



Opportunity Through Education

Jillian Balow – *Superintendent of Public Instruction*



2022+ WY-TOPP Math Assessment Blueprint

ALIGNED TO 2018 MATH WYOMING CONTENT & PERFORMANCE STANDARDS

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Effective – May 26, 2021

OPERATIONAL ON WY-TOPP MATH TESTS BEGINNING SCHOOL YEAR 2021-22



Gr. 3-10 WY-TOPP Math Blueprint Snapshot

2018 Wyoming Math Content Standards

% Range by Domain on the WY-TOPP Math Assessment

Grade	Operations and Algebraic Thinking	Number and Operations – Base 10	Number and Operations - Fractions	Measurement and Data	Geometry
3	38-43%	0%	18-23%	20-25%	15-20%
4	18-22%	18-22%	29-31%	18-22%	13-18%
5	13-18%	24-29%	24-29%	16-20%	13-18%

Grade	Ratios and Proportional Relationships	The Number System	Expressions and Equations	Functions	Geometry	Statistics and Probability
6	16-20%	18-22%	24-31%	N/A	16-20%	16-18%
7	18-22%	16-18%	20-24%	N/A	18-22%	16-20%
8	N/A	0%	27-33%	22-27%	22-29%	16-18%

Grade	Number and Quantity	Algebra	Functions	Statistics and Probability
9	15-20%	30-38%	33-40%	15-18%

Grade	Congruence	Similarity, Right Triangles, Trigonometry, and Circles	Expressing Geometric Properties with Equations	Geometric Measurement and Dimension & Modeling
10	33-38%	23-28%	20-25%	20-25%

WY-TOPP Gr. 3 Math Blueprint

2018 Wyoming Math Content Standards

OPERATIONS AND ALGEBRAIC THINKING [38-43%]

A. Represent and solve problems involving multiplication and division.

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.

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.

3.OA.A.3 Solve multiplication and division word problems within 100 using appropriate modeling strategies and equations.

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.)

B. Understand properties of multiplication and the relationship between multiplication and division.

3.OA.B.5 Apply properties of multiplication as strategies to multiply and divide. (Students need not use formal terms for these properties.)

3.OA.B.6 Understand division as an unknown-factor problem.

C. Multiply and divide within 100.

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.

D. Solve problems involving the four operations, and identify and explain patterns in arithmetic.

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.

3.OA.D.9 Identify arithmetic patterns and explain the relationships using properties of operations.

NUMBER AND OPERATIONS – FRACTIONS [18-23%]

F. Develop understanding of fractions as numbers. (Limited to denominators 2, 3, 4, 6, and 8) *use horizontal fractions

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 $1/b$.

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.

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.

MEASUREMENT AND DATA [20-25%]

H Represent and interpret data.

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.

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.

I Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

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.

3.MD.I.6 Measure areas by counting unit squares (square cm, square m, square in., square ft., and improvised units).

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

J Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

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.

GEOMETRY [15-20%]

K Reason with shapes and their attributes.

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.

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.

WY-TOPP Gr. 4 Math Blueprint

2018 Wyoming Math Content Standards

OPERATIONS AND ALGEBRAIC THINKING [18-22%]

A Use the four operations with whole numbers to solve problems.

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.

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.

B Gain familiarity with factors and multiples.

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.

NUMBER AND OPERATIONS – BASE TEN [18-22%]

D Generalize place value understanding for multi-digit whole numbers. (limited to numbers less than or equal to 1,000,000)

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.

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.

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

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)

4.NBT.E.4 Add and subtract multi-digit whole numbers using place value strategies including the standard algorithm.

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.

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.

NUMBER AND OPERATIONS – FRACTIONS [29-31%]

F Extend understanding of fraction equivalence and ordering. (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)

4.NF.F.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.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 $<$.

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.

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.

H Understand decimal notation for fractions, and compare decimal fractions.

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.

4.NF.H.6 Use decimal notation for fractions with denominators 10 or 100.

