Identify how their personal choices affect others and their environment.** *Ex. Student identifies that throwing their trash on the floor can cause more work for others, create hazards, or ruin the flooring.* **Level III Students will:** **Identify consequences of human choices.** *Ex. Eating too much candy can make you sick.* **Level II Students will:** **Identify choices made throughout their day.** **Level I Students will:** **Attend to a lesson about choices and consequences.**

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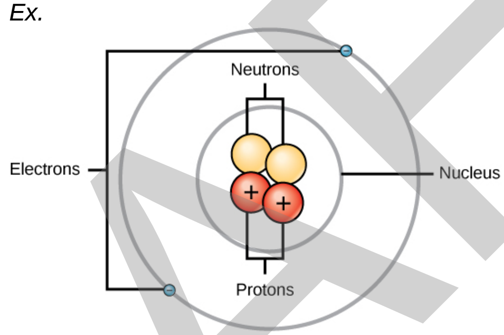
PS1 – Matter and Its Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.	**SES-HS-PS1-1. Using a model, identify the parts of an atom (protons, neutrons, electrons).**	**Level IV Students will:** **Identify how many electrons are in the outermost energy level of an atom.** **Level III Students will:** **Using a model, identify the parts of an atom (protons, neutrons, electrons).** *Ex.*  **Level II Students will:** **Identify a diagram or model of an atom.** *Ex. When given two choices, choose the picture or diagram that represents an atom.* **Level I Students will:** **Attend to a lesson about atomic structure.**
HS-PS1-2. Construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties, and revise, as needed. Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.	**SES-HS-PS1-2. Use a periodic table to identify symbols and atomic numbers for five main group elements (1-20.)**	**Level IV Students will:** **Use a Periodic Table to identify symbols, and atomic numbers, for main group elements (1-20).** **Level III Students will:** **Use a Periodic Table to identify the symbol, and the atomic number, for five main group elements (1-20).** **Level II Students will:** **Use a Periodic Table to identify symbols, and atomic numbers, for two main group elements (1-20).** **Level I Students will:** **Attend to a lesson on the information found in a periodic table.**

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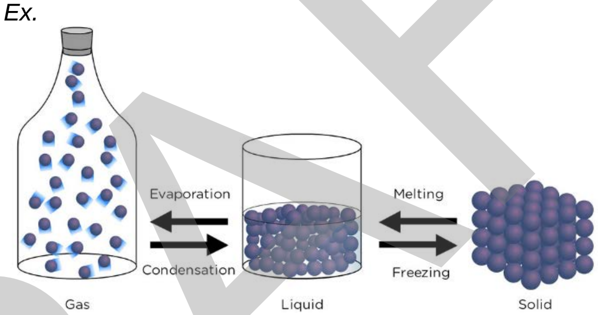
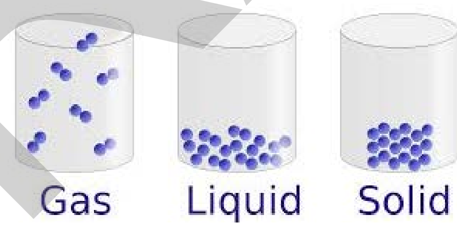
2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS1 - Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the macroscopic scale to infer the strength of electrical forces between particles. Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of macroscopic properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.	**SES-HS-PS1-3. Using models, investigate the results of changes in states of matter.**	**Level IV Students will:** **Gather evidence about how the strength of electrical forces between particles change the state of matter.** *Ex. Ice at 0-degrees vs water at 0-degrees.* **Level III Students will:** **Using models, investigate the results of changes in states of matter.** *Ex.*  **Level II Students will:** **Identify different states of matter.** *Ex: solid, liquid, gas, plasma*  *http://www.chem4kids.com/files/art/matter-states-03.png* **Level I Students will:** **Attend to an investigation of states of matter.**

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PS1 - Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. Clarification Statement: Emphasis is on the idea that a chemical reaction, as a system, affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.	**SES-HS-PS1-4. Using a model, determine if the product absorbs or releases energy, when given the reactants in a chemical reaction.**	**Level IV Students will:** **Investigate a model which illustrates that the amount of energy on one side of a chemical reaction will equal the amount of energy on the opposite side of the chemical reaction.** **Level III Students will:** **Using a model, determine if the product absorbs or releases energy, when given the reactants in a chemical reaction.** *Ex. Baking soda and vinegar absorbs energy.* *Ex. Magnesium in Hydrogen Chloride releases energy.* **Level II Students will:** **Given two models, identify the one that illustrates that each side of the reaction matches (conservation of matter and energy).** *Ex: Match two items that are identical.* **Level I Students will:** **Attend to lesson about conservation of matter and energy.**
HS-PS1-5. Apply scientific principles and use evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.	**SES-HS-PS1-5. Conduct an investigation measuring temperature differences, while observing and recording the reactions.**	**Level IV Students will:** **Compare data collected, through investigative processes, of temperature differences of substances used in reactions.** **Level III Students will:** **Conduct an investigation measuring temperature differences, while observing and recording the reactions.** *Ex. Using warm vinegar vs. cold vinegar in a baking soda experiment.* **Level II Students will:** **Investigate reacting substances of different temperatures.** **Level I Students will:** **Attend to an investigation of the reaction of substances of different temperatures.**

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PS1 - Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS1-6. Evaluate the design of a chemical system by changing conditions to produce increased amounts of products at equilibrium, and refine the design, as needed. Clarification Statement: Emphasis is on the application of Le Chatelier's Principle by evaluating and refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.	**SES-HS-PS1-6. Conduct a chemical experiment by changing a variable.**	**Level IV Students will:** **Compare the results of changing a variable in a series of experiments.** **Level III Students will:** **Conduct a chemical experiment by changing a variable.** *Ex. Mentos experiment - change the number of Mentos or the type of soda.* *Ex. Baking soda and vinegar experiment, changing the amount of baking soda used.* **Level II Students will:** **Identify the independent variable in an experiment.** **Level I Students will:** **Observe an experiment in which a variable is changed.**
HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. Clarification Statement: Emphasis is on using mathematical ideas, beyond memorization and rote application of problem solving techniques, to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale.	**SES-HS-PS1-7. integrated in PS1-4.**	**Not applicable.**

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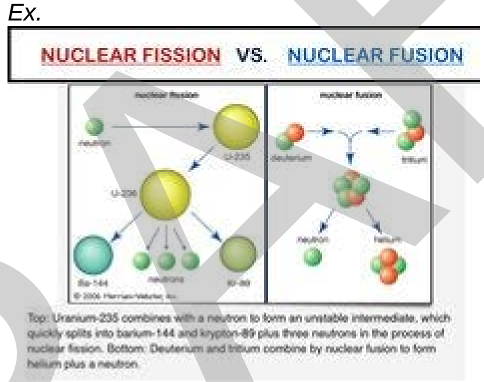
PS1 - Matter and Its Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.	**SES-HS-PS1-8. Compare models which illustrate fusion, fission, and radioactive decay.**	**Level IV Students will:** **Create models of fusion, fission, and radioactive decay.** **Level III Students will:** **Compare models which illustrate fusion, fission, and radioactive decay.** **Level II Students will:** **Identify models of fission, fusion, and radioactive decay.** *Ex.*  **Level I Students will:** **Attend to a presentation on models of fission, fusion, and radioactive decay.** *Ex. Take apart and put together Legos.*

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PS2 – Motion and Stability: Forces and Interactions

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. Clarification Statement: Examples of data could come from lab experiments or include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.	**SES-HS-PS2-1. Predict the outcome, when changing either mass or force, in an experiment using Newton's Second Law of Motion.**	**Level IV Students will:** **Using Newton's Second Law of Motion, compare the data from a series of experiments where force or mass is changed.** **Level III Students will:** **Predict the outcome, when changing either mass or force, in an experiment using Newton's Second Law of Motion.** **Level II Students will:** **Identify whether mass or force is changed in an experiment.** **Level I Students will:** **Attend to a lesson on how changing mass and force in an experiment change the outcome.**
HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.	**SES-HS-PS2-2. Demonstrate what happens to the velocity of an object when the mass of the object is increased.** Teacher Note: Calculator use is permitted.	**Level IV Students will:** **Use a model to demonstrate that momentum is conserved in a collision.** *Ex. https://phet.colorado.edu/en/simulation/legacy/collision-lab* *Ex: analysis of car crash videos* **Level III Students will:** **Demonstrate what happens to the velocity of an object when the mass of the object is increased.** *Ex. An object in motion would slow down if the mass increased.* *Ex: When a basketball & bowling ball are pushed with the same force, the bowling ball rolls further due to its higher mass.* **Level II Students will:** **Demonstrate the velocity of an object.** *Ex. Using an object or illustration, student should identify or demonstrate velocity (student drops/pushes an object to show movement).* **Level I Students will:** **Attend to a demonstration of velocity.**

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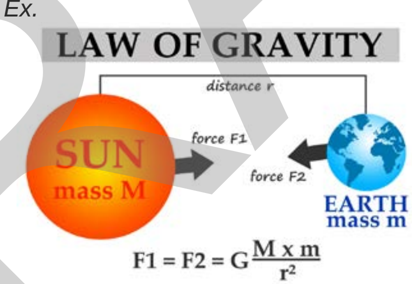
PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.	**SES-HS-PS2-3. Select between a variety of designs to minimize force on an object, during a collision, and record outcomes.**	**Level IV Students will:** **Apply scientific and engineering ideas to design a device that minimizes the force on an object during a collision, and record outcomes.** *Ex. Egg Drop Activity* **Level III Students will:** **Select between a variety of designs to minimize force on an object, during a collision, and record outcomes.** *Ex. Egg Drop Activity - Duct tape and cardboard vs. bubble wrap vs. egg carton, etc.* **Level II Students will:** **Predict (from provided designs) which design will minimize the force on an object during a collision.** **Level I Students will:** **Observe a demonstration of given designs to minimize the impact of force on an object during a collision.**
HS-PS2-4. Use mathematical representations to predict the gravitational and/or electrostatic forces between objects using Newton's Law of Gravitation and/or Coulomb's Law, respectively. Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and/or electric fields.	**SES-HS-PS2-4. Demonstrate that gravitational forces are constant.**	**Level IV Students will:** **Use mathematical representation to indicate that gravitational forces are always attractive.** *Ex.*  **Level III Students will:** **Demonstrate that gravitational forces are constant.** *Ex. Repeatedly show that different objects dropped will always fall towards the ground.* **Level II Students will:** **Recognize that objects can be attracted to one another.** *Ex. Balloon sticks to a wall due to static, but will eventually fall to the ground.* **Level I Students will:** **Attend to a demonstration of gravitational forces.**

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PS2 – Motion and Stability: Forces and Interactions (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.	**SES-HS-PS2-5. Conduct an experiment to test for a magnetic field around an electromagnet.**	**Level IV Students will:** **Conduct an experiment which demonstrates that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.** *Ex. https://phet.colorado.edu/en/simulation/legacy/magnets-and-electromagnets* **Level III Students will:** **Conduct an experiment to test for a magnetic field around an electromagnet.** *Ex. Use battery with copper coils to pick up paperclips.* *Ex. https://phet.colorado.edu/en/simulation/legacy/magnets-and-electromagnets* **Level II Students will:** **Identify a magnetic field.** *Ex. Given a diagram or demonstration, student identifies magnetic field lines.* *Ex. https://phet.colorado.edu/en/simulation/legacy/magnets-and-electromagnets* **Level I Students will:** **Attend to a demonstration of a magnetic field around an electromagnet.** *Ex. https://phet.colorado.edu/en/simulation/legacy/magnets-and-electromagnets*
HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of materials. Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include: why electrically conductive materials are often made of metal; flexible but durable materials are made up of long chained molecules; and pharmaceuticals are designed to interact with specific receptors.	**SES-HS-PS2-6. Demonstrate why material selection is important in building stable structures.**	**Level IV Students will:** **Build, or design, a stable structure.** *Ex. toothpick bridge, straw bridge, etc.* **Level III Students will:** **Demonstrate why material selection is important in building stable structure.** *Ex. Have students manipulate different objects to demonstrate which are best for building.* **Level II Students will:** **Given multiple pictures of familiar structures, select the one that illustrates the strongest structural elements.** *Ex. the house in the "Three Little Pigs" story* **Level I Students will:** **Attend to a demonstration of why material selection is important in building a stable structure.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS3 - Energy

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS3-1. Create or apply a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.	**SES-HS-PS3-1. Demonstrate the differences in the energy of a system when a component is changed.**	**Level IV Students will:** **Demonstrate, and describe, the effect of a change in energy on a system.** **Level III Students will:** **Demonstrate differences in the energy of a system when a component is changed.** *Ex. An increase or decrease in thermal energy, wind energy, water flow, etc. will change the energy of a system.* **Level II Students will:** **Compare the energies of two objects.** *Ex. Shown two different balls (differing weight, size, etc.) rolling down a hill, identify which one has more kinetic energy.* *Ex. Provided with 1 cup of cold water and 1 cup of warm water, the student identifies which cup contains more energy.* **Level I Students will:** **Participate in changing the energy of an object.** *Ex. Push a ball down a slope.* *Ex: Kick a ball to change the energy of the object.*
HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the Earth, and the energy stored between two electrically charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.	**SES-HS-PS3-2. Demonstrate that energy manifests itself in multiple ways, such as motion, sound, light, and thermal energy.**	**Level IV Students will:** **Develop, and describe, models of energy.** *Ex. https://phet.colorado.edu/en/simulation/legacy/energy-forms-and-changes* *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT05/CT05.html* **Level III Students will:** **Demonstrate that energy manifests itself in multiple ways, such as motion, sound, light, and thermal energy.** *Ex. https://phet.colorado.edu/en/simulation/legacy/energy-forms-and-changes* *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT05/CT05.html* **Level II Students will:** **Given illustrations of different types of energy, match each to its respective type of energy.** *Ex. A picture of the sun matched with solar energy/solar panel; a power plant matched with electrical energy.* **Level I Students will:** **Attend to a demonstration of the multiple ways in which energy can be manifested.**

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PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include high- efficiency hydrocarbon engines, Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of a variety of energy forms and efficiency.	**SES-HS-PS3-3. Conduct an experiment to convert one form of energy to another form of energy.**	**Level IV Students will:** **Conduct an experiment which demonstrates devices with varying levels of efficiency and compare the results.** *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/E17/E17.html* **Level III Students will:** **Conduct an experiment to convert one form of energy to another form of energy.** *Ex. Make nachos with solar oven.* *Ex. Test different levels of wind energy on windmills or turbines.* **Level II Students will:** **Given an example or illustration, identify one type of energy in an energy conversion.** *Ex: An automobile engine changes chemical energy to mechanical and heat energy.* *Ex: A tree changes solar energy to chemical energy.* *Ex. Hammering a nail changes mechanical energy to deformation and heat energy.* *Ex. An electric mixer changes electrical energy to mechanical and heat energy.* *Ex. A lamp changes electrical energy to radiant and heat energy.* *Ex: Wind energy to mechanical energy in windmills or turbines.* **Level I Students will:** **Attend to a demonstration of energy conversion.**

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PS3 – Energy (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system. Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.	**SES-HS-PS3-4. Conduct an experiment demonstrating the transfer of thermal energy when two components, of different temperature, are combined within a closed system.**	**Level IV Students will:** **Conduct an investigation, recording data, and describe the transfer of thermal energy.** *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/E17/E17.html* **Level III Students will:** **Conduct an experiment demonstrating the transfer of thermal energy when two components, of different temperature, are combined within a closed system.** *Ex. Mix two liquids of different initial temperatures together.* **Level II Students will:** **Describe how thermal energy can be absorbed.** *Ex. Describe how different colors of objects absorb thermal energy differently.* *Ex: Black paper in the sun gets warm faster than white paper.* *Ex: A thermometer on a car hood in the sun warms up.* **Level I Students will:** **Observe how thermal energy can be absorbed.** *Ex: Black paper in the sun gets warm.*
HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.	**SES-HS-PS3-5. Demonstrate that when two interacting objects change position, the interacting forces change.**	**Level IV Students will:** **Develop, and use, a model to demonstrate how to maximize the interacting forces when changing the position of two objects.** *Ex. Student manipulate magnets at different distances from objects produce different forces, such as a magnet closer to a pile of paper clips picks up more than a magnet further away.* **Level III Students will:** **Demonstrate that when two interacting objects change position, the interacting forces change.** *Ex. If the sun and moon were to become farther apart, the force between them would decrease.* **Level II Students will:** **Given two examples, distinguish between the effects of distance upon forces.** *Ex. Magnets at different distances from objects produce different forces, such as a magnet closer to a pile of paper clips picks up more than a magnet further away.* **Level I Students will:** **Attend to a demonstration of two interacting objects changing position.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

PS4: Waves and Their Applications in Technologies for Information Transfer

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum or glass, sound waves traveling through air or water, and seismic waves traveling through the Earth.	**SES-HS-PS4-1. Demonstrate that simple waves have a repeating pattern with a specific wavelength, frequency, and amplitude.**	**Level IV Students will:** **Demonstrate how to change the wavelength, frequency, and amplitude of a wave.** *Ex. Change the movement of the rope in order to change the patterns.* **Level III Students will:** **Demonstrate that simple waves have a repeating pattern with a specific wavelength, frequency, and amplitude.** *Ex. Move a rope (or a slinky) to create patterns which can be measured. Draw diagrams of the movement.* **Level II Students will:** **Identify two or more types of waves.** *Ex. Given a picture of a light wave, can match/identify as a light wave.* **Level I Students will:** **Attend to a demonstration of how a wave moves.** *Ex. Watch the teacher create a wave using a rope.*
HS-PS4-2. Evaluate the advantages and disadvantages of using digital transmission and storage of information. Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.	**SES-HS-PS4-2. Explore both physical and digital storage.**	**Level IV Students will:** **Evaluate different ways to store digital information by discussing advantages/disadvantages.** *Ex. List pros and cons of various digital storage methods. (on a computer hard drive, a USB drive, cloud storage, etc.)* **Level III Students will:** **Explore both physical and digital storage.** *Ex. saving files on a computer or USB* *Ex. printing a document and placing it in a folder* *Ex. pictures-saving on a phone, a computer, etc. vs. a photo album* **Level II Students will:** **Distinguish between digital and physical storage examples.** *Ex. identifies a computer as digital storage* *Ex. identifies a box with papers as physical storage* **Level I Students will:** **Attend to a lesson, or discussion, about different storage types.**

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PS4: Waves and their Applications in Technologies for information Transfer (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-PS4-3. Evaluate the evidence behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect	**SES-HS-PS4-3.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**
HS-PS4-4 was removed. The evaluated validity and reliability of claims in a variety of materials. *See HS-ETS1-5 pg. 64. (on the 2016 Science Standards)	**none**	**Not applicable.**
HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.	**SES-HS-PS4-5.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS1 – From Molecules to Organisms: Structure & Processes

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. Clarification statement: Explanations emphasize basic DNA replication, transcription, and translation.	**SES-HS-LS1-1. Construct a model of DNA.**	**Level IV Students will:** **Construct, and label, a model of DNA.** *Ex. Limited to sugars, phosphates and nitrogen bases.* **Level III Students will:** **Construct a model of DNA.** **Level II Students will:** **Match a picture of DNA structure to the term DNA.** **Level I Students will:** **Attend to the construction of a model of DNA.**
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms. Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.	**SES-HS-LS1-2. Construct a model of hierarchical organization of interacting systems from smallest to largest.**	**Level IV Students will:** **Construct, and explain, a model of hierarchical organization of interacting systems from smallest to largest.** **Level III Students will:** **Construct a model of hierarchical organization of interacting systems from smallest to largest.** *Ex. From atoms, to molecules, to cells, to tissues, to systems to organism.* **Level II Students will:** **Using diagrams or manipulatives, correctly arrange the interacting system of a hierarchical organization within a multi-cellular organism.** **Level I Students will:** **Attend to a demonstration of the hierarchical organization within a multi-cellular organism.**
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Clarification Statement: Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.	**SES-HS-LS1-3. Identify a feedback mechanism that helps maintain homeostasis.**	**Level IV Students will:** **Demonstrate, and explain, a feedback mechanism that helps maintain homeostasis.** *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT08/CT08.html* **Level III Students will:** **Identify a feedback mechanism that helps maintain homeostasis.** *Ex. Sweating means my body is too hot and is trying to maintain homeostasis.* **Level II Students will:** **Select a model of a feedback mechanism that helps maintain homeostasis.** *Ex. Given a picture of a coat and a picture of a bucket of ice, student chooses which would help maintain homeostasis in a cold environment.* **Level I Students will:** *Attend to a demonstration of a feedback mechanism that helps to maintain homeostasis.*

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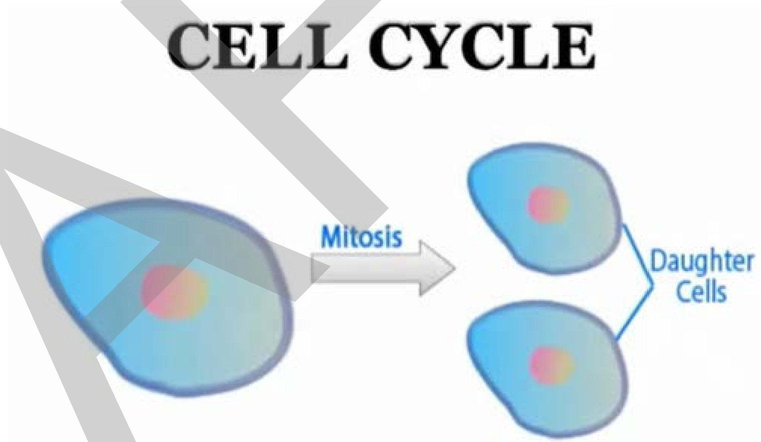
LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. Clarification Statement: Cellular division should include a description of the entire cell cycle along with the phases of mitosis.	**SES-HS-LS1-4. Use a model to demonstrate mitosis.**	**Level IV Students will:** **Label, and discuss, a model of the cell cycle.** *Ex. Students are given a diagram and label the phases in the cell cycle.* **Level III Students will:** **Use a model to demonstrate mitosis.** *Ex.*  **Level II Students will:** **Recognize that mitosis is the exact duplication of a cell.** **Level I Students will:** **Recognize a pair of duplicate objects.**

