

Proposed 2023 Wyoming Math and Science Content & Performance Standards

Kindergarten Math Standards

K.CC.1

- A. Count to 100 by ones and by tens.
- B. Count backwards by ones from 20.

K.CC.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).

K.CC.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.

K.OA.2 Solve word problems using objects and drawings to find sums up to 10 and differences within 10.

K.OA.3 Decompose numbers less than or equal to 10 in more than one way.

K.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number.

K.OA.5 Fluently add and subtract within 5.

K.MD.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.)

K.G.2 Correctly name shapes regardless of their orientations or overall size.

K.G.4 Analyze and compare two- and three-dimensional shapes, using informal language to describe their similarities, differences, and attributes.

K.G.6 Use simple shapes to compose squares, rectangles, and hexagons.

Kindergarten Science Standards

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.

K-PS3-2 Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.

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.

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.

Grade 1 Math Standards

1.OA.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.

1.OA.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.

1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.

1.NBT.1 Extend the number sequences to 120. In this range:

- A. Count forward and backward, starting at any number less than 120.
- B. Read numerals.
- C. Write numerals.
- D. Represent a number of objects with a written numeral.

1.NBT.2a-c 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 zero ones).

1.NBT.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.

1.MD.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).

1.G.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.

1.G.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.

Grade 1 Science Standards

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.

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.

1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted.

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.

Grade 2 Math Standards

2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, and 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.

2.OA.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.

2.NBT.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.)

2.NBT.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.

2.NBT.5 Add and subtract within 100 using strategies based on place value, properties of addition, and/or the relationship between addition and subtraction.

2.NBT.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.

2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.MD.7 Tell and write time from analog and digital clocks in five minute increments using a.m. and p.m.

2.MD.8 Solve word problems up to \$10 involving dollar bills, quarters, dimes, nickels, and pennies, using \$ (dollars) and ¢ (cents) symbols appropriately.

2.G.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

2.G.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.

Grade 2 Science Standards

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.

2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.

2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

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.

Grade 3 Math Standards

3.OA.7 Fluently multiply and divide with factors 1 - 10 using mental strategies. By the end of Grade 3, know automatically all products of one-digit factors based on strategies.

3.OA.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.

3.NBT.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.

3.NF.1 Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.

3.NF.2 Understand and represent fractions on a number line diagram.

A. Represent a fraction $\frac{1}{b}$ 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 $\frac{1}{b}$ and that the endpoint of the part based at 0 locates the number $\frac{1}{b}$ on the number line.

B. Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off a length $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line.

3.NF.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.

3.MD.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.

3.MD.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 $a \times b$ and $a \times c$.

3.G.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.

Grade 3 Science Standards

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.

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.

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.

3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

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.

Grade 4 Math Standards

4.OA.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.

4.NBT.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.]

4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

4.NBT.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.

4.NBT.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.

4.NF.1 Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ 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.

4.NF.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.

4.NF.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.

4.NF.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 $<$.

4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

4.MD.7 Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems.

4.G.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.

Grade 4 Science Standards

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

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.

4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

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.

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.

Grade 5 Math Standards

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions requiring parentheses that record calculations with numbers, and interpret numerical expressions without evaluating them.

5.NBT.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 $\frac{1}{10}$ of what it represents in the place to its left.

5.NBT.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.

5.NBT.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.

5.NF.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.

5.NF.3 Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$). 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.

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers by using visual fraction models or equations to represent the problem.

5.NF.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.

5.MD.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.

5.G.2 Plot and interpret points in the first quadrant of the coordinate plane to represent real-world and mathematical situations.

Grade 5 Science Standards

5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

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.

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

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-ESS3-1 Obtain and combine information about ways individual communities use science ideas to conserve Earth's resources and environment.

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.