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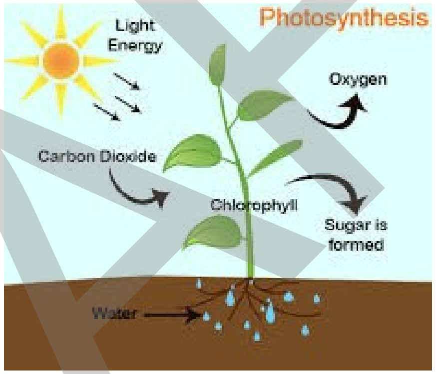
LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.	**SES-HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.**	**Level IV Students will:** **Create, and label, a model of how photosynthesis transforms light energy into stored chemical energy (glucose).** **Level III Students will:** **Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.** *Ex.*  **Level II Students will:** **Recognize that plants need sunlight to make food.** **Level I Students will:** **Attend to a simulation of the process of photosynthesis.**
HS-LS1-6. Construct explanations and revise, as needed, based on evidence for 1) how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules. Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations. Other hydrocarbons should include, but are not limited to: lipids, carbohydrates, and proteins.	**SES-HS-LS1-6. Construct models of carbon-based molecules.**	**Level IV Students will:** **Construct, and label, models of carbon- based molecules.** *Ex. glucose, amino acid, DNA, hydrocarbons, etc.* **Level III Students will:** **Construct models of carbon-based molecules.** *Ex. glucose, amino acid, DNA, hydrocarbons, etc.* **Level II Students will:** **Recognize a model of a carbon-based molecule.** *Ex. glucose vs salt* **Level I Students will:** **Attend to the construction of a model of a carbon-based molecule.**

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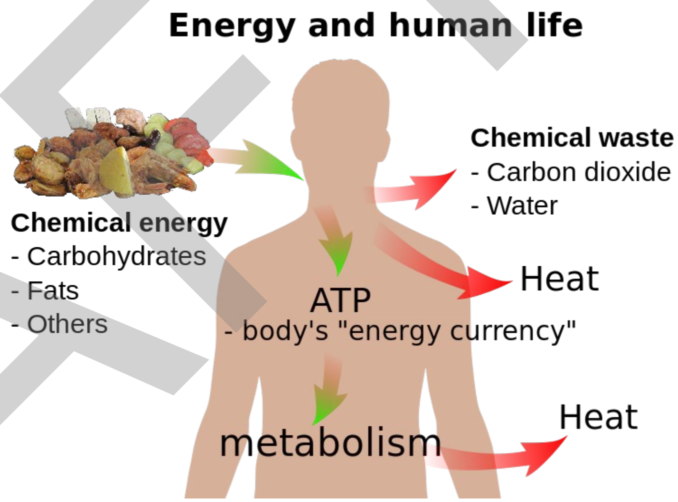
LS1 – From Molecules to Organisms: Structure & Processes (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of sugar molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration. The term "molecules" is synonymous with "food" in other grade level bands.	**SES-HS-LS1-7. Use a model to demonstrate that energy can be transferred through breaking and forming bonds.**	**Level IV Students will:** **Create a model that illustrates cellular respiration.** *Ex.*  **Level III Students will:** **Use a model to demonstrate that energy can be transferred through breaking and forming bonds.** **Level II Students will:** **Recognize that energy is transferred through breaking and forming bonds.** **Level I Students will:** **Attend to a lesson about the breaking and forming of bonds.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

LS2 – Ecosystems: Interactions, Energy, and Dynamics

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition in the Rocky Mountain region. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical, regional, or current data sets.	**SES-HS-LS2-1. Describe how the population of a species changes in relation to the availability of resources.**	**Level IV Students will:** **Use a model to explain how changes in the population of species affect the carrying capacity of an ecosystem.** **Level III Students will:** **Describe how the population of a species changes in relation to the availability of resources.** *Ex. When more water is present more species are present.* *Ex: When more food is available, populations grow.* **Level II Students will:** **Identify a factor that affects change on an ecosystem and how it can increase/decrease available resources.** *Ex. Drought decreases species distribution.* **Level I Students will:** **Given two illustrations or manipulatives, identify which one is found in an ecosystem (living vs. nonliving).** *Ex. ball vs. plant*
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. Revision refers to the scientific practice of modifying explanations using additional data analysis and/or research.	**SES-HS-LS2-2. Identify factors that affect biodiversity in different environments.**	**Level IV Students will:** **Create a model demonstrating factors affecting biodiversity and compare the difference in population numbers.** **Level III Students will:** **Identify factors that affect biodiversity in different environments.** *Ex. amount of rainfall, number of hours of sunlight, temperature, etc.* **Level II Students will:** **Identify which environments have higher, or lower, biodiversity.** *Ex. Picture of the rainforest with organisms vs. picture of the tundra with organisms. Student identifies the rainforest as having higher biodiversity.* **Level I Students will:** **Attend to lessons about biodiversity.**

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LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS2-3. Construct an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions, and revise as needed. Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments. Examples could include bioremediation of hydrocarbons or other materials, sewage / waste treatment, or decomposition.	**SES-HS-LS2-3. Construct models of matter and energy cycles.**	**Level IV Students will:** **Construct and compare models of matter and energy cycles.** **Level III Students will:** **Construct models of matter and energy cycles.** **Level II Students will:** **Use a model to answer questions about matter and energy cycles.** **Level I Students will:** **Attend to a discussion of matter and energy cycles.**
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen, and nitrogen being conserved as they move through an ecosystem.	**SES-HS-LS2-4. Integrated in SES-HS-LS2-3.**	**Not applicable.**
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	**SES-HS-LS2-5. Construct a model of the carbon cycle to include interaction with the atmosphere.**	**Level IV Students will:** **Construct and label a model of the carbon cycle to include explanation of cycling among the biosphere, atmosphere, hydrosphere and geosphere.** **Level III Students will:** **Construct a model of the carbon cycle to include interaction with the atmosphere.** **Level II Students will:** **Label the parts of the carbon cycle.** *Ex. Place labels on a pre-made diagram.* **Level I Students will:** **Attend to a lesson about the role animals play in the carbon cycle.**

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LS2 – Ecosystems: Interactions, Energy, and Dynamics (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex biotic and abiotic interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a modified ecosystem. Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.	**SES-HS-LS2-6. Demonstrate how a change in conditions can change an ecosystem.**	**Level IV Students will:** **Demonstrate and explain how changing conditions can change an ecosystem.** *Ex. http://glencoe.mheducation.com/sites/dl/free/0078802849/383927/BL_24.html* **Level III Students will:** **Demonstrate how a change in conditions can change an ecosystem.** *Ex.http://glencoe.mheducation.com/sites/dl/free/0078802849/383927/BL_24.html* **Level II Students will:** **Recognize factors that can affect changes on an ecosystem.** *Ex.* hunting, flooding, volcanic eruption, rise of sea level, etc. **Level I Students will:** **Recognize a factor that can affect change**. *Ex. turning on a heat lamp will warm an area*
HS-LS2-7. Evaluate and assess impacts on the environment and biodiversity in order to refine or design a solution for detrimental impacts or enhancement for positive impacts. Clarification Statement: Examples of impacts could include urbanization, reclamation projects, building dams, habitat restoration, and dissemination of invasive species.	**SES-HS-LS2-7. Compare and contrast detrimental or enhancing impacts on the environment.**	**Level IV Students will:** **Design a solution for a detrimental impact on the environment.** **Level III Students will:** **Compare and contrast detrimental or enhancing impacts on the environment.** **Level II Students will:** **Identify impacts on the environment.** *Ex. Pollution causes contamination of water.* *Ex: Tornados or fires destroy forests.* **Level I Students will:** **Observe impacts on the environment.** *Ex. litter, volcano, floods, pollution, etc.*
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.	**SES-HS-LS2-8. Identify organisms that demonstrate group behaviors.**	**Level IV Students will:** **Identify why organisms demonstrate certain behaviors and how it affects their group.** *Ex. sheep in flocks for safety, fish in schools for safety, wolves in packs for hunting, etc.* **Level III Students will:** **Identify organisms that demonstrate group behaviors.** *Ex. sheep in flocks, fish in schools, wolves in packs, etc.* **Level II Students will:** **Distinguish between group and individual behavior.** *Ex. schools of fish vs an individual octopus; geese that fly in v-formation vs an individual eagle* **Level I Students will:** **Observe group behavior.**

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LS3 – Heredity: Inheritance and Variation of Traits

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	**SES-HS-LS3-1. Identify traits that are passed from parent to offspring.**	**Level IV Students will:** **Identify DNA as a code for passing traits from parent to offspring.** **Level III Students will:** **Identify traits that are passed from parent to offspring.** *Ex. seed color, hair color, eye color, etc.* **Level II Students will:** **Identify parent and offspring combinations.** *Ex. horse and a colt* **Level I Students will:** **Attend to a lesson about traits that are passed from parent to offspring.**
HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.	**SES-HS-LS3-2. Demonstrate that mutations can occur in DNA.**	**Level IV Students will:** **Model that a mutation in the DNA can result in a physical change that can be passed onto offspring.** *Ex. PhET animation of natural selection.* *Ex. https://phet.colorado.edu/en/simulation/natural-selection* **Level III Students will:** **Demonstrate that mutations can occur in DNA.** *Ex. Pull a piece from a DNA model or change the model in some way.* **Level II Students will:** **Recognize the physical effect of a genetic mutation.** *Ex. webbed fingers vs. non-webbed* **Level I Students will:** **Attend to a lesson about DNA mutation.**
HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.	**SES-HS-LS3-3.** *****The Extended Standards Educator Committee determined there are not relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**

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LS4 – Biological Evolution: Unity & Diversity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, biochemical similarities, and order of appearance of structures in embryological development.	**SES-HS-LS4-1. Construct a model demonstrating lineage from an ancient extinct animal to a modern animal.**	**Level IV Students will:** **Construct a model demonstrating adaptations from an ancient extinct animal to a modern animal.** **Level III Students will:** **Construct a model demonstrating lineage from an ancient extinct animal to a modern animal.** *Ex. horse lineage* **Level II Students will:** **Match a common ancestor to a living organism.** *Ex. A mammoth to an elephant.* **Level I Students will:** **Attend to the construction of a model demonstrating lineage from an ancient extinct animal to a modern animal.**
HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.	**SES-HS-LS4-2. Demonstrate how a population can adapt to survive.**	**Level IV Students will:** **Explain how and why adaptations can help a population survive in a given environment.** *Ex. https://phet.colorado.edu/en/simulation/natural-selection* *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS06/LS06.html* **Level III Students will:** **Demonstrate how a population can adapt to survive.** *Ex. As an environment changes from hot to cold, individuals with thicker coats will survive to reproduce while thinner coats will die off, making it more likely that the thicker coated individuals are being produced.* **Level II Students will:** **Recognize that a population's adaptation assists in its survival.** **Level I Students will:** **Recognize changes in the environment that necessitate adaptation.** *Ex. I am cold, therefore I should put on my coat.*

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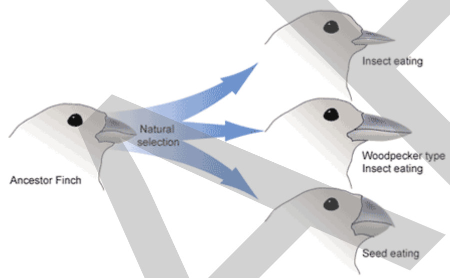
LS4 – Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations. Further development may include allele frequency calculations.	**SES-HS-LS4-3.** *****The Extended Standards Educator Committee determined there are no relevant applications for this standard that are appropriate for students with significant cognitive disabilities.**	**Not applicable.**
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term change in climate, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.	**SES-HS-LS4-4. Demonstrate how a population can change based on natural selection.**	**Level IV Students will:** **Explain how the population can change, over time, based on natural selection**. *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS06/LS06.html* *Ex. https://phet.colorado.edu/en/simulation/natural-selection* *Ex. http://glencoe.mheducation.com/sites/dl/free/0078802849/383939/BL_12.html* **Level III Students will:** **Demonstrate how a population can change based on natural selection.** *Ex. Peacocks with more eye feathers will be selected to reproduce over less colorful males.http://www.storyboardthat.com/storyboards/abigailglickman/the-natural-selection-of-colorful-peacocks* **Level II Students will:** **Given two examples, identify the population that has experienced a positive adaptation.** **Level I Students will:** **Attend to a lesson about population change based on natural selection.**

LS4 – Biological Evolution: Unity & Diversity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.	**SES-HS-LS4-5. Using evidence indicate the emergence of a new species over time.**	**Level IV Students will:** **Examine and explain the emergence of a new species over time.** *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS16/LS16.html* **Level III Students will:** **Using evidence indicate the emergence of a new species over time.** *Ex.*  **Level II Students will:** **Given an adaptation vs. non-adaptation, select the item that demonstrates the adaptation.** *Ex. Chameleons change skin color to hide in surroundings.* **Level I Students will:** **Given an adaptation, select the environmental condition that would cause it.** *Ex. Provided pictures of hot and cold environments, choose the one that would make you put on your coat.*
HS-LS4-6. Create and/or use a simulation to evaluate the impacts of human activity on biodiversity. Clarification Statement: Emphasis is on examining positive and negative impacts of human activity. Examples could include cost benefit analysis of proposed actions, protection for threatened or endangered species, reclamation projects and/or efforts to maintain biodiversity.	**SES-HS-LS4-6. Observe and describe the impacts of human activity on biodiversity.**	**Level IV Students will:** **Evaluate the impact of human activity on biodiversity.** *Ex: Cutting down rainforest kills toucans.* **Level III Students will:** **Observe and describe the impacts of human activity on biodiversity.** *Ex. http://media.hhmi.org/biointeractive/click/anthropocene/?_ga=2.254624008.1246819976.1499801160-1890238365.1499801160* **Level II Students will:** **Identify, as positive or negative, various impacts of human activity on biodiversity.** **Level I Students will:** **Attend to a simulation of the impacts of human activity on biodiversity.**

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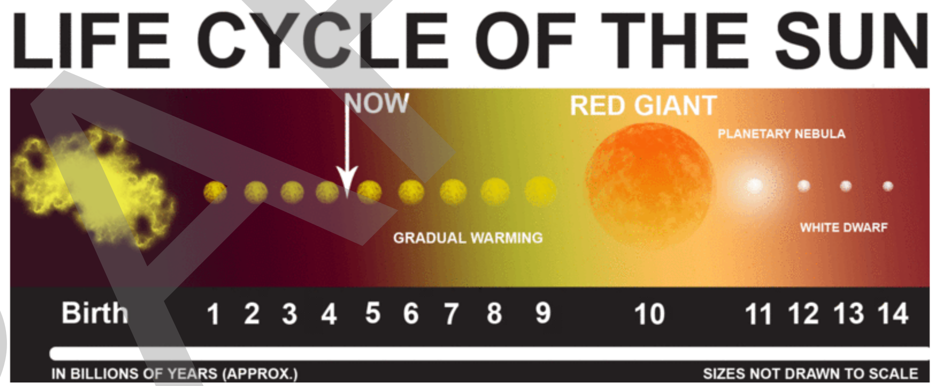
ESS1 – Earth's Place in the Universe

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11- year sunspot cycle, and non-cyclic variations over centuries.	**SES-HS-ESS1-1. Construct a model to illustrate the life span of the sun.**	**Level IV Students will:** **Construct a model to illustrate the life span of the sun, including the role of fusion.** *Ex. Energy comes from the fusion of elements in the core of the sun.* *https://imagine.gsfc.nasa.gov/educators/lessons/xray_spectra/background-lifecycles.html* **Level III Students will:** **Construct a model to illustrate the life span of the sun.** *Ex.*  **Level II Students will:** **Arrange a model of the sun's life cycle in chronological order.** **Level I Students will:** **Recognize that the sun keeps us warm.**

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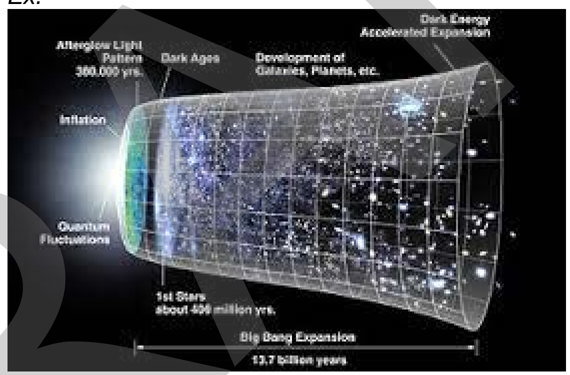
ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).	**SES-HS-ESS1-2. Construct a model of the expanding Universe.**	**Level IV Students will:** **Construct a model of the expanding Universe and that all matter came from a single point.** *Ex.https://www.monroecti.org/cms/lib07/PA03000492/Centricity/Domain/37/Big%20Bang%20Activity.pdf* **Level III Students will:** **Construct a model of the expanding Universe.** *Ex. Place 2 dots on a balloon and blow it up to demonstrate the expansion.* *http://cas.sdss.org/dr5/en/proj/basic/universe/expanding.asp.* **Level II Students will:** **Identify a model that illustrates the Big Bang theory.** *Ex.*  *http://www.physicsoftheuniverse.com/images/bigbang_expansion.jpg* **Level I Students will:** **Attend to a model of the expanding Universe.**
HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.	**SES-HS-ESS1-3. Compare life cycles of other stars to our sun.**	**Level IV Students will:** **Compare life cycles of other stars to our sun including the elements that are produced in each star.** **Level III Students will:** **Compare life cycles of other stars to our sun.** *Ex. Red Giants vs Main Sequence vs White Dwarf Stars* **Level II Students will:** **Recognize that our sun is a star.** **Level I Students will:** **Attend to a comparison of the life cycles of stars.**

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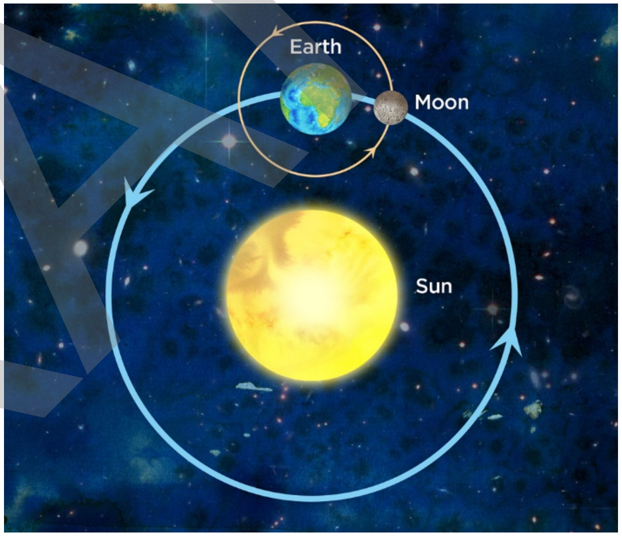
ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as natural solar system objects.	**SES-HS-ESS1-4. Use a simulation to represent the motion of orbiting objects in the solar system.**	**Level IV Students will:** **Demonstrate an understanding of how gravity affects the orbit of objects in the solar system.** **Level III Students will:** **Use a simulation to represent the motion of orbiting objects in the solar system.** *Ex.* [*https://phet.colorado.edu/en/simulation/gravity-and-orbits*](https://phet.colorado.edu/en/simulation/gravity-and-orbits) **Level II Students will:** **Participate in the motion of orbits.** *Ex.*  **Level I Students will:** **Attend to a simulation of orbits.**

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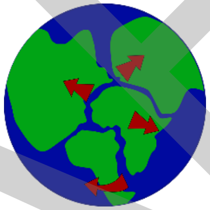
ESS1 – Earth's Place in the Universe (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core (a result of past plate interactions).	**SES-HS-ESS1-5. Use models to explore the theory of plate tectonics.**	**Level IV Students will:** **Use models to explain the theory of plate tectonics.** **Level III Students will:** **Use models to explore the theory of plate tectonics.** *Ex. Snickers lab (student demonstrates movement of plate tectonics)* *Ex. http://sepuplhs.org/middle/iaes/students/simulations/sepup_plate_motion.html*  **Level II Students will:** **Use a model to identify earth's current continental formations.** *Ex. A map with raised mountains.* **Level I Students will:** **Given picture(s) or models, determine which is land and which is water.**
HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest rocks), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.	**SES-HS-ESS1-6. From a model, construct an account of Earth's formation and early history.**	**Level IV Students will:** **Construct, and label, a model of the formation of the Earth.** **Level III Students will:** **From a model, construct an account of Earth's formation and early history.** *Ex. Given pictures, arrange in order, steps in the formation of the Earth.* **Level II Students will:** **Identify evidence of objects which impact the formation of the earth.** *Ex. meteorites* **Level I Students will:** **Attend to an exploration of the formation of the Earth.**

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ESS2 – Earth's Systems

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion). Focus on the varying rates of process.	**SES-HS-ESS2-1. Construct a model that demonstrates the formation of valleys and mountains.**	**Level IV Students will:** **Construct, and explain, a model that demonstrates the formation of valleys and mountains.** **Level III Students will:** **Construct a model that demonstrates the formation of valleys and mountains.** *Ex.*http://3.bp.blogspot.com/-87hT-3IMI0U/UGJMbl0dM-I/AAAAAAAAAUc/bNiLBKdrUJI/s1600/DSC03114.JPG *Ex. a play-dough model of mountains and valleys* **Level II Students will:** **Identify valleys and mountains.** **Level I Students will:** **Attend to a demonstration showing a valley and a mountain.**
HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. Clarification Statement: Examples of system interactions could include how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; how a decrease in greenhouse gases contributes to a decrease in global surface temperature which leads to an increase in glacial ice, or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.	**SES-HS-ESS2-2. Construct a model demonstrating that one change to Earth's surface can cause changes to other Earth systems.**	**Level IV Students will:** **Construct, and explain, a model demonstrating that one change to Earth's surface can cause changes to other Earth systems.** **Level III Students will:** **Construct a model demonstrating that one change to Earth's surface can cause changes to other Earth systems.** *Ex. Earthquake in one area, causing a lake to form where there was once a river, could cause drought where the river previously flowed.* *Ex. Hebgen Lake in Idaho (1959)* **Level II Students will:** **Identify an Earth surface feature that is going through a change.** **Level I Students will:** **Attend to a lesson/demonstration of changing Earth surface features.**

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ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.	**SES-HS-ESS2-3. Construct a model of the Earth's interior.**	**Level IV Students will:** **Construct, label, and explain, a model of the Earth's interior.** **Level III Students will:** **Construct a model of the Earth's interior.** *Ex. ball with layers of playdough* *Ex. peach cross-section* **Level II Students will:** **Identify the core, and the crust, on a cross-section representation of the Earth.** **Level I Students will:** **Attend to the construction of a model of the Earth's interior.**
HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.	**SES-HS-ESS2-4. Use a model to identify changes in the flow of energy that can change the climate.**	**Level IV Students will:** **Using a model, evaluate changes in the flow of energy that can change the climate.** *Ex. rising ocean temperature, evaluating how ocean currents effect weather patterns, etc.* **Level III Students will:** **Use a model to identify changes in the flow of energy that can change the climate.** *Ex. Identify what happens when volcanic ash blocks out the sun's rays.* **Level II Students will:** **Identify energy changes that can change the climate.** *Ex. large volcanic eruptions* **Level I Students will:** **Attend to the construction of a model demonstrating changes in the flow of energy that can change the climate.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids). Emphasis could be on local, regional and Wyoming state hydrological resources and features.	**SES-HS-ESS2-5. Construct a model depicting how water in the form of ice, liquid, and/or gas has changed the landscape.**	**Level IV Students will:** **Construct, and label, a model depicting how water in the form of ice, liquid, and/or gas has changed the landscape.** **Level III Students will:** **Construct a model depicting how water in the form of ice, liquid, and/or gas has changed the landscape.** *Ex. Expedition Yellowstone: Box with soil/sand that students pour water on and place ice cubes to model how water can change Earth's surface.* *http://officersiasacademy.blogspot.com/2016/04/landforms-created-by-glacier.html* *Ex. https://phet.colorado.edu/en/simulation/legacy/glaciers* **Level II Students will:** **Identify pictures/diagrams of how water has changed the landscape.** *Ex. 0ictures of the Grand Canyon* **Level I Students will:** **Attend to a lesson of how water in the form of ice, liquid, and/or gas has changed the landscape.**
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.	**SES-HS-ESS2-6. Integrated in SES-HS-LS2-5.**	**Not applicable.**

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ESS2 – Earth's Systems (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.	**SES-HS-ESS2-7. Explain how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.**	**Level IV Students will:** **Use evidence to explain how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.** **Level III Students will:** **Explain how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.** *Ex. After a volcanic eruption, how would life adapt?* *Ex. How did life adapt to changes in the atmosphere?* *Ex. How did life adapt to ice ages?* **Level II Students will:** **Identify pictures/diagrams of how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.** **Level I Students will:** **Attend to a demonstration of how life on Earth had to adapt to changes in the atmosphere, hydrosphere, or geosphere.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ESS3 – Earth and Human Activity

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.	**SES-HS-ESS3-1. Demonstrate how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.**	**Level IV Students will:** **Research an event that illustrates how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.** **Level III Students will:** **Demonstrate how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.** *Ex. The immigration of miners, trappers, etc. to different parts of the country.* **Level II Students will:** **Identify an event that illustrates how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.** **Level I Students will:** **Attend to a discussion of an event that illustrates how the availability of natural resources, the occurrence of natural hazards, and/or changes in climate have influenced human activity.**
HS-ESS3-2. Evaluate competing design solutions for developing, managing, and using energy and mineral resources based on cost-benefit ratios. Clarification Statement: Cost-benefit analysis should be based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, and ethical considerations). Emphasis needs to include the conservation, recycling, and reuse of resources (e.g., minerals, metals, and water) where possible, and on minimizing impacts where it is not. Examples include developing best practices for wind, hydroelectric, and solar energy, agricultural soil use, mining (for coal and oil shales), and pumping (for petroleum and natural gas).	**SES-HS-ESS3-2. From factors provided, select which factors need to be considered, prior to developing energy or mineral resources.**	**Level IV Students will:** **Identify factors to consider, prior to developing energy or mineral resources.** *Ex. How will opening or closing mines affect the environment and the people in the area?* **Level III Students will:** **From factors provided, select which factors need to be considered, prior to developing energy or mineral resources.** *Ex. Sage grouse habitat destruction vs improved grazing areas.* *Ex. Water source contamination vs. improved water quality.* **Level II Students will:** **Identify various energy or mineral resources.** *Ex. coal, oil, natural gas, wind farms* **Level I Students will:** **Attend to an exploration of various energy and mineral resources.** *Ex. Student visits a gas station and observes a car being fueled.* *Ex. Student observes or holds a piece of coal.* *Ex. Student visits a wind farm.*

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ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS3-3. Use a computational tools to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.	**SES-HS-ESS3-3. Integrated in SES-HS-ESS3-2.** **The management factors of natural resources was addressed in the previous standard.**	**Not applicable.**
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Technological solutions to evaluate could include landscape reclamation, reducing, reusing, and recycling resources, emission control systems, or evaporation control. Examples for limiting future impacts could range from local efforts to large-scale design solutions.	**SES-HS-ESS3-4. Construct a model of a technological solution that reduces impacts of human activities on natural systems.**	**Level IV Students will:** **Construct, and label, a model of a technological solution that reduces impacts of human activities on natural systems.** **Level III Students will:** **Construct a model of a technological solution that reduces impacts of human activities on natural systems.** *Ex. Create a storyboard that depicts landscape reclamation.* *Ex. Create a recycling center in their room or school.* *Ex. Create a model of a car muffler.* **Level II Students will:** **Identify a model of a technological solution that reduces impacts of human activities on natural systems.** **Level I Students will:** **Explore examples of technological solutions that reduce impacts of human activities on natural systems.** *Ex. Visit the local recycling center.* *Ex. Visit the school auto shop and watch a demonstration of how a car's emission control system works.* *Ex. Visit a mining facility and observe their reclamation activities.*

ESS3 – Earth and Human Activity (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ESS3-5. Analyze data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional change in climate and associated future impacts to Earth systems. Clarification Statement: Examples of evidence, for both data and climate model outputs, are for changes in climate (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmospheric and oceanic composition).	**SES-HS-ESS3-5. Use global climate models to identify global, or regional, change in climate and associated future impacts to Earth systems.**	**Level IV Students will:** **Compare results from global climate models to make an evidence-based forecast of the current rate of global, or regional, change in climate and associated future impacts to Earth systems.** *Ex. Compare results from a global climate model if no changes of policy occur vs. if we start recycling, reduce emissions etc.* *Ex. https://www.learner.org/jnorth/* **Level III Students will:** **Use global climate models to identify global, or regional, change in climate and associated future impacts to Earth systems.** *Ex. Read a graph, determine if the change is positive or negative, and predict an impact.* **Level II Students will:** **Use global climate models to identify global or regional change in climate.** *Ex. Journey North website https://www.learner.org/jnorth/* *Ex. Explore an internet weather site.* **Level I Students will:** **Attend to a presentation about global, or regional, change in climate.**
HS-ESS3-6. Use the results of a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. Consideration should be given to both positive and negative modification results.	**SES-HS-ESS3-6. Use a computational representation to illustrate how changes to the environment affect Earth systems.**	**Level IV Students will:** **Use a computational representation to illustrate, and explain, how changes to the environment affect Earth systems.** **Level III Students will:** **Use a computational representation to illustrate how changes to the environment affect Earth systems.** *Ex. http://glencoe.mheducation.com/sites/dl/free/0078802849/383927/BL_24.html* *Ex. http://glencoe.mheducation.com/sites/dl/free/0078802849/383929/BL_09.html* *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT04/CT04.html* **Level II Students will:** **Identify how changes to the environment affect Earth systems.** **Level I Students will:** **Attend to a computational representation which illustrates how changes to the environment affect Earth systems.**

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2018 WYOMING SCIENCE EXTENDED CONTENT AND PERFORMANCE STANDARDS

ETS1: Engineering, Technology & Applications of Science

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ETS1-1. Analyze a local, regional, or global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. Clarification Statement: Examples of challenges could include rural cell phone coverage, geothermal energy use, and sage grouse population.	**SES-HS-ETS1-1. Identify a local, regional, or global challenge for solutions that account for societal needs and wants.**	**Level IV Students will:** **Research a local, regional, or global challenge for solutions that account for societal needs and wants.** *Ex. The effect of the eclipse influx on local infrastructures.* **Level III Students will:** **Identify a local, regional, or global challenge for solutions that accounts for societal needs and wants.** *Ex. Compare maps of cell coverage from different cell phone companies and point out problems with coverage.* **Level II Students will:** **Identify a challenge in their lives that affects their needs and wants and propose a solution.** *Ex. I am cold, so I should put on my coat.* **Level I Students will:** **Identify a challenge in their lives that affects their needs and wants.** *Ex. Develop a communication signal for when they are cold.*
HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. Clarification Statement: Emphasis is on creativity, innovation, and inquiry.	**SES-HS-ETS1-2. Identify a solution to a real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**	**Level IV Students will:** **Propose a solution to a real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.** *Ex. Write a letter to the city council proposing recycling containers.* **Level III Students will:** **Identify a solution to a real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.** *Ex. If we provide recycling containers on our city streets, then people will recycle more.* **Level II Students will:** **Identify a solution to a problem that personally affects them by breaking it down into smaller, more manageable problems that can be solved through engineering.** *Ex. I can bring all the groceries in from the car in one trip if I gather all the bag handles together and put them over my arm.* **Level I Students will:** **Participate in the act of solving a problem.** *Ex. Putting books in a backpack to carry more easily.*

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ETS1: Engineering, Technology & Applications of Science (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ETS1-3. Evaluate a solution to a real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. Clarification Statement: Examples could include evaluation of historical, present day, and potential future challenges which take into account shifts in cultural norms and values, societal priorities, and/or technology.	**SES-HS-ETS1-3. Identify solutions to a real-world problem based on a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.**	**Level IV Students will:** **Identify a solution to a real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.** *Ex. Make a list of pro and con solutions and put them in order from best to worst.* **Level III Students will:** **Identify solutions to a real-world problem based on a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.** *Ex. Make a list of possible solutions to a problem such as air pollution.* **Level II Students will:** **Identify solutions to a problem that personally affects them based on a range of constraints, including cost, safety, social, and environmental impacts.** *Ex. Identify solutions to having a flat tire.* **Level I Students will:** **Identify a solution to a problem that personally affects them and develop a consistent positive response.** *Ex. When I am hungry, I will communicate this to someone who can assist me (verbally, communication board, etc.).*
HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. Clarification Statement: Examples can include using spreadsheets to modify and evaluate data, PhET simulations, GIS spatial modeling, etc.	**SES-HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a real-world problem.**	**Level IV Students will:** **Use a computer simulation to model the impact of two or more proposed solutions to a real-world problem.** **Level III Students will:** **Use a computer simulation to model the impact of a proposed solution to a real-world problem.** *Ex. Create a video illustrating the impacts of a solution and insert it into a PowerPoint presentation.* *Ex. Use existing computer simulations such as: http://glencoe.mheducation.com/sites/dl/free/0078802849/383927/BL_24.html* *Ex. http://glencoe.mheducation.com/sites/dl/free/0078802849/383929/BL_09.html* *Ex. http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT04/CT04.html* **Level II Students will:** **With guidance and support, create a simulation to model the impact of proposed solutions to a problem that affects their personal environment.** *Ex. Create a video or presentation about solutions to a problem in their personal environment.* **Level I Students will:** **Attend to a simulation which models the impact of proposed solutions to a problem that affects their personal environment.**

ETS1: Engineering, Technology & Applications of Science (cont.)

2016 Wyoming Science Benchmarks	2018 Wyoming Science Extended Benchmarks	Instructional Performance Level Descriptors
HS-ETS1-5 - Evaluate the validity and reliability of claims in a variety of materials. Clarification Statement: Examples of materials could include trade books, scientific publications, magazines, web resources, videos, and other passages that may reflect bias.	**SES-HS-ETS1-5. Given reliable materials, identify valid vs. invalid claims.**	**Level IV Students will:** **Identify the validity and reliability of claims in a variety of materials.** *Ex. Peer-reviewed journals vs online blogs.* **Level III Students will:** **Given reliable materials, identify valid vs. invalid claims.** *Ex. Analyzing types of websites like .com vs .edu.* *Ex: Claims supported by data collected in controlled experiments vs claims with no experimental support.* **Level II Students will:** **Identify a truth vs. a lie.** *Ex. Goldilocks has blond hair vs Goldilocks has black hair.* *Ex. The sky is blue vs. the sky is purple.* **Level I Students will:** **Identify real vs. not real.** *Ex. plastic vs. real apple*

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2014 WITH 2018 ADDITIONS
WYOMING
SOCIAL STUDIES
CONTENT AND PERFORMANCE STANDARDS

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Kathryn Sessions
Belenda Willson

Effective December 18, 2014

***to be fully implemented in districts by the beginning of school year 2017-18**

Revised Edition (in blue) Effective XXX XX, 2018

***to be fully implemented in districts by the beginning of school year 20XX-XX**

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ACKNOWLEDGMENT

The Wyoming State Board of Education would like to thank the Wyoming Department of Education, as well as educators, parents, students, business and industry representatives, community college representatives, and the University of Wyoming for all their help with the development of these standards.

2014 Standards

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2018 Standards

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2014 WYOMING SOCIAL STUDIES
CONTENT AND PERFORMANCE STANDARDS

RATIONALE

The Wyoming Social Studies Content and Performance Standards represent the cooperative effort of school district, University, community college, and business participants. The State Social Studies Standards Committee recognizes that social studies is the integrated study of the social sciences and humanities to promote civic competence. The mission of social studies is to help young people develop the ability to make informed and reasoned decisions as citizens of a culturally diverse, democratic society in an interdependent world. Students develop a core of knowledge and skills drawn from many academic disciplines, learn how to analyze their own and others' opinions on important issues, and become motivated to participate in civic and community life as active, informed citizens.

In the summer of 2012, a standards review committee was convened to review the Wyoming Social Studies Content and Performance Standards. *Subcommittees were formed and it was decided that an additional social studies standard would be added to address the Framework for 21st Century Skills for technology integration and make a connection to literacy through the Common Core State Standards for Literacy in History/Social Studies, Science, & Technical Subjects*. It was also decided that an additional grade band division would be added to better meet the demand for increased rigor at all grade levels and prepare students by introducing social studies concepts at the earliest grade levels. The committee recognizes that regardless of the variations of course sequences throughout the state, the knowledge and skills identified upon graduation are intended for all students.

Please note, W.S. 21-9-102 requires all publicly funded schools in Wyoming to "give instruction in the essentials of the United States constitution and the constitution of the state of Wyoming, including the study of and devotion to American institution and ideals…" In order to receive a high school diploma, instruction must be given for at least three (3) years in kindergarten through grade eight (8) and one (1) year in the secondary grades.

The Social Studies Content Standard 1, Citizenship, Government, and Democracy, includes several benchmarks to assist in teaching both the Wyoming and United States Constitutions.

Grade Band K-2	Grade Band 3-5	Grade Band 6-8	Grade Band 9-12
SS 2.1.1	SS 5.1.2	SS 8.1.3	SS 12.1.3
	SS 5.1.3	SS 8.1.5	SS 12.1.5
		SS 8.1.6	

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2018 Addition (pg. 5)

RATIONALE

On March 10, 2017, Governor Mead signed House Bill 76, House Enrolled Act 119 into law, authorizing the creation of a committee to review the 2014 Social Studies Standards. The Social Studies Standards Review Committee (SSSRC) convened November 2017 through January 2018 to review the 2014 standards "to ensure the cultural heritage, history and contemporary contributions of American Indians are addressed".

The SSSRC consisted of a total of 24 members including seven Northern Arapaho, five Eastern Shoshone, one Northern Cheyenne, and one Pawnee/Navajo. This committee consisted of 21 educators/administrators from 14 Wyoming school districts and the Director of the Native American Education, Research and Cultural Center at the University of Wyoming, as well as a cross-section of stakeholders from across the state.

The SSSRC recommends the attached changes to the 2014 Wyoming Social Studies Standards. These revisions and additions maintain the intent of the original benchmarks while still meeting the legislative mandate to include American Indian Education.

The SSSRC, in cooperation with the Indigenous Tribes of Wyoming, including the Eastern Shoshone and Northern Arapaho Indian tribes, took special care to preserve the intent of the legislation. Some changes were necessary and were either incorporated directly into the benchmark or added and denoted with an 'a' (e.g., SS8.5.2a).

INDIGENOUS TRIBES OF WYOMING: A DEFINITION

The term "Indigenous Tribes of Wyoming" was selected by the SSSRC to be a working definition inclusive of those groups who:

- Identify as indigenous, Native American, or American Indian under the regulations established by a tribe
- Maintain historical continuity with pre-colonial and/or pre-settler societies
- Maintain a strong link to territories and surrounding natural resources
- Maintain distinct social, economic, or political systems
- Maintain distinct language, culture, and beliefs
- Resolve to maintain their ancestral environments and systems as distinctive peoples and communities (e.g., Northern Arapaho, Eastern Shoshone, Northern Cheyenne, Crow, Ute, Lakota, etc.)

Adapted from the United Nations Permanent Forum on Indigenous Issues
http://www.un.org/esa/socdev/unpfii/documents/5session_factsheet1.pdf

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ORGANIZATION OF STANDARDS

Standards specify the essential learning that students must master providing a K-12 framework to assist school districts, schools, and communities in developing and strengthening curriculum. *It is not intended to prescribe courses, materials, or instructional methodology.* Content and performance standards are identified for grade spans K-2, 3-5, 6-8, and 9-12 with benchmarks at grades two, five, eight, and twelve.

Teachers, parents, and students work toward the achievement of the benchmarks at the completion of each grade band level. Success at these benchmark levels requires the effort and commitment of **all** who are involved at that level.

- K-2
- 3-5
- 6-8
- 9-12

Content Standards: what students are expected to know and be able to do by the time they graduate

Benchmarks: specify the skills and content students must master in order to meet the content standards by the time they graduate

Performance Level Descriptors: determine student performance of the benchmarks

Descriptors help teachers assess where students are performing in relation to the benchmarks, and ultimately, the content standards.

Advanced: Students at the advanced level *independently* use their knowledge of social studies in complex and abstract situations and can analyze, synthesize, and communicate information and ideas.

Proficient: Students at the proficient level *consistently* use their knowledge of social studies in complex and abstract situations. This is the minimum level required to demonstrate mastery of the skills.

Basic: Students at the basic level demonstrate *partial mastery* of knowledge and skills to acquire and communicate information and ideas.

Below Basic: Students at the below basic level are *unwilling or do not address* the expectations of the basic level.

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2014 Wyoming Social Studies Content and Performance Standards

Content Standard 1 - Citizenship, Government, and Democracy - Students analyze how people create and change structures of power, authority, and governance to understand the continuing evolution of governments and to demonstrate civic responsibility.

Content Standard 2 - Culture and Cultural Diversity - Students demonstrate an understanding of the contributions and impacts of human interaction and cultural diversity on societies.

Content Standard 3 - Production, Distribution, and Consumption - Students describe the influence of economic factors on societies and make decisions based on economic principles.

Content Standard 4 - Time, Continuity, and Change - Students analyze events, people, problems, and ideas within their historical contexts.

Content Standard 5 - People, Places, and Environments - Students apply their knowledge of the geographic themes (location, place, movement, region, and human/environment interactions) and skills to demonstrate an understanding of interrelationships among people, places, and environment.

Content Standard 6 - Technology, Literacy, and Global Connections - Students use technology and literacy skills to access, synthesize, and evaluate information to communicate and apply social studies knowledge to global situations.

All Standards Documents can be found on the Wyoming Department of Education Standards Page at http://edu.wyoming.gov/educators/standards/.

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Social Studies Content Standard 1 - Citizenship, Government, and Democracy

Students analyze how people create and change structures of power, authority, and governance to understand the continuing evolution of governments and to demonstrate civic responsibility.

Rationale

The vitality and continuation of a democratic republic depends upon the education and participation of informed citizens. All students should have opportunities to apply their knowledge and skills and participate in the workings of the various levels of power, authority, and governance, which should be applied to the rights and responsibilities of good citizenship.

W.S. 21-9-102 requires all publicly funded schools in Wyoming to "give instruction in the essentials of the United States constitution and the constitution of the state of Wyoming, including the study of and devotion to American institution and ideals…" In order to receive a high school diploma, instruction must be given for at least three (3) years in kindergarten through grade eight (8) and one (1) year in the secondary grades.

Benchmarks

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.1.1 Understand that schools, tribes, communities, and the United States have rules that have to be followed.	**SS5.1.1** Describe the basic rights and responsibilities of citizenship.	**SS8.1.1** Explain the rights, duties, and responsibilities of a United States citizen. **SS8.1.1.a** Explain the rights, duties, and responsibilities of being a tribal member on the Wind River Indian Reservation (e.g., inherent rights, treaty obligations, and tribal sovereignty).	**SS12.1.1** Analyze unique freedoms, rights, and responsibilities of living in a democratic society and explain their interrelationships. **SS12.1.1.a** Compare the rights, duties, and responsibilities (inherent rights, treaty obligations, and tribal sovereignty) of being a tribal member on the Wind River Indian Reservation to the rights, duties, and responsibilities of an American citizen.
SS2.1.2 Identify the symbols and traditional practices, including those of Indigenous Tribes of Wyoming (e.g. Arapaho and Shoshone flags, songs, and pledges), that honor patriotism in the United States.	**SS5.1.2** Understand the basic local, tribal, state, and national political processes (e.g., campaigning and voting).	**SS8.1.2** Explain how to participate in the political process. (i.e., tribal, local, state, and national elections).	**SS12.1.2** Explain and/or demonstrate how to participate in the political process and form personal opinions. (i.e., tribal, local, state, and national elections).

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Social Studies Content Standard 1 - Citizenship, Government, and Democracy (cont.)