Grade 6 Math Standards

- 6.RP.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.
- 6.NS.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.
- 6.NS.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.
- 6.NS.7** 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.
 - D. Distinguish comparisons of absolute value from statements about order.
- 6.NS.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.
- 6.EE.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 using positive rational numbers and whole-number exponents. Include expressions that arise from formulas in real-world problems.
- 6.EE.3** Apply the properties of operations to generate equivalent expressions.
- 6.EE.6** Use variables to represent unknown numbers and write expressions when solving a real-world or mathematical problem.
- 6.EE.7** Write and solve real-world and mathematical problems in the form of one-step, linear equations involving non negative rational numbers.
- 6.EE.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.
- 6.G.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.
- 6.G.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.
- 6.SP.4** Display numerical data in plots on a number line, including dot plots, stem-and-leaf plots, histograms, and box plots.
- 6.SP.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.

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Grade 7 Math Standards

- 7.RP.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.
- 7.RP.3** Solve multi-step real world and mathematical problems involving ratios and percentages.
- 7.NS.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.)
- 7.EE.1** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- 7.EE.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.
- 7.G.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 π 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.
- 7.G.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.6** Solve real-world and mathematical problems involving
- A. area and surface area of objects composed of triangles and quadrilaterals,
 - B. Volume of objects composed only of right prisms having triangular or quadrilateral bases.
- 7.SP.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.
- 7.SP.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.
- 7.SP.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.
- 7.SP.6** Collect multiple samples to compare the relationship between theoretical and experimental probabilities for simple events.

Grade 8 Math Standards

8.NS.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.

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.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.

8.EE.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.

8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

8.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.

8.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.

8.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.

8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems.

8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

8.SP.3 Use an equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

8.SP.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.

Middle School Science Standards

Physical Science

MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.

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-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.

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-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.

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-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-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Life Science

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-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

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.

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-LS4-1 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-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

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.

Earth & Space Science

- 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-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.
- 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-ESS2-6** 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-ESS3-3** Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.

Engineering, Technology, & Applications of Science

- 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-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.

High School Math Standards

Number and Quantity

N.RN.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.

N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

N.Q.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.

N.CN.7 Solve quadratic equations with real coefficients that have complex solutions.

Algebra

A.SSE.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.

A.APR.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.

A.APR.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.

A.CED.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.

A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.CED.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.

A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.REI.4 Solve quadratic equations in one variable.

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 .

A.REI.6 Estimate solutions graphically and determine algebraic solutions to linear systems, focusing on pairs of linear equations in two variables.

A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

Functions

F.IF.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 $y = f(x)$.

F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.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.

F.IF.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.

F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

F.BF.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.

F.BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.

F.BF.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 .

F.LE.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.

F.LE.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).

Geometry

- G.CO.3** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- G.CO.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
- G.CO.9** Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
- G.CO.10** Prove theorems about triangles. Theorems include: measure 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.
- G.SRT.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- G.SRT.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- G.C.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.
- G.GPE.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).
- G.GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Statistics and Probability

- S.ID.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.
- S.ID.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.
- S.ID.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
- S.ID.9** Distinguish between correlation and causation.
- S.CP.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").

High School Science Standards

Physical Science

- 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.
- 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.
- 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.
- HS-PS1-7** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
- 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.
- 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.
- 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.
- HS-PS2-6:** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of materials.
- 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.
- 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.

Life Science

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.

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.

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.

HS-LS4-6: Create and/or use a simulation to evaluate the impacts of human activity on biodiversity.

Earth & Space Science

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-ESS1-5: 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.

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.

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.

HS-ESS3-2: Evaluate competing design solutions for developing, managing, and using energy and mineral resources based on cost - benefit ratios.

HS-ESS3-3: Use computational tools to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

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 climate change and associated future impacts to Earth systems.

Engineering, Technology, & Applications of Science

HS-ETS1-3 Evaluate a solution to a complex 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.

HS-ETS1-5 Evaluate the validity and reliability of claims in a variety of materials.