Benchmarks (continued)

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.1.3 Identify people and events that are honored on United States holidays. **SS2.1.3.a** Identify how Indigenous Tribes of Wyoming honor people and celebrate through events (e.g., Native American Veterans Day, Native American Heritage Day, Wyoming Native American Day, Pow Wows)	**SS5.1.3** Understand the basic origins of the United States Constitution (e.g., Declaration of Independence).	**SS8.1.3** Explain the historical development of the United States Constitution and treaties (e.g., 1868 Fort Bridger Treaty) and how they have shaped the United States, ~~and~~ Wyoming, and Tribal Government.	**SS12.1.3** Analyze the historical development of the United States Constitution and treaties (e.g., 1868 Fort Bridger Treaty) and how it has shaped the United States and Wyoming Government (tribal, local, state, federal). **SS12.1.3.a** Analyze the historical development of governance of the Indigenous Tribes of Wyoming through U.S. Congressional Acts and U.S. Supreme Court decisions (e.g., Per Capita Act, Marshall Trilogy, U.S. v. Shoshone Tribe of Indians)
SS2.1.4 Understand that the rules in the United States are called laws.	**SS5.1.4** Understand the purpose of the U.S. legal system and that tribal governments have separate legal systems.	**SS8.1.4** Understand the difference between United States civil and criminal legal systems within the federal, state, and tribal levels.	**SS12.1.4** ~~Demonstrate an understanding of the United States civil and criminal legal systems and distinguish differences between those systems.~~ Distinguish the difference between civil and criminal legal systems and how they apply at the federal, state, and tribal levels.
Not assessed at this time.	**SS5.1.5** Understand the purposes of the three branches of government (executive, legislative, and judicial). Understand how the Northern Arapaho and Eastern Shoshone are sovereign nations with their own systems of governance (i.e., each has a General Council and a resolution form of government).	**SS8.1.5** Describe the structures of the United States and Wyoming Constitutions (e.g., Articles, Bill of Rights, amendments). Describe how the U.S. Constitution creates a special relationship with tribal governments (i.e., Plenary Power, Indian Commerce Clause - Article I, Section 8, Clause 3; Supremacy Clause - Article VI, Clause 2; Cherokee Nation v. Georgia).	**SS12.1.5** Demonstrate an understanding of the structures of both the United States and Wyoming Constitutions. Describe the inherent powers held by Indigenous Tribes of Wyoming due to their sovereignty. (e.g., taxation, membership, per capita payments, fish and game)
Not assessed at this time.	Not assessed at this time.	**SS8.1.6** Understand the basic structures of various political systems (e.g., tribal, local, national, and world).	**SS12.1.6** Compare and contrast various world political systems (e.g., ideologies, structure, and institutions) with that of the United States. **SS12.1.6.a** Compare and contrast various tribal political systems (e.g., ideologies, structure, and institutions) within the United States.

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Social Studies Content Standard 1 - Citizenship, Government, and Democracy Performance Level Descriptors

GRADE 2

Advanced: A second-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) demonstrate the importance of rules/laws in schools and communities;
b) demonstrate knowledge of good citizenship within their school and communities;
c) identify and explain symbols, traditions, people, and events that are honored within the United States.

Proficient: A second-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) demonstrate the importance of rules/laws in schools and communities;
b) demonstrate knowledge of good citizenship within their school and communities;
c) identify and explain symbols, traditions, people, and events that are honored within the United States.

Basic: A second-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) demonstrate the importance of rules/laws in schools and communities;
b) demonstrate knowledge of good citizenship within their school and communities;
c) identify and explain symbols, traditions, people, and events that are honored within the United States.

Below Basic: A second-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

GRADE 5

Advanced: A fifth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) demonstrate knowledge of citizenship rights and responsibilities across various communities, including tribal communities;
b) describe the purpose and various levels of government in our lives;
c) locate and apply information of historical events and issues from a variety of sources to effectively explain connections between past and present.

Proficient: A fifth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) demonstrate knowledge of citizenship rights and responsibilities across various communities, including tribal communities;
b) describe the purpose and various levels of government in our lives;
c) locate and apply information of historical events and issues from a variety of sources to effectively explain connections between past and present.

Basic: A fifth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) demonstrate knowledge of citizenship rights and responsibilities across various communities, including tribal communities;
b) describe the purpose and various levels of government in our lives;
c) locate and apply information of historical events and issues from a variety of sources to effectively explain connections between past and present.

Below Basic: A fifth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 1 - Performance Level Descriptors (cont.)

GRADE 8

Advanced: An eighth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) describe and compare the principles and structures of power, authority, and governance;
b) demonstrate knowledge of citizenship, rights, and responsibilities across various communities, including tribal communities;
c) conduct research to draw unique parallels between historical and current events and issues.

Proficient: An eighth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) describe and compare the principles and structures of power, authority, and governance;
b) demonstrate knowledge of citizenship, rights, and responsibilities across various communities, including tribal communities;
c) conduct research to draw unique parallels between historical and current events and issues.

Basic: An eighth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) describe and compare the principles and structures of power, authority, and governance;
b) demonstrate knowledge of citizenship, rights, and responsibilities across various communities, including tribal communities;
c) conduct research to draw unique parallels between historical and current events and issues.

Below Basic: An eighth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

GRADE 12

Advanced: A twelfth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) analyze and critique the principles and structure of power, authority, and governance at tribal, local, state, and national levels;
b) demonstrate civic responsibility by participating as a citizen in the process;
c) analyze historical and political developments and conducts research to thoroughly and effectively create and defend a position on an issue.

Proficient: A twelfth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) analyze and critique the principles and structure of power, authority, and governance at tribal, local, state, and national levels;
b) demonstrate civic responsibility by participating as a citizen in the process;
c) analyze historical and political developments and conducts research to thoroughly and effectively create and defend a position on an issue.

Basic: A twelfth -grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) analyze and critique the principles and structure of power, authority, and governance at tribal, local, state, and national levels;
b) demonstrate civic responsibility by participating as a citizen in the process;
c) analyze historical and political developments and conducts research to thoroughly and effectively create and defend a position on an issue.

Below Basic: A twelfth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

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Social Studies Content Standard 2 - Culture and Cultural Diversity

Students demonstrate an understanding of the contributions and impacts of human interaction and cultural diversity on societies.

Rationale

Culture helps us to understand ourselves as both individuals and members of various groups. In a multicultural society, students need to understand multiple perspectives that derive from different cultural vantage points. As citizens, students need to know how institutions are maintained or changed and how they influence individuals, cultures, and societies. This understanding allows students to relate to peoples of local, tribal, state, national, and global communities.

Benchmarks

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.2.1 Name the ways groups (e.g., families and schools), including Indigenous Tribes of Wyoming meet human needs and concerns (e.g., belonging and personal safety) and contribute to personal identity and daily life (e.g., compare features of modern-day living [food, shelter, clothing, transportation] to those of the past; create a chart showing how farming, schools, or communities have changed over time; illustrate past dwellings [tepee, sweat lodge, wikiup, sod, log cabin, earth lodge] and present-day housing).	**SS.5.2.1** Identify and describe the ways groups, including Indigenous Tribes of Wyoming (e.g., families, communities, schools, and social organizations), meet human needs and concerns (e.g., belonging, self-worth, and personal safety) and contribute to ~~personal~~ (e.g., personal, tribal, ethnic) identity and daily life (e.g., traditions, beliefs, language, customs).	**SS8.2.1** Compare and contrast the ways various groups (e.g., ~~cliques, clubs,~~ ethnic communities~~,~~ and ~~American Indian tribes~~ Indigenous Tribes of Wyoming) meet human needs and concerns (e.g., self-esteem, friendship, and tribal heritage) and contribute to identity, situations, and events.	**SS12.2.1** Analyze and evaluate the ways various groups (e.g., social, political, and cultural) meet human needs and concerns (e.g., individual needs and common good) and contribute to identity (e.g., group, national, and global), situations, and events. SS12.2.1.a Analyze and evaluate the ways Indigenous Tribes of Wyoming meet human needs and concerns and contribute to tribal identity (e.g., group, nation, and global), as well as historical and contemporary situations and events (e.g., intergenerational care, mineral royalty payments, water rights, tribal economic development, the repopulation of local animal species, and social/cultural events).
SS2.2.2 Recognize and describe unique ways in which expressions of culture influence people including Indigenous Tribes of Wyoming (e.g., language, sign language, stories, music, symbolism, and art).	**SS5.2.2** ~~Identify and d~~Describe, compare and contrast ways in which unique expressions of culture ~~influence people~~ (e.g., tribal affiliation, language, spirituality, stories, folktales, music, art, and dance) influence people.	**SS8.2.2** ~~Examine and e~~Evaluate how human expression (e.g., language, literature, arts, architecture, traditions, beliefs, and spirituality) contributes ~~to the~~ cultural development, ~~and~~ understanding, and continuity ~~transmission of culture~~ (e.g., oral tradition, Pow Wows, ceremonies, and assimilation).	**SS12.2.2** Analyze human experience and cultural expression (e.g., language, literature, arts, traditions, beliefs, spirituality, values, and behavior) and illustrate integrated views of a specific culture. **SS12.2.2.a** Compare and contrast the human experience and cultural expression of Indigenous Tribes of Wyoming (e.g., oral history, Native literature, traditional arts, values, songs, dance, artifacts, and language).

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Social Studies Content Standard 2 - Culture and Cultural Diversity (cont.)

Benchmarks (continued)
Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
Assessed in SS2.2.1.	**SS5.2.3** Identify and describe characteristics and contributions of local and state cultural groups including Indigenous Tribes of Wyoming, in Wyoming and the region.	**SS8.2.3** ~~Compare and contrast~~ Analyze the unique cultural characteristics of various groups within Wyoming and the nation, including Indigenous Tribes of Wyoming (e.g., language, traditions, spirituality, art, and lifestyle).	**SS12.2.3** Evaluate how the unique characteristics of cultural groups to include Indigenous Tribes of Wyoming, have contributed and continue to influence Wyoming's history and contemporary life (e.g., tribes, explorers, early settlers, and immigrants).
Assessed in SS2.2.2.	**SS5.2.4** Identify and describe positive and negative interactions (e.g., withholding of Native American U.S. citizenship until 1924) the tensions ~~between~~ among cultural groups, social classes and/or significant individuals in Wyoming and the United States (e.g., Martin Luther King Jr., Helen Keller, Sacagawea, ~~and~~ Chief Washakie, Chief Black Coal, Chief Pocatello, Chief Sharp Nose, and Chief Friday).	**SS8.2.4** Explain the cultural contributions of and tensions between groups in Wyoming, the United States, and the World (e.g., racial, ethnic, social and institutional). **SS8.2.4.a** Explain the cultural contributions of and interactions between Native Americans and immigrant groups in Wyoming and the United States.	**SS12.2.4** Analyze and critique the conflicts resulting from cultural assimilation and cultural preservation in Wyoming, the United States, and the World (e.g., racial, ethnic, social, and institutional). **SS12.2.4.a** Evaluate the conflicts resulting from forced assimilation (e.g., mission/boarding schools and relocation) and cultural preservation efforts (e.g., language revitalization and repatriation of human remains and artifacts) on Indigenous Tribes of Wyoming.

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Social Studies Content Standard 2 - Culture and Cultural Diversity Performance Level Descriptors

GRADE 2

Advanced: A second-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) name ways groups and cultures meet human needs;
b) list ways people contribute to personal identity in daily life.

Proficient: A second-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) name ways groups and cultures meet human needs;
b) list ways people contribute to personal identity in daily life.

Basic: A second-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) name ways groups and cultures meet human needs;
b) list ways people contribute to personal identity in daily life.

Below Basic: A second-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

GRADE 5

Advanced: A fifth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify and describe ways groups and cultures meet human needs;
b) identify and describe ways people contribute to personal identity in daily life;
c) identify and describe characteristics, contributions, and possible tensions ~~between~~ among cultural groups, including tribes.

Proficient: A fifth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify and describe ways groups and cultures meet human needs;
b) identify and describe ways people contribute to personal identity in daily life;
c) identify and describe characteristics, contributions, and possible tensions ~~between~~ among cultural groups, including tribes.

Basic: A fifth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) identify and describe way groups and cultures meet human needs;
b) identify and describe ways people contribute to personal identity in daily life;
c) identify and describe characteristics, contributions, and possible tensions ~~between~~ among cultural groups, including tribes.

Below Basic: A fifth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

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Social Studies Content Standard 2 - Performance Level Descriptors (cont.)

GRADE 8

Advanced: An eighth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) compare and contrast the ways various groups meet human needs;

b) evaluate and examine the transmission of cultural ideas;

c) ~~compare and contrast a group's unique cultural characteristics and explain their contributions and possible tensions they may cause.~~ c) compare and contrast the unique cultural characteristics of groups, including tribes, and explain their contributions and possible tensions they may encounter.

Proficient: An eighth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) compare and contrast the ways various groups meet human needs;

b) evaluate and examine the transmission of cultural ideas;

c) ~~compare and contrast a group's unique cultural characteristics and explain their contributions and possible tensions they may cause.~~ c) compare and contrast the unique cultural characteristics of groups, including tribes, and explain their contributions and possible tensions they may encounter.

Basic: An eighth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) compare and contrast the ways various groups meet human needs;

b) evaluate and examine the transmission of cultural ideas;

c) ~~compare and contrast a group's unique cultural characteristics and explain their contributions and possible tensions they may cause.~~ c) compare and contrast the unique cultural characteristics of groups, including tribes, and explain their contributions and possible tensions they may encounter.

Below Basic: An eighth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

GRADE 12

Advanced: A twelfth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) analyze and evaluate the way various cultural groups, including tribes, meet human needs and contribute to or influence contemporary life;

b) analyze human experience that integrates views of cultural expression;

c) analyze the conflicts resulting from cultural assimilation and preservation.

Proficient: A twelfth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) analyze and evaluate the way various cultural groups meet, including tribes, human needs and contribute to or influence contemporary life;

b) analyze human experience that integrates views of cultural expression;

c) analyze the conflicts resulting from cultural assimilation and preservation.

Basic: A twelfth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) analyze and evaluate the way various cultural groups, including tribes, meet human needs and contribute to or influence contemporary life;

b) analyze human experience that integrates views of cultural expression;

c) analyze the conflicts resulting from cultural assimilation and preservation.

Below Basic: A twelfth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

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Social Studies Content Standard 3 - Production, Distribution, and Consumption

Students describe the influence of economic factors on societies and make decisions based on economic principles.

Rationale

In a global economy marked by rapid technological, political, and economic change, students will examine how people organize for the production, distribution, and consumption of goods and services.

Benchmarks

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.3.1 Give examples of and/or identify needs, wants, goods, and services.	**SS5.3.1** Give examples of needs, wants, goods, services, scarcity, and choice.	**SS8.3.1** Identify and apply basic economic concepts (e.g., supply, demand, production, exchange and consumption, labor, wages, scarcity, prices, incentives, competition, and profits).	**SS12.3.1** Analyze the impact of supply, demand, scarcity, prices, incentives, competition, and profits on what is produced, distributed, and consumed.
SS2.3.2 Identify how price may affect buying, selling, and saving decisions.	**SS5.3.2** Identify basic economic concepts (e.g., supply, demand, price, and trade).	**SS8.3.2** Compare and contrast how people organize for the production, distribution, and consumption of goods and services in various economic systems (e.g., characteristics of market, command, and mixed economies).	**SS12.3.2** Analyze and evaluate how people organize for the production, distribution, and consumption of goods and services in various economic systems (e.g., capitalism, communism, and socialism).
SS2.3.3 Identify how science or technology affects production (e.g., assembly line, robots, and video streaming).	**SS5.3.3** Identify and describe how science and technology have affected production and distribution locally, nationally, and globally (e.g., trains and natural resources).	**SS8.3.3** Describe the impact of technological advancements on production, distribution, and consumption. (e.g., businesses and/or corporations in the United States and the world).	**SS12.3.3** Analyze and evaluate the impact of current and emerging technologies at the micro and macroeconomic levels (e.g., jobs, education, trade, and infrastructure) and their impact on global economic interdependence.
Assessed in SS2.3.2.	**SS5.3.4** Explain the roles and effect of money, banking, savings, and budgeting in personal life and society.	**SS8.3.4** Explain or illustrate how money is used by individuals, groups, and financial institutions.	**SS12.3.4** Explain how financial and government institutions make economic decisions (e.g., banking, investment, credit, regulation, and debt).
Assessed in SS2.3.2.	Assessed in SS5.3.4.	**SS8.3.5** Describe how values and beliefs influence individual, family, and business decisions (microeconomics).	**SS12.3.5** Evaluate how values and beliefs influence microeconomic and macroeconomic decisions.

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Social Studies Content Standard 3 - Production, Distribution, and Consumption
Performance Level Descriptors

GRADE 2
Advanced: A second-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify currency;
b) explain the purpose of money;
c) explain how science and technology affect economic production.

Proficient: A second-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify currency;
b) explain the purpose of money;
c) explain how science and technology affect economic production.

Basic: A second-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) identify currency;
b) explain the purpose of money;
c) explain how science and technology affect economic production.

Below Basic: A second-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

GRADE 5
Advanced: A fifth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify economic concepts to needs, wants, goods, services, scarcity, and choice;
b) explain the influence of banking on their personal life and society;
c) identify and describe the impact of science and technology on production and distribution.

Proficient: A fifth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify economic concepts and provide examples of needs, wants, goods, services, scarcity, and choice;
b) explain the influence of banking on their personal life and society;
c) identify and describe the impact of science and technology on production and distribution.

Basic: A fifth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) identify economic concepts to needs, wants, goods, services, scarcity, and choice;
b) explain the influence of banking on their personal life and society;
c) identify and describe the impact of science and technology on production and distribution.

Below Basic: A fifth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 3 - Production, Distribution, and Consumption
Performance Level Descriptors

GRADE 8

Advanced: An eighth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify and apply basic economic concepts;
b) compare and contrast economic systems;
c) describe factors influencing economic decisions.

Proficient: An eighth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify and apply basic economic concepts;
b) compare and contrast economic systems;
c) describe factors influencing economic decisions.

Basic: An eighth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) identify and apply basic economic concepts;
b) compare and contrast economic systems;
c) describe factors influencing economic decisions.

Below Basic: An eighth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

GRADE 12

Advanced: A twelfth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) explain how economic factors influence societies and how decisions are based on economic principles;
b) explain connections between economic principles and government;
c) describe economic systems and concepts.

Proficient: A twelfth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) explain how economic factors influence societies and how decisions are based on economic principles;
b) explain connections between economic principles and government;
c) describe economic systems and concepts.

Basic: A twelfth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The student will:

a) explain how economic factors influence societies and how decisions are based on economic principles;
b) explain connections between economic principles and government;
c) describe economic systems and concepts.

Below Basic: A twelfth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 4 - Time, Continuity, and Change

Students analyze events, people, problems, and ideas within their historical contexts.

Rationale

Students need to understand their historical roots and how past events shape the ~~past,~~ present~~,~~ and may shape the future. Students must know what life was like in the past to comprehend how things change and develop over time. Students gain historical understanding through inquiry, ~~of history by~~ and through researching and interpreting events affecting individual, local, tribal, state, national, and global histories.

Benchmarks

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.4.1 Identify how an event could change the future (e.g., moving to a new town means going to a new school or learning to ride a bike could mean getting to a friend's house faster).	**SS5.4.1** Describe how small changes can lead to big changes (cause and effect) (e.g., introduction of horses to the Plains tribes, discovery of gold and minerals in the region, discovery of electricity, impact of the Homestead Act and Dawes Act, establishment of water rights and resource management).	**SS8.4.1** Describe how historical events impact the future (cause and effect) and how change spreads to other places (e.g., spread of industrial revolution or causes of the Civil War, impacts of Manifest Destiny, aftermath of French and Indian War, and progression of Indian Removal Act).	**SS12.4.1** Describe patterns of change (cause and effect) and evaluate how past events impacted future events and the modern world. **SS 12.4.1.a** Describe patterns of change (cause and effect) and evaluate how past events impact current realities for Indigenous Tribes of Wyoming (e.g., migration, evolution of tribal leadership, treaties, Powder River Expedition, Red Cloud's War, Great Sioux War, Battle of Little Bighorn, land cessions, and 1905 Shoshone Reservation Congressional Act).
SS2.4.2 Identify tools and technologies, including those of Indigenous Tribes of Wyoming, that made or make life easier and sustainable (e.g., cars for getting one place to another, washing machines for washing clothes, ~~or~~ flashlights to see in the dark, and usage of bison and natural resources).	**SS5.4.2** Describe how tools and technology make ~~makes~~ life easier; describe how one tool or technology evolves into another (e.g., telegraph to telephone to cell phone or travois to horse-drawn wagon to railroad to car); identify a tool or technology that impacted history (e.g., ships allowed for discovery of new lands, ~~or~~ boiling water prevented spread of disease, railroads and the industrial revolution led to devastation of bison population, and impact of mineral and oil development in the region).	**SS8.4.2** Describe how tools and technology in different historical periods impacted the way people, including Indigenous Tribes of Wyoming, lived, made decisions, and saw the world (e.g., impact of horses and European trade goods on Plains Indian cultures, mechanized agriculture, and Industrial Revolution technologies).	**SS12.4.2** Analyze the development and impact of tools and technology and how it shaped history and influenced the modern world.

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Social Studies Content Standard 4 - Time, Continuity, and Change (cont.)

Benchmarks (continued)

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.4.3 Describe a "current event~~.~~" involving significant people and places in Wyoming (e.g., local, state, or tribal events).	**SS5.4.3** Select current events for relevance and apply understanding of cause and effect to determine how current events impact people or groups, including Indigenous Tribes of Wyoming (e.g., energy development, water rights, new technology, and social issues). ~~(e.g., the building of a new school means that younger students will have new classrooms to learn in or war in another country means that some children's parents will have to leave to fight).~~	**SS8.4.3** Analyze the way ~~people and/or groups react to~~ current events~~;~~ affect all people, including Indigenous Tribes of Wyoming. Investigate the history leading up to those events and suggest alternative ways such events may have played out.	**SS12.4.3** Given a significant current event, critique the actions of the people or groups involved; hypothesize how this event would have played out in another country.
Not assessed at this time.	**SS5.4.4** Discuss different groups that a person may belong to, including Indigenous Tribes of Wyoming, (e.g., family, neighborhood, cultural/ethnic, and workplace) and how those roles and/or groups have changed over time.	**SS8.4.4** Identify historical interactions between and among individuals, groups, and/or institutions (e.g., family, neighborhood, political, economic, religious, social, cultural, and workplace). **SS8.4.4.a** Identify how federal policies have impacted Indigenous Tribes of Wyoming historically and currently (e.g., reservations, treaties, allotment, boarding schools, and forced assimilation).	**SS12.4.4** Describe the historical interactions between and among individuals, groups, and/or institutions (e.g., family, neighborhood, political, economic, religious, social, cultural, and workplace) and their impact on significant historical event **SS12.4.4.a** Describe the historical interactions between Indigenous Tribes of Wyoming, state, and federal governments (e.g. Chief Washakie and the federal government, treaties, 1871 Indian Appropriations Act, Dawes Act, and the 1956 Indian Relocation Act).
Not assessed at this time.	**SS5.4.5** Identify differences between primary (e.g., historical photographs, artifacts, and documents, including treaties) and secondary sources. Find primary and secondary sources about an historical event. (e.g., creation of reservations, Sand Creek Massacre, and creation of national parks). Summarize central ideas in primary and secondary resources.	**SS8.4.5** Identify relevant primary (e.g., historical photographs, artifacts, and documents, including treaties) and secondary sources for research. Compare and contrast treatment of the same topic in several primary and secondary sources, which may include oral history and traditional storytelling.	**SS12.4.5** Using primary and secondary sources, apply historical research methods to interpret and evaluate important historical events from multiple perspectives. **SS12.4.5.a** Interpret and evaluate historical events with primary and secondary sources to include oral tradition and traditional storytelling of Indigenous Tribes of Wyoming (e.g., traditional drama and theater, song, and dance).

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Social Studies Content Standard 4 - Time, Continuity, and Change Performance Level Descriptors

GRADE 2

Advanced: A second-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify different social groups and their interactions;
b) identify how an event could change the future;
c) identify tools and technology.

Proficient: A second-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify different social groups and their interactions;
b) identify how an event could change the future;
c) identify tools and technology.

Basic: A second-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) identify different social groups and their interactions;
b) identify how an event could change the future;
c) identify tools and technology.

Below Basic: A second-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

GRADE 5

Advanced: A fifth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify historical interactions and the impact of change;
b) study current events and apply understanding of cause and effect;
c) describe the evolution of tools and technology.

Proficient: A fifth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify historical interactions and the impact of change;
b) study current events and apply understanding of cause and effect;
c) describe the evolution of tools and technology.

Basic: A fifth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) identify historical interactions and the impact of change;
b) study current events and apply understanding of cause and effect;
c) describe the evolution of tools and technology.

Below Basic: A fifth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 4 - Time, Continuity, and Change Performance Level Descriptors

GRADE 8

Advanced: An eighth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) describe events, people, problems, conflicts, and ideas within their historical contexts;
b) analyze the way people react to current events and make connections between the past and present;
c) describe the impact of tools and technology in different historical settings.

Proficient: An eighth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) describe events, people, problems, conflicts, and ideas within their historical contexts;
b) analyze the way people react to current events and make connections between the past and present;
c) describe the impact of tools and technology in different historical settings.

Basic: An eighth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) describe events, people, problems, conflicts, and ideas within their historical contexts;
b) analyze the way people react to current events and make connections between the past and present;
c) describe the impact of tools and technology in different historical settings.

Below Basic: An eighth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

GRADE 12

Advanced: A twelfth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) accurately examine events, people, problems, conflicts, and ideas within their historical contexts;
b) make comparisons, describe cause and effect, and make connections between the past and current events;
c) analyze the development and impact of tools and technology.

Proficient: A twelfth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) accurately examine events, people, problems, conflicts, and ideas within their historical contexts;
b) make comparisons, describe cause and effect, and make connections between the past and current events;
c) analyze the development and impact of tools and technology.

Basic: A twelfth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) accurately examine events, people, problems, conflicts, and ideas within their historical contexts;
b) make comparisons, describe cause and effect, and make connections between the past and current events;
c) analyze the development and impact of tools and technology.

Below Basic: A twelfth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 5 - People, Places, and Environments

Students apply their knowledge of the geographic themes (location, place, movement, region, and human/environment interactions) and skills to demonstrate an understanding of interrelationships among people, places, and environment.

Rationale

Students gain geographical perspectives of the community, state, nation, and world by studying the Earth and how humans interact with people, places, and environments. Their knowledge of geography allows students to make local and global connections. Students develop increasingly abstract thought as they use data and apply skills to analyze human behavior in relation to its physical and cultural environment.

Benchmarks

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
Spatial	**Spatial**	**Spatial**	**Spatial**
SS2.5.1 Use a map, globe, and mental mapping to identify familiar areas and simple patterns and create maps using various media.	**SS5.5.1** Apply mental mapping skills and use different representations of the Earth to demonstrate an understanding of human and physical patterns and how local decisions may create global impacts. **SS5.5.1.a** Identify boundaries of the Wind River Indian Reservation	**SS8.5.1** Use and create models of the Earth to analyze the interactions of physical and human systems to demonstrate global interconnectedness. SS8.5.1.a Analyze the impact of natural resources on tribal locations, past and present.	**SS12.5.1** Use geographic tools and reference materials to interpret, analyze, evaluate, and synthesize historical and geographic data to demonstrate an understanding of global patterns and interconnectedness. SS12.5.1.a Use geographic tools and reference materials to compare ancestral locations of Indigenous Tribes of Wyoming to reservations today.

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Social Studies Content Standard 5 - People, Places, and Environments (cont.)

Benchmarks
Students will:

Physical Place and Region	Physical Place and Region	Physical Place and Region	Physical Place and Region
SS2.5.2 Identify, describe, and use local physical and human characteristics to discuss the similarities and differences between parts of the community (e.g., neighborhoods, schools, towns, and reservation communities).	**SS5.5.2** Explain how physical features, patterns, and systems impact different regions and how these features may help us generalize and compare areas within the state, nation, or world.	**SS8.5.2** Analyze and evaluate how physical features and changes influenced historical events (e.g., route of Union Pacific Railroad, location of Wind River Indian Reservation, state and national monuments and parks) and participate in collaborative problem solving and decision making in the selection of professional and personal choices.	**SS12.5.2** Describe regionalization and analyze how physical characteristics distinguish a place, influence human trends, political and economic development, and solve immediate and long-range problems. **SS12.5.2.a** Analyze how the value placed on physical characteristics and natural resources cause conflict among different groups. (e.g., Black Hills, energy development, Big Horn River Adjudication, Devils Tower/Bear Lodge, and Yellowstone)
Human Place and Movement	**Human Place and Movement**	**Human Place and Movement**	**Human Place and Movement**
SS2.5.3 Use the human features of a community to describe what makes that community ~~special~~ unique (e.g., cultural, language, religion, food, clothing, political, economic, population, and types of jobs in an area) and why others ~~want to~~ move to ~~there~~ or ~~move away~~ from ~~there~~ that place.	**SS5.5.3** Describe the human features of an area (e.g., language, religion, political and economic systems, population distribution, and quality of life), past and present settlement patterns (e.g., ~~American Indians~~ Indigenous Tribes of Wyoming and the Oregon Trail), and how ideas, goods, and/or people move from one area to another. **SS5.5.3.a.i** Describe how cultural values of the Indigenous Tribes of Wyoming influence the importance and preservation of place and sacred sites (e.g., Devils Tower/Bear Lodge, Hot Springs State Park, Vedauwoo, Crowheart Butte, Bighorn Medicine Wheel, Estes Park, Yellowstone, Heart Mountain, and Wind River Mountains). **SS5.5.3.a.ii** Describe and identify a variety of place names and their connection to Indigenous Tribes of Wyoming.	**SS8.5.3** Explain how communities' current and past demographics, migrations, and settlement patterns influence place (e.g., culture, needs, and political and economic systems) and use this analysis to predict future settlement patterns. **SS8.5.3a** Explain how the migration and settlement patterns of indigenous tribes influence place (e.g. migration of pre-Columbian Tribes, and reservation movement).	**SS12.5.3** Analyze, interpret, and evaluate how conflict, demographics, movement, trade, transportation, communication, and technology affect humans' sense of place. **SS12.5.3a** Analyze how conflict, demographics, movement, trade, transportation, communication, and technology affect the Indigenous Tribes of Wyoming's sense of place.

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Environment and Society	Environment and Society	Environment and Society	Environment and Society
SS2.5.4 Identify how people including Indigenous Tribes of Wyoming, may adjust to and/or change their environment in order to survive (e.g., clothing, houses, foods, and natural resources).	**SS5.5.4** Describe how the environment influences people in Wyoming and how we adjust to and/or change our environment in order to survive (e.g., natural resources, housing, and food). **SS5.5.4.a** Discuss the ways in which the environment, including climate and seasons, influenced how the Indigenous Tribes of Wyoming adapted to their natural environment (e.g., how they obtained food, clothing, tools, and migration)	**SS8.5.4** Analyze the changes to and consequences of human, natural, and technological impacts on the physical environment. **SS8.5.4.a** Analyze how cultural practices continue to influence how Indigenous Tribes of Wyoming interact with the environment.	**SS12.5.4** Analyze how environmental changes and modifications positively and negatively affect communities, tribes and the world both economically and socially.

Social Studies Content Standard 5 - Performance Level Descriptor

GRADE 2

Advanced: A second-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) use a map, globe, and mental mapping to identify familiar areas, simple patterns, and create maps using various media;
b) identify, describe, and use local physical and human characteristics to discuss the similarities and differences between parts of the community and identify how people may adjust to and/or change their environment in order to survive;
c) use the human features of a community to describe what makes that community special and why others want to move there or move away from there.

Proficient: A second-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) use a map, a globe and mental mapping to identify familiar areas, simple patterns, and create maps using various media;
b) identify, describe, and use local physical and human characteristics to discuss the similarities and differences between parts of the community and identify how people may adjust to and/or change their environment in order to survive;
c) use the human features of a community to describe what makes that community special and why others want to move there or move away from there.

Basic: A second-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) use a map, a globe and mental mapping to identify familiar areas, simple patterns, and create maps using various media;
b) identify, describe, and use local physical and human characteristics to discuss the similarities and differences between parts of the community and identify how people may adjust to and/or change their environment in order to survive;
c) use the human features of a community to describe what makes that community special and why others want to move there or move away from there.

Below Basic: A second-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

Social Studies Content Standard 5 - People, Places, and Environments Performance Level Descriptor

GRADE 5

Advanced: A fifth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) apply mental mapping skills and use different representations of the Earth to demonstrate an understanding of human and physical patterns and how local decisions may create global impacts;

b) explain how physical features, patterns, and systems have impacted different regions and how ~~we~~ people, including tribes, adjust to and/or change ~~our~~ their environment in order to survive;

c) describe the human features of an area, past and present settlement patterns, and how ideas, goods, and/or people move from one area to another.

Proficient: A fifth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) apply mental mapping skills and use different representations of the Earth to demonstrate an understanding of human and physical patterns and how local decisions may create global impacts;

b) explain how physical features, patterns, and systems have impacted different regions and how ~~we~~ people, including tribes, adjust to and/or change ~~our~~ their environment in order to survive;

c) describe the human features of an area, past and present settlement patterns, and how ideas, goods, and/or people move from one area to another.

Basic: A fifth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) apply mental mapping skills and use different representations of the Earth to demonstrate an understanding of human and physical patterns and how local decisions may create global impacts;

b) explain how physical features, patterns, and systems have impacted different regions and how ~~we~~ people, including tribes, adjust to and/or change ~~our~~ their environment in order to survive;

c) describe the human features of an area, past and present settlement patterns, and how ideas, goods, and/or people move from one area to another.

Below Basic: A fifth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 5 - People, Places, and Environments Performance Level Descriptor

GRADE 8

Advanced: An eighth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) analyze, use, and create various representations of the Earth to demonstrate global interconnectedness that includes human, natural, and technological impacts on the physical environment;

b) analyze how regionalization influenced historical trends and affects political and economic developments;

c) explain how population distributions, migrations, and settlement patterns impact the creation and change of places and predict patterns of population distribution and growth.

Proficient: An eighth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) analyze, use, and create various representations of the Earth to demonstrate global interconnectedness that includes human, natural, and technological impacts on the physical environment;

b) analyze how regionalization influenced historical trends and affects political and economic developments;

c) explain how population distributions, migrations, and settlement patterns impact the creation and change of places and predict patterns of population distribution and growth.

Basic: An eighth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) analyze, use, and create various representations of the Earth to demonstrate global interconnectedness that includes human, natural, and technological impacts on the physical environment;

b) analyze how regionalization influenced historical trends and affects political and economic developments;

c) explain how population distributions, migrations, and settlement patterns impact the creation and change of places and predict patterns of population distribution and growth.

Below Basic: An eighth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 5 - People, Places, and Environments Performance Level Descriptor

GRADE 12

Advanced: A twelfth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) analyze and evaluate geographic data, historical and current events, the interaction of physical and human systems, and geographical patterns;

b) use geographical or regional knowledge and analysis of environmental ~~modification(s)~~ changes to participate in both collaborative problem solving and informed decision making;

c) evaluate how conflict, demographics, and movement impact global interdependence and human identification with place.

Proficient: A twelfth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) analyze and evaluate geographic data, historical and current events, the interaction of physical and human systems, and geographical patterns;

b) use geographical or regional knowledge and analysis of environmental ~~modification(s)~~ changes to participate in both collaborative problem solving and informed decision making;

c) evaluate how conflict, demographics, and movement impact global interdependence and human identification with place.

Basic: A twelfth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) analyze and evaluate geographic data, historical and current events, the interaction of physical and human systems, and geographical patterns;

b) use geographical or regional knowledge and analysis of environmental ~~modification(s)~~ changes to participate in both collaborative problem solving and informed decision making;

c) evaluate how conflict, demographics, and movement impact global interdependence and human identification with place.

Below Basic: A twelfth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 6 - Technology, Literacy, and Global Connections

Students use technology and literacy skills to access, synthesize, and evaluate information to communicate and apply social studies knowledge to global situations.

Rationale

*Using a variety of resources, students will apply the inquiry process to locate, interpret, and evaluate multiple primary and secondary sources. Students will use this information to become critical thinkers and decision makers in a global community. Social Studies Content Standard 6 was written around the Framework for 21st Century Skills and the Common Core Literacy Standards for History and Social Studies.**

Benchmarks

Students will:

End of Grade 2	End of Grade 5	End of Grade 8	Upon Graduation Grade 12
SS2.6.1 Identify what kinds of information can be found in different resources (e.g., library, computer, atlas, and dictionary).	**SS5.6.1** Use various media resources in order to address a question or solve a problem.	**SS8.6.1** Use and evaluate multiple sources of information in diverse formats and media in order to address a question or solve a problem.	**SS12.6.1** Analyze, evaluate, and/or synthesize multiple sources of information in diverse formats and media in order to address a question or solve a problem.
SS2.6.2 Distinguish between fiction and non-fiction.	**SS5.6.2** Identify validity of information (e.g., accuracy, relevancy, fact, or fiction).	**SS8.6.2** Distinguish among fact, opinion, and reasoned judgment in a text.	**SS12.6.2** Assess the extent to which the reasoning and evidence in a text supports the author's claims.
SS2.6.3 Use digital tools to learn about social studies concepts.	**SS5.6.3** Use digital tools to research, design, and present social studies concepts (e.g., understand how individual responsibility applies in usage of digital media). https://www.iste.org/standards/nets-for-students	**SS8.6.3** Use digital tools to research, design, and present social studies concepts (e.g., understand how individual responsibility applies in usage of digital media). https://www.iste.org/standards/nets-for-students	**SS12.6.3** Use digital tools to research, design, and present social studies concepts (e.g., understand how individual responsibility applies in usage of digital media). https://www.iste.org/standards/nets-for-students
Not assessed at this time.	**SS5.6.4** Identify the difference between primary and secondary sources.	**SS8.6.4** Use accurate, sufficient, and relevant information from primary and secondary sources to support writing.	**SS12.6.4** Evaluate and integrate accurate, sufficient, and relevant information from primary and secondary sources to support writing

*Wyoming Social Studies teachers are responsible for the Reading and Writing ELA Standards for Literacy in History/Social Studies found on pp. 60-66 at http://edu.wyoming.gov/educators/standards/social-studies

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Social Studies Content Standard 6 - Technology, Literacy, and Global Connections
Performance Level Descriptors

GRADE 2

Advanced: A second-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) identify an inquiry process to locate information;
b) identify fiction and nonfiction sources.

Proficient: A second-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) identify an inquiry process to locate information;
b) identify fiction and nonfiction sources.

Basic: A second-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) identify an inquiry process to locate information;
b) identify fiction and nonfiction sources.

Below Basic: A second-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

GRADE 5

Advanced: A fifth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) choose an appropriate inquiry process to locate information from a variety of sources;
b) use digital tools to research, design, and present social studies concepts;
c) explain the differences between primary and secondary sources.

Proficient: A fifth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) choose an appropriate inquiry process to locate information from a variety of sources;
b) use digital tools to research, design, and present social studies concepts;
c) explain the differences between primary and secondary sources.

Basic: A fifth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) choose an appropriate inquiry process to locate information from a variety of sources;
b) use digital tools to research, design, and present social studies concepts;
c) explain the differences between primary and secondary sources.

Below Basic: A fifth-grade student at below basic is ***unwilling*** **or** ***does not address*** the expectations of the basic level.

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Social Studies Content Standard 6 - Performance Level Descriptors

GRADE 8

Advanced: An eighth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) evaluate multiple sources of information in diverse formats in order to address a question or solve a problem;
b) use digital tools to research, design, and present social studies concepts;
c) use accurate, sufficient, and relevant information from primary and secondary sources to support writing.

Proficient: An eighth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) evaluate multiple sources of information in diverse formats in order to address a question or solve a problem;
b) use digital tools to research, design, and present social studies concepts;
c) use accurate, sufficient, and relevant information from primary and secondary sources to support writing.

Basic: An eighth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) evaluate multiple sources of information in diverse formats in order to address a question or solve a problem;
b) use digital tools to research, design, and present social studies concepts;
c) use accurate, sufficient, and relevant information from primary and secondary sources to support writing.

Below Basic: An eighth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

GRADE 12

Advanced: A twelfth-grade student meets expectations at the proficient level and ***independently*** demonstrates superior performance in the following. The student will:

a) analyze or synthesize multiple sources of information in diverse formats in order to address a question or solve a problem;
b) use digital tools to research, design, and present social studies concepts;
c) analyze and critique primary and secondary sources to support writing.

Proficient: A twelfth-grade student at the proficient level ***consistently*** demonstrates performance in the following. The student will:

a) analyze or synthesize multiple sources of information in diverse formats in order to address a question or solve a problem;
b) use digital tools to research, design, and present social studies concepts;
c) analyze and critique primary and secondary sources to support writing.

Basic: A twelfth-grade student at the basic level demonstrates ***partial mastery*** of knowledge and skills. The students will:

a) analyze or synthesize multiple sources of information in diverse formats in order to address a question or solve a problem;
b) use digital tools to research, design, and present social studies concepts;
c) analyze and critique primary and secondary sources to support writing.

Below Basic: A twelfth-grade student at below basic is ***unwilling* or *does not address*** the expectations of the basic level.

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Glossary

Assimilation: Assimilation is the absorption and integration of people, ideas, and/or culture into a wider society or group.

Example: Assimilation would include the melting pot theory as well as indigenous people being sent to boarding schools to acquire Western culture.

Budget: A budget is a spending and saving plan based on expected income and expenses.

An orderly program for spending, saving, and investing the money earned to achieve desired goals; also called a financial plan or spending plan.

Example: Budgets can include the federal budget, state budget, or personal budget.

Cause and Effect: Cause and effect is a way of describing what happens and why. The cause is the reason that the effect took place. The effect is the event that took place as a result of the cause.

Example: The invention of the automobile led to drive through restaurants.

Civic Responsibility (Good Citizenship): Civic responsibility is comprised of actions and attitudes associated with democratic governance and social participation.

Example: Civic responsibility can include participation in government, church, volunteers and memberships of voluntary associations. Actions of good citizenship can be displayed in advocacy for various causes include political, economic, civil, environmental, or quality of life issues. It is also reflected in a general willingness to sacrifice personal desires for the common good.

Collaboration: Collaboration is the working of one with another; cooperating on a common product.

Example: Collaboration in government would be bi-partisanship or the United Nations.

Command Economy: Command Economy is an economic system in which a central authority is in command of the economy; a centrally planned economy.

Example: Although most economies today are market-based mixed economies (which are partially planned), fully command economies of the Soviet-type continue to exist in Cuba, North Korea and Laos.

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Community: Community is a group of people with a common characteristic or interest living together within a larger society.

Example: Chinatown, Little Italy, communes, reservations, neighborhoods, schools, and classrooms are all communities.

Consumption: In economics, consumption is the final using up of goods and services. The term excludes the use of intermediate products in the production of other goods (e.g., , the purchase of buildings and machinery by a business). Economists use statistical information on income and purchases to trace trends in consumption, seeking to map consumer demand for goods and services.

Example: The consumption of renewable energy has increased steadily. Renewable energy currently accounts for about 8.20% of the United States energy consumption. Most of that comes from biomass and hydroelectric sources.

Continuity and Change: In studying the past we can see that some things remain continuous or steady, while other things change. Thinking about continuity and change requires us to compare different points in time-either two points in time from the past or one point from the past with one from the present. Sometimes what changes and what stays the same are surprising or obscure. Sometimes change brings progress, other time decline.

Example: The advent of electricity and household technology brought major changes to family life in the United States, but there were continuities as well. Doing laundry was much easier and less physically strenuous with washing machines, but laundry remained a household task that was almost always done by women and the amount of clothing that most people owned increase, so the time taken to do laundry did not decrease significantly.

Cultural Diversity: Cultural diversity is the cultural variety and cultural differences that exist in the world, a society, or an institution. Cultural diversity is based on the idea that cultural identities should not be discarded or ignored, but rather maintained and valued. The foundation of this belief is that every culture and race has made a substantial contribution to American history.

Example: Dying languages and urbanization are threats to cultural diversity.

Cultural Groups: These groups are socially defined categories based on common culture or nationality. Culture can, but does not have to, include common ancestry, appearance, cuisine, dressing style, heritage, history, language or dialect, religion, symbols, traditions, or other cultural factor.

Example: Cultural Groups are referenced when people speak of Italian, Samoan, or Japanese culture. They are referring to the shared language, traditions, and beliefs that set each of these peoples apart from others. In most cases, those who share your culture do so because they acquired it as they were raised by parents and other family members who have it.

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Cultural Preservation: To preserve culture is to maintain the beliefs values, customs, and norms of a group of people.

Example: Means of cultural preservation would include teaching languages spoken at home, creating museums, and collecting oral histories.

Culture: Culture is evidence of a human institution and is manifested in the learned behavior of people, which includes their belief systems, languages, social relations, technologies, institutions and organizations, and their development and use of material goods.

Example: There are many features of a people's culture like language, religion, traditions, clothing, or food used or consumed by a group of people.

Current Event: Current events are news items: important political and social events or issues of the present time.

Example: Current events can be found in places like the newspaper which includes news, events, highlights, and feature stories from around the world that are significant to students' lives.

Democratic Society (Democracy): A democratic society is one in which the people have ultimate political authority.

Example: A democratic society contrasts with other societies where power is either held by one, as in a monarchy, or where power is held by a small number of individuals, as in an oligarchy.

Demographics: The statistical study of human populations especially with reference to size and density, distribution, and vital statistics.

Example: Demographics include statistical data like distribution of wealth and population. When moving to a new city or visiting a new area it is helpful to look at demographics to learn about the people who live in that area.

Distribution: Distribution is the process of making a product or service available for use or consumption by a consumer or business user, using direct or indirect means (such as a third party go between).

Example: Product distribution gives you a way to get your product to the consumer. There are many methods you can use to distribute your product. When choosing the most cost-effective distribution method, be sure to consider costs associated with direct selling, as well as any retailer, wholesaler or broker fees, commissions, and shipping.

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Economic Principle: Economic Principle is the interrelated economic factors that explain what may cause what, or what may happen under certain circumstances in economics.

Example: Scarcity, opportunity cost, and efficiency are all considered factors of how the economy works (or should work), hence, they refer to economic factors.

Environment: Environment is defined as all the external factors influencing the life and activities of people, plants, and animals. Environment is the social and cultural forces that shape the life of a person or a population.

Example: Your surroundings, classroom, town, community, or neighborhood are all environments.

Environmental Modification: Environment modifications are any changes made to the environment.

Example: Environment modifications are usually made for the purposes of farming. The use of pesticides to grow crops and the effects it has on the soil and environment would be an environmental modification.

Geographical Patterns: Geographical patterns are the spatial distributions explainable as a repetitive distribution.

Example: Sand dunes, the Interstate Highway System, the Great Migration, settlements by water, and westward expansion are all geographical patterns.

Global Interconnectedness/Interdependence: Global interconnectedness is a state of being connected reciprocally.

Example: As China is dependent on US consumers to purchase its goods and the US debt to China steadily increases, the two superpowers demonstrate global interconnectedness.

Globalization: Globalization is the development of an increasingly integrated global economy marked especially by free trade, free flow of capital, and the tapping of cheaper foreign labor markets.

Example: NAFTA, McDonalds in other countries, social media, outsourcing of jobs, or OPEC

Government: Government is the important political institutions and the customs, laws, and rules that are used to interact with each other and to govern society.

Example: The government of the United States of America is the federal government of the constitutional republic of fifty states, as well as one capital district, and several other territories. The federal government is composed of three distinct branches: legislative, executive and judicial.

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Human Characteristics: Human characteristics are the human-designed cultural features of a place (land use, architecture, forms of livelihood, religion, food, transportation, and communication networks).

Example: The human characteristics of Wyoming include cell phone towers, cowboy hats, roads, the Oregon and Mormon Trails, farms, and ranches.

Human/Environment Interaction: Human/Environment Interaction considers how humans adapt to and modify the environment. Humans shape the landscape through their interaction with the land; this has both positive and negative effects on the environment.

Example: Some examples of human/environment interaction are pollution, recycling, planting trees, factories, way of dress, synthetic vs. organic, pest control, and weather patterns.

Indigenous Tribes of Wyoming: The term is inclusive of those groups who:

- Identify as indigenous, Native American, or American Indian under the regulations established by a tribe
- Maintain historical continuity with pre-colonial and/or pre-settler societies
- Maintain a strong link to territories and surrounding natural resources
- Maintain distinct social, economic, or political systems
- Maintain distinct language, culture, and beliefs
- Resolve to maintain their ancestral environments and systems as distinctive peoples and communities (e.g., Northern Arapaho, Eastern Shoshone, Northern Cheyenne, Crow, Ute, Lakota, etc.)

Adapted from the United Nations Permanent Forum on Indigenous Issues
http://www.un.org/esa/socdev/unpfii/documents/5session_factsheet1.pdf

Location: Location can be absolute or relative. Absolute location provides a definite reference to locate a place. The reference can be latitude and longitude, a street address, or even the Township and Range system. Relative location describes a place with respect to its environment and its connection to other places, or what surrounds a place.

Example: We are north of or south of a relative location. Also, a more specific example would be that the Wyoming capital city of Cheyenne is located at 41.145548N, 104.802042W.

Macroeconomics: Macroeconomics is the study of the economy as a whole, including topics such as inflation, unemployment, and economic growth.

Example: Macroeconomics includes the global economy, e-commerce, and international trade.

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Market Economy: A market economy is an economy that relies chiefly on market forces to allocate goods and resources and to determine prices.

Example: The term market economy used by itself can be somewhat misleading. For example, the United States constitutes a mixed economy (substantial market regulation, agricultural subsidies, extensive government-funded research and development, Medicare/Medicaid), yet at the same time it is foundationally rooted in a market economy. Different perspectives exist as to how strong a role the government should have in both guiding the market economy and addressing the inequalities the market produces.

Mental Map: Mental maps are maps we have in our minds of places we have experienced. They are a personal point-of-view perception. They include perceptual images in our mind that provide us with an awareness of the location of places and relationships between direction, distance, size and characteristics of a place.

Example: Simple sketches of maps created from memory of an urban area used to reveal five elements of the city: nodes, edges, districts, paths, and landmarks.

Microeconomics: Microeconomics is the study of the economic behavior and decision making of small units, such as individuals, families, and businesses.

Example: Microeconomics includes personal and business finances.

Migration: Migration is passing from one region or climate to another.

Example: Westward migration, immigration, and the Silk Road are all examples of migration.

Mixed Economy: A mixed economy is an economy in which private enterprise exists in combination with a considerable amount of government regulation and promotion

Example: A mixed economy combines elements of the command and market economies. The definition of mixed economy remains somewhat subjective. The world's developed nations are the most common examples of mixed economies. The United States, Canada, Australia, Japan, Germany, the United Kingdom, and Italy are all examples of mixed economies. Examples in the developing world include Mexico, Slovenia, and South Africa.

Movement: Movement includes natural and human phenomena change on Earth's surface over time. Humans move, a lot! In addition, ideas, fads, goods, resources, and communication all travel distances. This theme studies movement and migration across the planet.

Example: Natural phenomena such as ocean currents and air masses move across Earth's surface on a continuing basis. Humans interact on Earth from travelling from place to place, communicating across long distances and transporting goods by land, water, and air.

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Multicultural: Multicultural societies are ethnically and/or racially diverse.

Example: The United States is a multicultural society since it includes people from many different ethnic groups.

Nation: A territorial division containing a body of people of one or more nationalities and usually characterized by relatively large size and independent states.

Example: A national identity might be American, Arapaho, Shoshone, or German.

Physical Characteristics: Physical characteristics describe the natural environment of the place.

Example: The Rocky Mountains, Ayers Natural Bridge, the Grand Canyon, Sinks Canyon, and Devils Tower are all examples of locations with unique physical characteristics.

Place: Place describes the human and physical characteristics of a location.

Example: Physical characteristics include a description such things as the mountains, rivers, beaches, topography, and animal and plant life of a place. Human characteristics include the human-designed cultural features of a place (land use, architecture, forms of livelihood, religion, food, transportation, and communication networks).

Political Process: Political process is the process followed to resolve important issues that concern a large number of people.

Example: Political process refers to those legal activities where citizens are capable of a change in public policy.

Political System: A political system is a system of politics and government. It is usually compared to the legal system, economic system, cultural system, and/or other social systems.

Example: A country's political system includes who should have authority, how religious questions should be handled, and what the government's influence on its people and economy should be.

Population Distribution: Population distribution is the arrangement or spread of people living in a given area; also, how the population of an area is arranged according to variables such as age, race, or sex.

Example: An examples of locations with variances in population distribution would be urban vs. rural.

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Primary Source: If you are seeking to learn about the past, primary sources of information are those that provide first-hand accounts of the events, practices, or conditions you are researching. In general, these are documents that were created by the witnesses or first recorders of these events at about the time they occurred, and include diaries, letters, reports, photographs, creative works, financial records, memos, and newspaper articles (to name just a few types).

Examples of primary sources include:

- Diary of Anne Frank - Experiences of a Jewish family during WWII
- The Constitution of Canada - Canadian History
- A journal article reporting NEW research or findings
- Native American beadwork and treaties - Native American history
- Plato's Republic - Women in Ancient Greece

Production: Production is the act of creating output, a good or service which has value and contributes to the utility of individuals. The act may or may not include factors of production other than labor. The function of production, to some extent, is to try to meet the unlimited wants of consumers.

Example: In a democratic society, production is determined by individuals. People choose the goods and services they consume and produce, although advertising and consumer demand influence both. The concept of exchange of money is related to economic production: consumers use money to purchase goods and services.

Reasoned Judgment: Reasoned judgment is a decision that requires time and effort and results from careful information gathering, generation of alternatives, and evaluation of alternatives.

Example: Reasoned judgment is reached once a student has taken the time to research a topic and come to a belief based on evidence.

Region: Regions divide the world into manageable units for geographic study. Regions have some sort of characteristic that unifies the area. Regions can be formal, functional, or vernacular.

Example: Formal regions are those that are designated by official boundaries, such as cities, states, counties, and countries. For the most part, they are clearly indicated and publicly known. Functional regions are defined by their connections. For example, the circulation area for a major city area is the functional region of that paper. Vernacular regions are perceived regions, such as "The South," "The Midwest," or the "Middle East;" they have no formal boundaries but are understood in our mental maps of the world.

Regionalization: Regionalization is to divide into regions or administrative districts: arrange regionally.

Example: Regionalization has occurred in the United States as Republicans and Democrats migrate to common communities and create polarized states.

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Scarcity: Scarcity is the economic situation where needs or wants exceeds means. Therefore, people have to make choices.

Example: Scarcity impacts natural resources like uranium and fresh water.

Secondary Source: In contrast to a primary source, a secondary source of information is one that was created *later* by someone who *did not* experience first-hand or participate in the events or conditions you're researching. For the purposes of a historical research project, secondary sources are generally scholarly books and articles. Also included would be reference sources like encyclopedias.

Example:

Examples of secondary sources include:

- A journal/magazine article which interprets or reviews previous findings
- A history textbook
- A book about the effects of WWI

Tribe: A tribe is a social division in a traditional society consisting of families or communities linked by social, economic, religious, or blood ties, with a common culture and dialect, typically having a recognized leader.

Example: In contemporary contexts, it is problematic when used to refer to a community living within a traditional society. It is strongly associated with past attitudes of white colonists toward so-called primitive or uncivilized peoples living in remote undeveloped places. For this reason it is generally preferable to use alternative terms such as community or people (Eastern Shoshone, Northern Arapaho).

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2014 Wyoming Social Studies Content and Performance Standards

Historical Background

The Wyoming Social Studies Content and Performance Standards represent a cooperative effort. In 1998-1999, representatives from each of the districts participated in regional groups along with community college, University, and business representatives. The process began with regional meetings where the participants compiled drafts using local district standards. The state committee, consisting of regional representatives, utilized the regional documents to draft the state standards. National standards and several states' standards were referenced to establish the rigor of the Wyoming Social Studies Content and Performance Standards. These documents are listed below:

- National Council for the Social Studies, Curriculum Standards for Social Studies - ISBN 0-87986-065-0.
- National Center for History in the Schools, National Standards for History - ISBN 0-9633218-4-6.
- Center for Civic Education - National Standards For Civics And Government, ISBN 0-89818-155-0.
- Alaska, Content Standards for Alaska Students.
- Arkansas, Social Studies Curriculum Framework
- California, The Challenge Initiative, History and Social Science Standards, California State Department of Education.
- Colorado Model Geography Standards
- Florida, Sunshine State Standards
- Indiana, The Social Studies Proficiency Guide, Indiana Department of Education.
- Massachusetts, History & Social Science Curriculum Framework.
- New York, Social Studies Resources Guide.
- Texas, TEKS for Social Studies, Texas Education Agency.
- Virginia, History & Social Studies Standards of Learning.

In 2002-2003, writing committees were convened to review and revise these standards.

In 2008, consistent with its responsibility to evaluate and review the uniformity and quality of the standards at least every five years, the Wyoming State Board of Education Board directed the Wyoming Department of Education (WDE), working in consultation and coordination with local school districts, to formulate and implement a process to evaluate and review the uniformity and quality of the standards by November, 2008.

In order to accomplish the goal of reviewing the standards, a steering committee was convened to guide the review process. It met in early 2008 to develop the process to be used by Content Review Committees in each content area with representation from as many Wyoming school districts as possible. Members of the Standards Review Steering Committee nominated eight to twelve expert educators in each of the ten content areas represented in the Standards. These

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committees were balanced geographically and represented preschool, elementary, secondary, special education, and higher education teachers.

The reviewers who agreed to serve on a committee met in spring, 2008 to participate in a systematic evaluation of the uniformity and quality of the standards in their content area. Among the aspects of the Standards reviewed were:

a. The cognitive complexity of the standards.
b. The degree of integration of the Common Core of Skills, 21st Century Skills, and technology in the standards.
c. How Wyoming Standards compare to national curriculum standards and other states' standards.
d. How the format of standards documents might be improved to make them more uniform, more understandable, and more useful.
e. How urgent the need for substantive revision of the standards is in each content area.

The 2008 standards reflect formatting rather than substantive changes. Substantive revisions to standards in all content areas will be recommended based on conclusions from the 2008 standards review and continuing work by content review committees and other stakeholder groups between 2008 and 2013.

In the summer of 2012, a standards review committee was convened to review the Wyoming Social Studies Content and Performance Standards. Subcommittees were formed and it was decided that an additional social studies standard would be added addressing the Framework for 21st Century Skills for technology integration and a connection to literacy through the Common Core State Standards for Literacy in History/Social Studies, Science, & Technical Subjects. It was also decided that an additional grade band division would be added to better meet the demand for increased rigor at all grade levels and prepare students by introducing social studies concepts at the earliest grade levels. The committee recognizes that regardless of the variations of course sequences throughout the state, the knowledge and skills identified upon graduation are intended for all students.

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2014 Wyoming Social Studies Content and Performance Standards References

During the 2012-2013 revision, National standards and several states' standards were referenced to establish the rigor of the Wyoming Social Studies Content and Performance Standards. These documents are listed below:

- National Council for the Social Studies, National Curriculum Standards for Social Studies - ISBN 0-87986-105-6.
- National Council for Geographic Education, National Geography Standards, http://education.nationalgeographic.com/education/standards/national-geography-standards.
- Common Core State Standard Initiative, Common Core State Standards for Literacy in History/Social Studies, Science, & Technical Subjects, http://www.corestandards.org/ELA-Literacy/RH/introduction.
- International Society for Technology in Education, National Education Technology Standards for Students – ISBN 9781564842374.
- Partnership for 21st Century Skills, Framework for 21st Century Learning, http://www.p21.org/our-work/p21-framework.
- Alaska, Content and Performance Standards for Alaska Students.
- Idaho, Social Studies Content Standards, http://www.sde.idaho.gov/site/content_standards/ss_standards.htm.
- Montana, Standards for Social Studies, http://opi.mt.gov/pdf/standards/ContStds-SocSt.pdf.
- New York, Core Curriculum, http://www.p12.nysed.gov/ciai/socst/pub/sscore1.pdf.
- South Dakota, Social Studies Standards, http://doe.sd.gov/contentstandards/documents/Full_Social%20Studies.pdf.

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2018 Wyoming Social Studies Content and Performance Standards Content Review Committee "Indian Education Program for All" Bill (2017-2018)

George Abeyta, Fremont #21
Jed Anderson, Fremont #14
Stephany Anderson, Park #6
Amberlee Beardsley, Sweetwater #1
Homer Bennett, Lincoln #2
Beth Clingman, Albany #1
Teresa HisChase, Fremont #38
Kim Knobloch, Sheridan #1
Kate Mead, Teton #1
Caroline Mills, Ft. Washakie Learning Center
Patrick Moss, Fremont #38
Nancy Nelson, Big Horn #3
Suzanne Moum Nelson, Natrona #1
Shawn Peck, Fremont #25
Tom Rea, Casper
Eugene Ridgely, St. Stephens Indian School
Leslie Shakespeare, Arapahoe
Celeste Spoonhunter, Fremont #25
D. Lynette St. Clair, Fremont #14
Owen St. Clair, Fremont #14
Donna Tinsley, Campbell #1
James Trosper, UW Native American Education, Research and Cultural Center
John Washakie, Fremont #21
Yufna Soldier Wolf, St. Stephens Indian School

2014 Wyoming Social Studies Content and Performance Standards Content Review Committee (2012-2013)

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Chase Anfinson, Converse #2
Brian Boaz, Platte #1
Ann Christopherson, Laramie #1
Tammy Cobb, Natrona #1
Rose Robertson, Sublette #1
Brian Eberhard, UW
Billy Edwards, Niobrara #1
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Althea Farthing, Laramie #1
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Vera Hale, Carbon #1
Chris Henry, Natrona #1
LeeAnn Holt, Johnson #1
Jim Horne, Natrona #1
Jim Johanson, Laramie #1
James Kapptie, Park #1
Scott Mattson, Laramie #1
Lee McCoole, Platte #1
Wendy McGregor, Natrona #1
Stacy Morgan, Natrona #1
Suzanne Nelson, Carbon #1
Cindy Nunley, Fremont #25
Jill Prince, Laramie #1
Greg Schliske, Campbell #1
Kani Seifert, Carbon #1
Lynette St. Clair, Fremont #21
Anna Swank, Laramie #1
Aaron Temple, Natrona #1
Jeanne Tinnin, Johnson #1
Lona Tracy, Crook #1
Allen Von Eye, Weston #1
Patricia Waliser, Campbell #1
Dodie White, Fremont #14

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2008 Wyoming Social Studies Content and Performance Standards
Content Review Committee
(2008)

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2003 Wyoming Social Studies Content and Performance Standards
Revised State Writing Committee
(2002-2003)

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Donna Mathern, Natrona #1
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Wyoming Social Studies Content and Performance Standards
Revised State Writing Committee
(1998-1999)

Bruce Berst, Natrona #1
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Laura Cielinski, Natrona #1
Pat Crumrine, Big Horn #2
Kathy Cunningham, Fremont #38
Michelle Davis, Natrona #1
Maureen Emrich, Business Representative
Gerald George, Big Horn #1
Rosemary Graff, Fremont #2
Dr. William Gribb, University of Wyoming,
Carolyn Helling, Albany #1
Julie Holgate, Sublette #9
Christy Kessler, Johnson #1
Carol Kilmer, Niobrara #1
Ted Kinney, Goshen #1
Matt Kruse, Goshen #1
James Lash, Hot Springs #1
James Mader, Johnson #1
Gary McDowell, Laramie #1
Thad Morgan, Lincoln #2
Ferris Morrison, Platte #1
John Oglietti, Sublette #1
Jeff Parrott, Teton #1
Rexann Paul, Campbell #1
David Peterson, Niobrara #1
Rick Porter, Carbon #1
Janet Radkey, Fremont #2
Jody Rakness, Washakie #1
Dr. Tim Rush, UW
Sarah Stoll, Fremont #38
Larry Sturgeon, Laramie #1
Mike Struiksma, Washakie #1
Barbara Summers, Dept. of Employment
Jeanne Tinnin, Johnson #1
Gary Troudt, Niobrara #1
Lois Van Mark, Business Representative
Jeff Wagoner, Campbell #1
Kathy Walsh, Albany #1
Joe Winkler, Washakie #1
Beth Wipplinger, Park #1

DRAFT

Summary of January 25, 2018 Meeting
Advisory Committee on Accountability

Differences between ESSA and WAEA

A guiding principle of the Advisory Committee and WDE was to create coherence between the WAEA and the ESSA school accountability systems. Some ESSA requirements make complete coherence impractical. The Advisory Committee also wanted to ensure that WAEA is at least as rigorous, if not more so than ESSA, which causes some incoherence. As the table below indicates, there are only a few, albeit important, areas of incoherence. The differences are noted in bold and red font in the table below.

Table 1. Key differences between the current ESSA and WAEA school accountability systems.

ESSA	WAEA
Participation Rate: Denominator in achievement indicator must be at least 95% of students attending the school (Expanded standards students excluded). Not tested students in excess of 5% of all students are counted as not proficient on achievement indicator.	Participation Rate: • **Currently requires schools not meeting the 95% participation rate to have its calculated performance level reduced by one level.**
Achievement Indicator: Percent of proficient math and English language arts tests.	Achievement Indicator: Percent of proficient math, English language arts, and **science** tests
Growth Indicator: Mean Student Growth Percentile	Growth Indicator: Mean Student Growth Percentile
Graduation Rate: Must measure four year, on-time cohort rate and use this for CSI determination.	Graduation Rate: **Wyoming extended rate. Four-year, on-time cohort plus all five, six and seven year rates in the current year.**
English Learner: School score is percent of English Learner students meeting annual progress targets learning English.	English Learner: School score is percent of English Learner students meeting annual progress targets learning English.
Student Success/School Quality Indicator: • Equity – MGP of students in bottom quartile in prior year (high weight –80%) and MGP of top 3 quartiles (low weight – 20%) • Postsecondary readiness. Percent of students college, career, or military ready	Student Success/School Quality Indicator: **ity – MGP of students in bottom quartile from prior** secondary readiness. Percent of students college, career, ilitary ready
Indicator Target Levels: • **Above average (3)** • **Average (2)** • **Below average (1)**	**Indicator Target Levels:** • **Exceeds Target** • **Meets Target** • **Below Target**
Performance Level Designations: • **Comprehensive support and improvement (CSI)** • **Targeted support and improvement (TSI)** • **Additional targeted support** • **Unidentified**	**Performance Level Designations:** • **Exceeding Expectations** • **Meeting Expectations** • **Partially Meeting Expectations** • **Not Meeting Expectations**

ESSA	WAEA
Aggregation Method • **Average of target levels** • **The lowest average indicator score eligible for CSI and TSI … final determination based on average of achievement and growth scores**	**Aggregation Method** • **Decision tables**
Exit criteria for CSI and TSI. Must have improved performance on aggregate indicator score for two consecutive years.	**Exit criteria. None**
Long-Term Goals. Use method prescribed by Advisory Committee. Have interim targets that increase for schools with baseline scores below the long-term goals and must be maintained for schools at or above the long-term goals.	Long-Term Goals. HEA 61 directed WDE to establish long-term goals for achievement, graduation rate, and progress towards ELP. The same methods and goals established under ESSA will be used for WAEA.
Alternative Schools. Must have same scores as all other high schools.	**Alternative Schools. Will have a separate, but related accountability system for alternative schools.**
Subgroups. Scores needed for all subgroups for Targeted Support and Intervention identification.	**Subgroups. Consolidated Subgroup**

The Advisory Committee's recommendations regarding several of the key discrepancies are listed below.

Participation Rate

ESSA requires states to explicitly consider participation rate in evaluating schools. ESSA does not require states to fail schools if any subgroup falls below the 95% participation rate. For ESSA many states, Wyoming included, have decided to "fill up the denominator" of any indicator calculation with 95% of eligible students for any subgroup that falls below 95% participation. For example, let's say there were 100 eligible students in the school, but only 80 participated on the assessment and 50 of those students scored proficient. In this case, the achievement indicator would not be calculated as 50/80 x 100%. Rather, the achievement indicator would be calculated as 50/95 x 100% because the denominator of 95 (in this example) represents 95% of the eligible students in the school or subgroup. WAEA currently requires schools to be docked a performance level if their participation rate drops below 95%, and to receive an automatic determination of "Not Meeting Expectations" if their participation rate drops below 90%, regardless of the school's performance on the indicators. This approach is more a blunt instrument than the ESSA approach. The ESSA approach allows for finer-grained consequences to participation rate shortcomings. ***The Advisory Committee recommends adopting the ESSA approach to participation rate for WAEA.***

Science Achievement

ESSA does not allow science to be included as part of the achievement indicator. Some states have included science as part of the other academic indicator, but the achievement indicator must be based on reading/English language arts and math. The achievement indicator for WAEA is the weighted (by numbers of students) composite of ELA, math, and science.

The Advisory Committee recommends maintaining science as part of the WAEA achievement indicator.

Graduation Rate

The approved Wyoming ESSA plan relies on the adjusted cohort four-year graduation rate only, while WAEA adds the five-, six-, and seven-year graduates to the four-year, on-time cohort. Additional rates are permitted under ESSA as long as long-term goals and interim targets are established for the four-year rate.

The Advisory Committee recommends maintaining the different approaches for incorporating graduation rate into the accountability system.

Equity

The equity indicator used as part of WAEA for several years is based on the growth of the lowest performing 25% of students. WDE proposed this same indicator for ESSA but the USED interpreted the law to mean that all indicators must include all students in the school and not just the lowest 25%. WDE did not agree with this interpretation, but in an effort to have an approved plan, WDE proposed a fix that included all students where the growth of both the lowest 25% and highest 75% of students is evaluated. The indicator is calculated by weighting the growth of the lowest 25% four times the weight of the other 75% so the outcome is very similar, although more cumbersome, to the WAEA equity indicator.

The Advisory Committee recommends maintaining the approved weighting of the equity indicator 80-20 (80% for the lowest-performing 25%) for both ESSA and WAEA. However, the Advisory Committee recommends evaluating how this weighting is working after the first year of implementation and considering requesting an amendment to the ESSA State Plan if a different weighting improves the validity and reliability of the indicator. The Advisory Committee notes that the equity indicator was NOT included in the ESSA accountability plan for high school since post-secondary readiness is used as the indicator for school quality and student success and it was not required to have more than one "5th indicator" in the ESSA system. However, both post-secondary readiness and equity are included in the WAEA high school accountability system. At this time, the Advisory Committee recommends maintaining both indicators in the WAEA high school system, but also recommends studying this issue going forward.

Indicator Target Levels

WDE will employ a normative approach for establishing indicator targets (below average, average, and above average) for ESSA, but is using more of a criterion-referenced approach for WAEA. WDE has proposed the normative approach for ESSA to be able to better differentiate school performance since the overall determinations require normative decisions (e.g., lowest performing 5% of Title I schools).

Given the differences in purposes and consequences associated with the two systems, the Advisory Committee recommends maintaining the different approaches for reporting indicator results for the two systems.

Aggregation Methods

WAEA has relied on decision tables to aggregate the multiple indicators into an overall determination. The 2012 Advisory Committee report (Marion & Domaleski, 2012) spelled out the advantages of decision tables compared with weighted composite indices, but that report also noted that decision tables can become cumbersome when the accountability system includes more than three major indicators. As noted above, the ESSA accountability system must produce normative outcomes, so a weighted index makes sense to be able to identify schools for comprehensive and targeted support and improvement.

Given the inclusion of additional indicators (e.g., ELP) in the WAEA system, the Advisory Committee recommends shifting from a decision matrix to a weighted index aggregation method for WAEA.

Weighting Index

The Advisory Committee spent considerable time at its January 25, 2018 meeting discussing this issue as well as considering potential weighting schemes for the elementary/middle and high school systems. The Advisory Committee recognized that no matter the specific weighting scheme, there would be schools that would be too small to meet the minimum-n for certain indicators. This most obvious case is for the English language proficiency indicator where only about 25% of Wyoming's schools have enough EL students to be counted for this indicator.

Therefore, the Advisory Committee wanted to consider such eventualities when designing a weighting scheme. When all indicators are considered individually, the simple way to deal with the missing indicator is to redistribute the weight of that indicator to the other indicators equally. For example, when there are four indicators, each worth 25%, and the school does not meet the minimum-n for one indicator, the typical reaction is to weight the remaining indicators 33.3% each. Unfortunately, simple is not often correct, and this approach assumes that the system acts the same with and without the missing indicator. One way to avoid such unintended consequences is to group the indicators in major categories or "super-indicators" and weight the major categories first before determining the weights of the specific indicators. This way if an indicator is missing, the weight of that indicator is redistributed within the category.

The Advisory Committee discussed these options but was not yet ready to make a decision about the specific weighting approaches. The Advisory Committee will continue this work this winter and spring and will rely on modeling 2016-2017 data to inform these recommendations and then validate the recommendations once the 2017-2018 assessment results are available.

Long-term goals and interim targets

ESSA requires states to establish long-term goals and interim targets for all schools and subgroups in the state. The state is not required to hold schools accountable for these goals, but the state must report on the goals and interim targets. Wyoming Statute 21-2-204(e) requires the establishment of long-term goals and interim performance targets for all Wyoming indicators used in WAEA and further directs the SBE to "utilize the performance targets in carrying out the duties and the deliberative process required under subsection (f) of this section." The Advisory Committee previously recommended that WDE employ the same goal-setting approach designed for ESSA.

The Advisory Committee continues to support the common approach for establishing accountability goals and targets.

Alternative Schools

Wyoming, along with several other states, had the wisdom to establish a separate accountability system for alternative schools that was more tailored to the mission and population of these schools. Unfortunately, ESSA requires all public schools to be held to the same criteria to participate in the same accountability system.

The Advisory Committee recommends that Wyoming continue to employ the alternative school accountability system as part of WAEA.

Subgroups

With the exception of students with disabilities and economically disadvantaged students, it is well-known that Wyoming has very few schools that have subgroups large enough to meet the minimum-n and, therefore, would not be held accountable for subgroup performance. Nevertheless, ESSA requires reporting of performance and progress for all identifiable subgroups, which the Advisory Committee endorses, but ESSA goes further by requiring subgroup accountability to determine which schools will be identified for TSI. WAEA relies on a consolidated subgroup based on performance of the lowest 25% rather than demographic characteristics of the students.

Therefore, the Advisory Committee continues to recommend the approach to subgroups employed by WAEA and to maintain different approaches to subgroups for both ESSA and WAEA.

Other Recommendations

The issues and challenges with trying to create two cohesive accountability systems have led the Advisory Committee to offer several recommendations for policy considerations for the Wyoming Legislature.

1. The Advisory Committee proposes to study, during the 2018 interim, effective and efficient organizational structures for state educational systems in order to propose recommendations for how Wyoming can best ensure coherence in its educational policies and practices. **Specifically, the Advisory Committee will study the relationship among the Wyoming Legislature, State Board of Education, Wyoming Department of Education, and the Governor's Office to identify cases where laws and rules are supporting coherent policy implementation and cases that suffer from incoherent policies.** The purpose of this exercise will be to extract general guidelines from the various cases to use as a framework for new legislation and possibly to support amendments to existing legislation to ensure that local educators receive the most coherent policies messages from the State as possible.
2. In the near term, the Advisory Committee **supports clarifying the scope of the PJP** as noted in W.S. 21-2-204(f) so that the PJP is responsible only for recommending cutscores on indicators and the overall system for any new or substantially changed state accountability system based on recommendations of the Advisory Committee.
3. The Advisory Committee recommends **evaluating approaches and options for weighting the specific indicators (and categories of indicators).** This work is both conceptual and empirical and will require evaluating potential weighting approaches using the 2016-17 data to inform these recommendations and then validating the recommendations with the 2017-2018 assessment results. The Advisory Committee proposes to conduct this work during the spring of 2018 to ensure that the initial weighting recommendations are made well in advance of having to operationalize the 2018 analyses.
4. The Advisory Committee is confident that the accountability systems proposed for WAEA and ESSA represent best practices and are designed to best fit the Wyoming context. However, design and implementation are not the same, and even the best laid plans do not always work out as intended. Therefore, the Advisory Committee recommends spending the 2018 interim **creating an evaluation and continuous improvement plan to serve as a guide for WDE and SBE** for conducting the highest priority research and evaluation to ensure that the systems are working as well as possible and to suggest changes if shortcomings are uncovered.

#MilkenAward

MILKEN EDUCATOR AWARDS

The future belongs to the educated

"The excitement that my students and colleagues shared with me over winning the Award was thrilling! Recognition and validation of the teaching profession is an important message of the Milken Family Foundation and the students certainly heard it."

JOHN LARY
2015 Louisiana Milken Educator
Fellow, Lowell Milken Center for Unsung Heroes

EDUCATION, OPPORTUNITY AND AMERICA'S FUTURE

Education Commission of the States honored Milken Family Foundation Chairman and Co-Founder Lowell Milken with the 2017 James Bryant Conant Award for outstanding individual contributions to American education.

Global competition raises the stakes for quality education. As an international businessman and philanthropist for more than three decades, I have seen how the challenges to our economy, and more broadly to our way of life, bombard us from diverse sources at an ever-faster pace. To meet such challenges, America must produce students and graduates in increasing numbers who are not only literate, numerate and conversant in the humanities and sciences, but who are creative, motivated and confident; young people who are able and willing to think independently and act with integrity.

The talented educators who teach and prepare students to meet these demands are doing nothing less than laying the foundation for our national security. For whether a school is urban, suburban or rural—whether it represents the affluent or those most in need—within the course of a school day, research confirms that nothing and no one has more impact on student learning than the effectiveness of the teacher in the classroom.

The Milken Educator Awards were created to bring to the fore those educators who epitomize achievement, plus the potential to make even more profound contributions moving forward.

Since presenting our first Awards to one dozen exemplary California educators in 1987, we have seen how focusing the spotlight of recognition on such excellence inspires not only educators, but students and entire communities to new heights of commitment and expectation.

With each new class of Milken Educators, we are reminded anew that the power and promise of education must be replenished from generation to generation if we are to sustain our course as a democracy with opportunities for all. In a complex and changing world, the watchwords of the Milken Educator Awards have never been more timely as they proclaim:

The future belongs to the educated.

Lowell Milken

Lowell Milken
Chairman and Co-Founder
Milken Family Foundation

The Milken Educator Award
TOUCHING HEARTS AND MINDS

Since 1987, more than two million students have experienced that special day when an educator was surprised with a $25,000 award, hailed as a celebrity, and showered with attention from students, colleagues, VIPs, media and community.

Unlike most teacher recognition programs, the Milken Educator Awards have no formal nomination or application process. Candidates are sourced through a confidential selection process and then reviewed by blue ribbon panels appointed by state departments of education. Those most exceptional are recommended for the Award, with final approval by the Milken Family Foundation.

The surprise announcements are made during all-school assemblies filled with cheering students, respected colleagues, an entourage of distinguished officials, the media—and a stunned new Milken Educator. In a moment's time, these unsung heroes gain a significant, unrestricted financial prize of $25,000 and experience the unfamiliar but well-deserved acclaim and acknowledgment they rightly merit.

Media multiplies the message of the pivotal role that talented educators play in student achievement. Thousands of headline news stories from coast to coast herald the inspiration and contributions of these newly discovered role models in education.

"The Milken Educator Award reminds students that teaching is like being a lawyer or being a doctor. It's one of our society's most respected professions and it's something that they can consider as part of their life dreams."

JOHN WHITE
Louisiana State Superintendent of Education

"Since I received the Milken Educator Award, students at my school have been much more vocal about their appreciation of teachers. Students from past years and students I have never personally had in class come up to me to say congratulations and that I deserve it. I've also had several students tell me that they want to be a teacher, just like me, when they grow up. It brings tears to my eyes every single time."

AMANDA RAUPE
2016 Oklahoma Milken Educator

HELPING TEACHERS AND STUDENTS REACH THEIR POTENTIAL

"Milken Educators point to their Award as a pivotal professional milestone. They understand that encompassed in this recognition is the responsibility to grow as a leader in and beyond the school level. Encouraged and supported, these outstanding educators discover a renewed passion and purpose as they stretch their professional practices and policy influence to ever higher levels.

As a 1994 recipient from Indiana, I know firsthand the value I placed on colleagues I met first in my Indiana network and then across the country. To this day, these interactions continue to recharge my batteries and remind me of the importance of our work and why we chose to be educators—to be the catalyst and guide that helps all students reach their potential."

DR. JANE FOLEY
1994 Indiana Milken Educator
Senior Vice President, Milken Educator Awards


"Nothing assures the success of a nation more than education. And nothing assures the quality of education more than dedicated classroom teachers instilling a love of learning and a sense of wonder in their students."
MICHAEL MILKEN
President and Co-Founder, Milken Family Foundation

"I was quite young, having just started my seventh year of teaching, when I received this awesome, unexpected and life-changing Award. My first response was, 'They must think I'm doing something really great, so I'd better get started.'

I used the Award money to earn my master's degree, which launched my career into administration. Many doors opened because of my association with the Milken Family Foundation and I have had an amazing journey."

DR. ANGIE BESENDORFER
1996 Missouri Milken Educator
Chancellor, Western Governors University Missouri (WGU)

THE CRITERIA

The criteria for the selection of outstanding elementary and secondary teachers, principals and specialists as Milken Educators include all of the following:

- ✓ Exceptional educational talent as evidenced by effective instructional practices and student learning results in the classroom and school.
- ✓ Exemplary educational accomplishments beyond the classroom that provide models of excellence for the profession.
- ✓ Individuals whose contributions to education are largely unheralded yet worthy of the spotlight.
- ✓ Early- to mid-career and educators who offer strong long-range potential for professional and policy leadership.
- ✓ Engaging and inspiring presence that motivates and impacts students, colleagues and the community.

GOALS

Outstanding educators who continue to learn are essential to the fostering of student growth, the improvement of schools and the enhancement of the education profession. Hence, the goals of the Milken Educator Awards are to:

- ✓ Honor and reward outstanding K-12 educators for the quality of their teaching, their professional leadership, their engagement with families and the community, and their potential for even greater contributions to the healthy development of children.
- ✓ Focus public attention on the importance of excellent educators.
- ✓ Encourage able, caring and creative people to choose the challenge, service and adventure of teaching as a career.
- ✓ Create national and state networks that:
  - Foster the active professional development and career enhancement of Milken Educators and other professionals.
  - Encourage Milken Educators to help shape the educational policies that influence their classrooms and schools.
- ✓ Engage nonprofit, business and policy partners in assisting Milken Educators and in supporting policies that advance education.

"As educators, we shape the world. In order to do so we must continuously be lifelong learners ourselves. Those who are educated will have the unique ability to continue to break down barriers, find cures, achieve great success in their profession and ultimately impact the lives of those around them. Education is truly power."

DESI NESMITH
2014 Connecticut Milken Educator
Chief Turnaround Officer Connecticut State Department of Education

“While the money is indeed a benefit, the lasting thing is the significant public recognition, the validation of excellence and the opportunity to join the national network.”

LOWELL MILKEN
Chairman and Co-Founder, Milken Family Foundation

NATIONAL MILKEN EDUCATOR FORUM

A professional highlight of receiving the Milken Educator Award takes place each spring as the newest class of Milken Educators comes together to meet and become inspired by fellow Award recipients, as well as "veteran" Milken Educators whose accomplishments continue to impress. An instant camaraderie develops as recipients share experiences, techniques and accomplishments while developing bonds that last a lifetime.

During sessions with national policy makers and education leaders, Milken Educators learn how to cultivate their impact beyond their classroom walls and to further advance educational excellence at state and national levels. Most importantly, the Forum helps Milken Educators articulate their passions and develop their "voice" into leadership roles.

MILKEN EDUCATOR NETWORK

Cultivating Effective Leadership and Education Reform

The visibility and reputation of a Milken Educator Award results in unlimited opportunities for educators to improve education from local to international levels. New recipients join the Milken Educator Network, a group of more than 2,700 distinguished professionals whose expertise serves as a valuable resource to fellow educators, legislators, school boards and others shaping the future of education.

The Milken Educator Network fosters effective leadership and education reform through its state and national engagement. Network meetings, discussion forums, national gatherings, webinars and other experiences promote collegiality and enhance communication among education stakeholders.

"Receiving the Milken Educator Award completely changed my life. It gave me an invitation to a world that was previously unavailable to me—a world where policy makers and educational leaders actually wanted to know what I thought about things.

The Award also provided a family of people who celebrated the success of others and who encouraged and cheered as other educators did innovative things. The work that I do now came 20 years after the Award, but there's a fairly direct line between what I gained from the Award and the opportunity I have to create positive learning experiences for a much larger group of students."

CRAIG LINDVAHL
1989 Illinois Milken Educator
Illinois State Board of Education

STATE NETWORKS

Across the country, Milken Educators…

CELEBRATE

Hawaii Milken Educators

Aloha State Award recipients from years past travel from the outer islands to take part in the surprise notifications. Their collective support sheds light on the professional possibilities awaiting the newest members of the Milken Educator family. A special highlight is an annual event to honor their new recipient and present mini-grants to early career teachers.

ELEVATE

Virginia Teachers of Promise

In 2001, the Virginia Milken Educator Network, inspired by the Milken Educator Awards, established three goals: to celebrate the teaching profession in Virginia, to elevate the status of the teaching profession, and to activate both future and practicing educators to pursue excellence in teaching. Three years later, they launched the Teachers of Promise Institute (www.teachersofpromise.com), an annual two-day event that features presentations by master educators from across the nation.

To date, over 2,100 future teachers from three dozen college and university schools of education have been recognized as Teachers of Promise, and more than 50 master educators—including over 30 Milken Educators—have served as mentors and presenters. The Institute is funded by the Teachers of Promise Foundation, a 501(c)(3) established by Wade Whitehead, VA '00, in 2010.

"We are identifying and honoring the next generation of great teachers and are working to advance their understanding of what teaching and learning really are. Truly, they are our last, best hope for navigating the astounding potential hidden in our schools."

WADE WHITEHEAD
2000 Virginia Milken Educator
Executive Director, Teachers of Promise Institute
President, The Teachers of Promise Foundation

ACTIVATE

MEA Why Not Us

Milken Educators accept the Award as both an honor and a responsibility, acknowledging that it provides opportunities and expectations to grow as a leader in the profession. The 2017 MEA Forum in New Orleans gave rise to an exciting new initiative as a group of veteran Milken Educators—led by Dr. Hector Ibarra, IA ’93, and Dr. Dilhani Uswatte, AL ‘09—created a mentoring program called MMM (MEA Mentee Mentoring Program) to formalize the connection between new and veteran Award recipients. This partnership provides a structure of collaboration to explore, prepare and undertake leadership roles from the schoolhouse to the statehouse and beyond.

Pursuing the philosophy of “MEA Why Not Us” the program establishes ongoing, focused and substantive communications, with personalized support and coaching to assist individual Milken Educators in determining how, when and where to pursue professional leadership roles to influence practice and policy. Veteran mentors disseminate information, advice and connections for mentees to gain access to fellowships, grants and strategies that enhance classroom instruction and professional capacity.


Dr. Hector Ibarra


Dr. Dilhani Uswatte

“My mentor has an outside and experienced perspective that has allowed me to learn and expand my understanding in a setting that is friendly and open. As I transition into a new role, she has been invaluable in guiding me through reflection and next steps. My mentor has been both my cheerleader and my guide. I couldn’t ask for more!”

JENNIE SCHMALTZ
2016 Colorado Milken Educator

MILKEN EDUCATORS AS LEADERS

The Milken Educator Award is an ongoing relationship that provides recipients with additional resources and opens up a world of opportunities.

"I vividly remember Lowell Milken at my notification telling me that he expected great things from me. I recall him saying that this Award was being given for what I was going to do to make a positive difference in education. I took that to heart! I will remember that day forever because I suddenly had an entire 'family' who believed that I had the ability to make a difference. That is extremely powerful."

SHANNON GARRISON
2008 California Milken Educator
National Assessment Governing Board

While continuing in her role as a classroom teacher, Shannon is one of three educators on the National Assessment Governing Board that sets policy for the National Assessment of Education Program (NAEP), known as "the nation's report card." She was reappointed for a second term.

Throughout the years, Milken Educators have assumed the challenges and responsibilities of leadership, frequently earning new accolades along the way. The recent achievements listed below, are but a sampling of the thousands of leadership roles undertaken to strengthen education in its many forms.

STATE CHIEF SCHOOL OFFICERS

Dr. Michael Johnson, AK '08
Commissioner of Education and Early Development for the State of Alaska

Dr. Steven Paine, WV '95
State Superintendent of Schools for the State of West Virginia

NATIONAL DISTINGUISHED SERVICE TO EDUCATION AWARD FROM THE NATIONAL ASSOCIATION OF SECONDARY SCHOOL PRINCIPALS

Les Andersen, ND '93

STATE LEGISLATORS

Roger Fuller, ME '93
Maine House of Representatives, 59th District

Arnold Roblan, OR '97
Oregon State Senator, District 5

CHIEF TURNAROUND OFFICER, CONNECTICUT STATE DEPARTMENT OF EDUCATION

Desi Nesmith, CT '14

STATE BOARD OF EDUCATION MEMBERS

Dr. Yvonne Chan, CA '91
Former Member, California State Board of Education

Craig Lindvahl, IL '89
Illinois State Board of Education

William Twyman, KY '93
Chairman, Kentucky State Board of Education

Roger Wilcox, KY '97
Kentucky State Board of Education

Mary Harris, LA '06
Former Member, Louisiana Board of Elementary and Secondary Education

2016 SOCIAL INNOVATION AWARD FROM TEACH FOR AMERICA

Rachel Willis

SCHOOL NAMED IN EDUCATOR'S HONOR CLARK COUNTY SCHOOLS, LAS VEGAS, NEVADA

Dr. Beverly Mathis, NV '00

NEW INDUCTEES, NATIONAL TEACHERS HALL OF FAME

Kim Bearden, GA '99

Wade Whitehead, VA '00

"I need to thank the Milken Family Foundation for giving me the opportunity to build my platform as an educator and a leader. Their support, and the support of other Milken Educators, has changed me. I feel so empowered and cannot wait to see what my future will bring… but I know I'm ready!"

JAYDA PUGLIESE
2016 Pennsylvania Milken Educator

THE FUTURE BELONGS TO THE EDUCATED

"A high-quality education gets you into the Super Bowl of life. Without having an education, you're listening to the game on the radio."

ANTHONY WHITTINGTON
2004 Maryland Milken Educator
Named as the 2000th Award recipient

Affiliated Initiatives in Education

Unsung Hero (n): One who created positive change in history by improving the lives of others, and has yet to be recognized for his or her actions.

Lowell Milken Center FOR *Unsung Heroes*

Discover Create Change

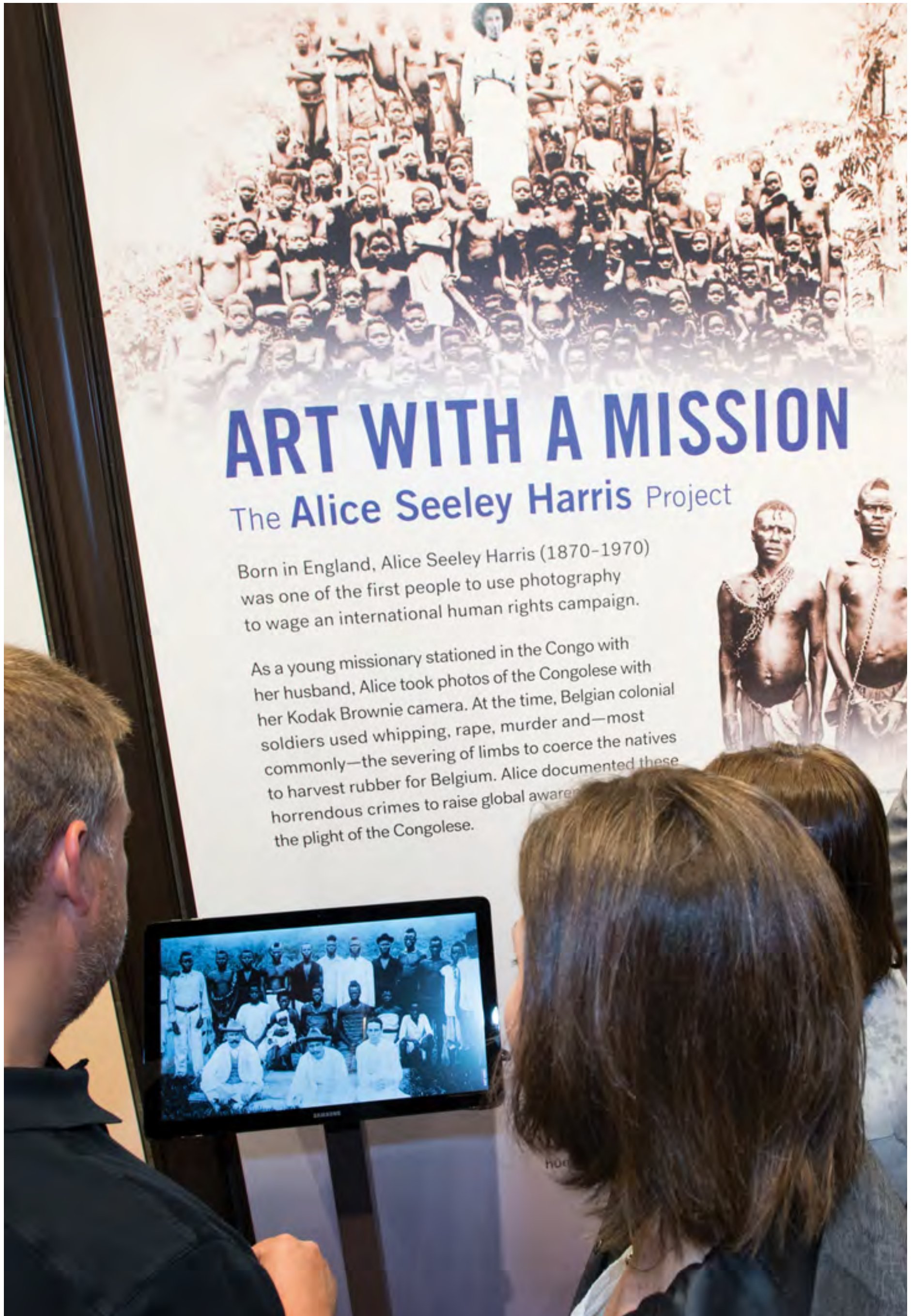
The Lowell Milken Center for Unsung Heroes (LMC) discovers, develops and communicates the stories of Unsung Heroes through a unique project-based learning approach. It was established in 2007 as a partnership between Lowell Milken and 1992 Kansas Milken Educator and history teacher Norm Conard. LMC collaborates with students and educators across diverse academic disciplines to develop creative projects highlighting individuals who changed the world through their courage and compassion, yet who are not found in history books.

LMC has reached over one million students worldwide virtually via its unique project-based learning, educator resources and student competitions. LMC's headquarters in Fort Scott, Kansas, has welcomed visitors from over 80 countries. This extraordinary level of interest led to the 2016 opening of the Hall of Unsung Heroes—an inspirational, high-tech space presenting interactive, museum exhibits and expanded opportunities for research. LMC is an initiative of the Lowell Milken Family Foundation.

"Real heroes tower and guide. They are the North Star that today's youth can look up to. But their stories need to be discovered and heard. And when we do, we have the opportunity to motivate new generations to aspire to values that are essential during the challenging times we face individually, as a nation and as a world community.

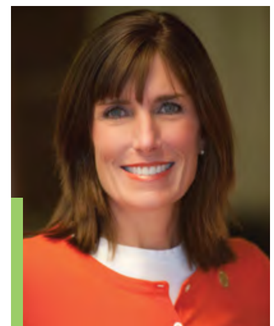
That is the purpose of the Center for Unsung Heroes."

LOWELL MILKEN
Founder



LOWELL MILKEN CENTER FELLOWS

The LMC Fellowship brings top educators from the U.S. and around the world to the historic Fort Scott headquarters for a prestigious, merit-based professional development program focused on the unique discovery process rooted in project-based learning.



"The LMC Fellowship was my most intense professional development experience. It was on a completely different plane than anything I've experienced in 20 years of teaching."

ANNA HULL
2010 Florida Milken Educator
Lowell Milken Center Fellow

"I'm answering some of the greatest 'what if' questions I've ever had from grade-level students. I'm watching them gain real-world leadership, cooperation and problem-solving skills along the way."

BILL SMITHYMAN
2015 Kansas Milken Educator
Lowell Milken Center Fellow

STUDENT COMPETITIONS

Illustrating its motto to **Discover** – **Create** – **Change**, LMC holds two annual competitions offering students more than $30,000 in cash prizes.

DISCOVERY AWARD

Uncovering and sharing the impact of an Unsung Hero takes resourcefulness, determination and passion on the part of students, who learn invaluable research, communication and life skills in the process. With financial prizes totaling $14,500, LMC's Discovery Award recognizes outstanding Unsung Hero projects by students in grades 4-12. Entries can take the form of a documentary, performance, website or exhibit and must include a process paper.

"History is the connective tissue between generations. It provides the moral fiber. By uncovering these stories, we hope to instill these values in our own generation and our children's generation."

CALEB JOHNSON
2013 Discovery Award Grand Prize Team Member
Prince George, Virginia

THE ArtEffect PROJECT

The ArtEffect Project, with cash prizes totaling $16,500, teaches students their power to effect positive change through creative storytelling that celebrates Unsung Heroes from history. U.S. and international middle and high school students are invited to submit creative art projects in the visual arts, film, theater or creative nonfiction. Students are encouraged to showcase completed projects beyond the classroom walls in order to create positive community impact and inspire social action.

ArtEffect 2017 grand prize winner:
"Hope for the Verdict"
Unsung Hero: Mitsuve Endo
by Molly Cahill, 11th grade

MILKEN SCHOLARS
Lifelong Leaders for a Better World

The **Milken Scholars Program** was founded in 1989 by Lori and Michael Milken to honor exceptional young men and women based on scholarship, leadership, service, character and triumphs over obstacles. Scholars are graduating high school seniors from New York, Washington, D.C., and Los Angeles who go through a rigorous nomination and interview process.

Each receives a $10,000 scholarship, but what makes the program unique is the access to a lifetime of resources including mentorship throughout their college careers and beyond. The annual three-day Summit in Los Angeles, with presentations by outstanding leaders from diverse fields, allows Scholars to form and renew friendships as they exchange ideas and aspirations. The Program is a joint initiative of the Milken Family Foundation and the Milken Institute.

"Whether they become doctors, research scientists, educators, entrepreneurs or diplomats, the common denominator of Milken Scholars is a genuine sense of service."

MICHAEL MILKEN
Founder, Milken Scholars

"Milken Scholars are clearly the leaders to effect change and lead from a position of personal experience about topics such as education gaps, healthcare disparities or environmental issues."

DR. JOELLE SIMPSON
1995 Milken Scholar

Medical Director of Emergency Preparedness
Children's National Health System, Washington, D.C.

LEADING ADVANCES IN EDUCATION

MILKEN FAMILY FOUNDATION

Founded by Michael and Lowell Milken in 1982, the Milken Family Foundation strives to discover and advance inventive, effective ways of helping people help themselves and those around them lead productive and satisfying lives. The means most conducive to achieving these goals is through education.

The belief that young people are not only our greatest *natural* resource, but our greatest *national* resource has been the guiding philosophy behind our groundbreaking education reform initiatives. Whether founding the nation's preeminent teacher recognition program, promoting excellence through academic achievement, preserving and expanding a cultural legacy or pioneering the nation's most successful comprehensive education reform system, MFF continues to champion strategies that elevate education in America and around the world.

Our initiatives:

- ✓ Strengthen the profession by recognizing and rewarding outstanding educators, and by expanding their professional leadership and policy influence.
- ✓ Attract, develop, motivate and retain the best talent for the teaching profession.
- ✓ Stimulate creativity and productivity among people of all ages through programs that encourage learning as a lifelong process.

"I never thought when I left engineering to teach, I'd get an award! Teaching is the hardest thing I've ever done. Engineering was easier. But I have never had a job this fulfilling and where I had this much fun!"

SAKHALIN FINNIE
2007 California Milken Educator

"It's such an honor. I come from a family of educators and I feel like I'm representing them. I'm representing my mom... representing all of those other teachers who do hard work every day and don't get recognition. This is for them, not just for me."

MICHELLE JOHNSON
2014 Washington, D.C. Milken Educator

Professional Staff

Lowell Milken
Chairman and Co-Founder

Michael Milken
President and Co-Founder

Richard Sandler
Executive Vice President and Secretary

Lawrence Lesser
Senior Vice President, Creative Services

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Senior Vice President, Milken Educator Awards

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Erika Kerekes
Social Media and Online Content Manager

Andressa Rogers
Media and Public Affairs Database Administrator

Andrew Ross
Communications Coordinator

"The Milken Family Foundation seeks you out to let you know that every day your choices are affecting the human capital in the world. To have that acknowledgment not only validates what we do, but it takes us away from a career and moves us into a profession. It restores the nobility of teaching."

NADER TWAL
2003 California Milken Educator

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Administrative Committee (AC) Summary

January 29, 2018

Present: Belenda Willson, Robin Schamber, Kenny Rathbun, Walt Wilcox, Sue Belish, Tom Sachse, Julie Magee, Kari Eakins, Kylie Taylor, Adam Leuschel

1. The committee reviewed draft agenda for the February 15-16 SBE meeting to be held in Cheyenne.
    a. Several agenda items were clarified, and some were rearranged on the agenda.
    b. Items added to the agenda included a report on changes to the Chapter 29 rules based on the feedback from the SBE and from other organizations, a report from the nominations committee, and a report from the Advisory Committee on Accountability.
    c. At the February meeting will be acknowledging several teachers who have received recognition (Milken Award recipient and recipients of the Presidential Award for Excellence in Math and Science Teaching). AC members are interested in continuing to recognize outstanding achievement by Wyoming educators. We want to be sure to set up some process to be intentional in that recognition. We don't want to leave anyone out. We understand that there may not be time during each of our meetings to honor a recipient or to ask them to attend a SBE meeting, but we may want to find a way to 1. Know about such awards, 2. Invite awardees to meetings, 3. Send a written card or letter to each. We understand that the communications committee is addressing this same issue.
2. The committee reviewed and approved with slight changes, the draft Request for Proposals (RFP) for the Consultant for the Professional Judgement Panels (PJP). Gratitude was expressed to both Tom and Julie for the excellent work they did in preparing the RFP. It was a great example of collaboration. Several items were explained, the timeline was revised slightly, and an additional responsibility was included. We anticipate that the final document will be submitted to procurement in the next day or two. Julie and Tom described the timeline for the rest of the process. Tom will provide more details at the February meeting. He will ask for volunteers to serve on the RFP review panel which will probably take place in early March.
3. The committee discussed a draft of the communications policy. There was discussion about whether this would be a standard operating procedure or a SBE policy. If this becomes a communications policy, there were questions about whether it should be expanded to include how board members communicate with each other, with the public, or with legislators. We want the policy to provide sufficient guidance but allow flexibility. Tom will be working on this policy specifically and on finalizing the entire policy manual. The task may take several months to complete.
4. We briefly discussed the fact that Tom is quickly running out of the total number of hours in his contract. He indicated that he had used 60% of his yearly hours by the end of December and we had another 6 months to go in the contract. His work on the PJP, the policy manual, and attending the legislative session will greatly impact the number of hours he has left. The AC has asked him to monitor his hours and project what will be needed in the coming months. If the board so chooses we may be able to extend his contract or create a new contract using some of the funds in our professional services budget. We have asked Adam to check on the viability of that solution.
5. Committee members were asked to think about dates for the next AC meeting.

SBE Communications Committee
February 5, 2018

Communications Committee members present via Zoom: Ryan Fuhrman, Robin Schamber, and Scotty Ratliff.

Members absent: Kathryn Sessions.

Also present: Kylie Taylor, WDE; Kari Eakins, WDE; Tom Sachse, and Kelly Pascal.

February 5, 2018

CALL TO ORDER

Chairman Fuhrman called the meeting to order at 3:02 p.m.

APPROVAL OF MINUTES

Minutes from the January 10th meeting were looked over, no objections or changed were expressed, the minutes were approved.

Review Kelly's Contract
After reviewing Kelly's January invoice it was noted that $7,468.75 remained of the contract with five months left until the end of the contract on June 30th. Kelly noted that without new direction from the board the remaining will be spent continuing to support the board and the coordinator as is done currently.

Stakeholder Communication Update
Continued discussion to prompt two-way communication with educators, business and community leaders about K-12 education (teachers and school leaders; exemplary educators — like Teachers of the Year, Milken Award Winners; and regional leaders who live and work in close proximity to meetings held throughout the state). And to bring in subject matter experts on key topics the board is addressing, and/or taking action on, to ensure they pull in diverse perspectives about the topic. Kelly is going to draft a checklist/timeline and share with the group.

Website Update
The committee reviewed the website and social media analytics for the month of January, there has been an increase in posts, impressions, and followers. Kelly suggested an area on the board's

website for the public to submit public comment if they cannot make the board meeting in person. Kari also suggested that the committee and the board as a whole explore different medium for sending out the board packet, perhaps something similar to what LSO does.

Media Outreach

The committee discussed the role of communications during the legislative session and what the important topics will be for the upcoming board meetings.

ACTION SUMMARY SHEET
STATE BOARD OF EDUCATION

DATE: February 16, 2018

ISSUE: Proposed 2018 Wyoming Content & Performance Standards

AUTHORITY: W.S. 21-2-304(c)

BACKGROUND/HISTORY: The Board is charged with evaluating and reviewing the uniformity and quality of the educational standards imposed under W.S. 21-9-101 including the student content and performance standards. The Wyoming Department of Education (WDE) convened three Standards Review Committees to review the standards and make a recommendation to the state board in the content areas of Mathematics, Science Extended, and Social Studies Standards.

FUNDING: N/A

IMPLEMENTATION AND SUSTAINABILITY: Once these standards are adopted and Ch. 10 Rules are promulgated, the standards will remain in effect until the next review cycle or until directed by the Board to open the review process, whichever comes first. Upon adoption of these standards, the Board will determine dates for implementation in schools per W.S. 21-2-304(a)(iv).

SUGGESTED MOTION(s)/RECOMMENDATION(s): I ask the Wyoming Department of Education to move forward to the next phase in the State Board of Education's adopted process, to share these three standards documents, which include mathematics, science extended, and social studies, with the public and collect input electronically, as well as through four public events around the state.

SUPPORTING INFORMATION ATTACHED: The standards documents for mathematics, science extended, and social studies, as well as presentation materials are included in the Board packet.

PREPARED BY: Laurie Hernandez
Laurie Hernandez, WDE Director of Standards & Assessment

ACTION TAKEN BY STATE BOARD: ___________________ **DATE:** __________________

COMMENTS:

OFFICIAL BALLOT

State Board of Education
Election of Officers

INSTRUCTIONS: To vote for a candidate, make an X in the oval beside the name of the candidate you prefer.

CHAIR
(vote for one)

⬭ Walt Wilcox

⬭ ______________________________
(write in)

VICE CHAIR
(vote for one)

⬭ Sue Belish

⬭ ______________________________
(write in)

TREASURER
(vote for one)

⬭ Max Mickelson

⬭ ______________________________
(write in)

WY State Board of Education Legal Status

A. INTRODUCTION TO THE STATE BOARD OF EDUCATION COMPOSITION

The Wyoming State Board of Education was created by the Wyoming state legislature in 1917 and is composed of 14 members, 12 of whom are appointed by the Governor and can vote, while three are ex officio. The ex officio members include the State Superintendent of Public Instruction, a designee of the President of the University of Wyoming, and the Executive Director of the Wyoming Community College Commission.

Among the gubernatorial appointments, there must be one certified classroom teacher at the time of appointment, one certified school administrator at the time of appointment, two representatives of private business or industry, and seven additional appointees representing different regions of the state. Not more than six appointed members may be registered for the same political party. The appointments are typically six-year terms and approved by the state legislature.

These and other requirements for convening the Wyoming State Board of Education are contained in WSS 21-2-301.

B. INTRODUCTION TO THE DUTIES OF THE STATE BOARD OF EDUCATION

Powers and duties:

The Wyoming State Board of Education is required by statute to fulfill a broad range of requirements enumerated in WSS 21-2-304.

These include adopting Uniform Student Content and Performance Standards in designated subject areas; establishing equitable standards for graduation for all Wyoming high schools; implementing a statewide assessment system based on a coherent system of measures; implementing a statewide accountability system that includes a technically-defensible approach to calculate achievement, growth, readiness, and equity; and promulgating rules and regulations for implementing and administering a comprehensive school district teacher performance evaluation system and leader accountability system. Before promulgating rules, the State Board of Education partners with the Wyoming Department of Education to assess and consider K-12 requirements.

Once approved by the Governor and legislature, new K-12 requirements are administered by the Wyoming Department of Education.

C. INTRODUCTION TO DUTIES OF THE BOARD CHAIR

Constitutional and Statutory Provisions:

§21-2-301(b) established the process for electing the board chair and lists duties, including the right to call meetings of the board as required. The same opportunity to call meetings of the state board are also given to the Governor and the State Superintendent.

State Board Policy:

The Chair shall preside at all meetings of the Board and shall be the Board's official representative at all times unless otherwise provided by the Board.

The Chair may appoint members to represent the Board at legislative and legal hearings, conferences, and other meetings deemed appropriate by the Board.

Special meetings may be called by the Chair. The Chair may appoint special or ad hoc committees as needed. The chair of a special or ad hoc committee shall be designated by the Board Chair.

The Chair shall, comply with Section 19 of Wyoming State Board of Education policy manual on the development of agendas. The Chair shall, in consultation with the State Superintendent or designee, hold a debrief meeting including relevant board members and/or staff within a month following the meeting of the Board.

The Chair shall sign all contracts that the Board is authorized to execute.

The Chair is responsible for immediate interpretation, application and enforcement of policies related to board membership. All complaints concerning a possible ethical violation shall be made to the Chair who shall make an initial determination of the issue. If further action is warranted, the Chair will pursue an appropriate course of action.

D. INTRODUCTION TO INTERNAL AND EXTERNAL BOARD COMMUNICATIONS

Issues related to communications are intrinsically interwoven into the ethics statutes and executive orders. The Ethics Act is at W.S. 9-13-101 through -109, and the two executive orders are Executive Order 1997-4 and 1981-12. Attached is the AG's office lobbying memos as well - the lobbying statutes are at W.S. 28-7-101 through -201.

1 . Policy purpose

1.1 The purpose of this policy is to identify the various channels of communication within the SBE, their intended purpose and the roles and responsibilities of board members in accessing and using them.

2 . Policy statement

2.1 The SBE has the objective of enhancing and streamlining internal communications to reinforce the board's vision and strategic priorities. This involves ensuring that information is equitably disseminated to board members and is relevant, easy to access, accurate, and appropriate in both content and quality.

2.2 Each member of the SBE has a digital device allowing them to access and collaborate about key documents and information, primarily in email and on the shared Google Docs platform. SBE will continue to develop and expand new communication platforms, channels, and tools to improve information sharing and collaboration among SBE members.

2.3 This policy is to be implemented in a way that ensures compliance with relevant legislative requirements and standards of best practice.

2.4 Board members are encouraged to share information with their peers and the broader education community about activities and events that have an association with SBE.

2.5 In some cases, the board chair will speak, write, and communicate virtually for the board on issues that have come before the board. Every effort will be made to make such communications known to the entire board as time allows.