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 $<$.

MEASUREMENT AND DATA [18-22%]

I Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

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, 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.

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.

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

J Represent and interpret data.

4.MD.J.4 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots.

K Geometric measurement: understand concepts of angle and measure angles.

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.

4.MD.K.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

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

GEOMETRY [13-18%]

L Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

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.

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.

4.G.L.3 Identify line-symmetric figures. Recognize and draw lines of symmetry for two-dimensional figures.



WY-TOPP Gr. 5 Math Blueprint

2018 Wyoming Math Content Standards

OPERATIONS AND ALGEBRAIC THINKING [13-18%]

A. Write, interpret, and/or evaluate numerical expressions.

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

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

NUMBER AND OPERATIONS – BASE TEN [24-29%]

C Understand the place value system.

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

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.

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.

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.

D Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.D.5 Multiply multi-digit whole numbers using place value strategies including the standard algorithm.

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.

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.

NUMBER AND OPERATIONS – FRACTIONS [24-29%]

E Use equivalent fractions as a strategy to add and subtract fractions.

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.

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.

F Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

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.

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.

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.

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.

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.

MEASUREMENT AND DATA [16-20%]

G Convert like measurement units within a given measurement system.

5.MD.G.1 Solve multi-step real world problems by converting among different-sized standard measurement units within a given measurement system.

H Represent and interpret data.

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.

I Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

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.

5.MD.I.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units.

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.

GEOMETRY [13-18%]

J Graph points on the coordinate plane to solve real-world and mathematical problems.

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.

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

K Classify two-dimensional figures into categories based on their properties.

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.

5.G.K.4 Classify polygons in a hierarchy based on properties.

WY-TOPP Gr. 6 Math Blueprint

2018 Wyoming Math Content Standards

RATIOS AND PROPORTIONAL RELATIONSHIPS [16-20%] Non-Calculator Section

A Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.

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.

THE NUMBER SYSTEM [18-22%] Non-Calculator Section

B Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

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.

C Compute fluently with multi-digit numbers and find common factors and multiples.

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.

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.

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.

D Apply and extend previous understandings of numbers to the system of rational numbers.

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.

EXPRESSIONS AND EQUATIONS [24-31%] Non-Calculator Section

E Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.E.1 Write and evaluate numerical expressions involving whole-number exponents.

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.

6.EE.E.3 Apply the properties of operations to generate equivalent expressions.

6.EE.E.4 Identify when two expressions are equivalent.

F Reason about and solve one-variable equations and inequalities.

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.

6.EE.F.6 Use variables to represent unknown numbers and write expressions when solving a real-world or mathematical problem.

6.EE.F.7 Write and solve real-world and mathematical problems in the form of one-step, linear equations involving nonnegative rational numbers.

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.

G Represent and analyze quantitative relationships between dependent and independent variables.

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.

GEOMETRY [16-20%] Calculator Section

H Solve real-world and mathematical problems involving area, surface area, and volume.

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.

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.

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.

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.

STATISTICS AND PROBABILITY [16-18%] Calculator Section

I Develop understanding of statistical variability.

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.

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.

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.

J Summarize and describe distributions.

6.SP.J.4 Display numerical data in plots on a number line, including dot plots, stem-and-leaf plots, histograms, and box plots.

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.

WY-TOPP Gr. 7 Math Blueprint

2018 Wyoming Math Content Standards

RATIOS AND PROPORTIONAL RELATIONSHIPS [18-22%]

A Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.RP.A.1 Compute unit rates, including those involving complex fractions, with like or different units.

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.

7.RP.A.3 Solve multistep real world and mathematical problems involving ratios and percentages.

THE NUMBER SYSTEM [16-18%]

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.

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.

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.)

EXPRESSIONS AND EQUATIONS [20-24%]

C Use properties of operations to generate equivalent expressions.

7.EE.C.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

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.

D Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

7.EE.D.3 Solve multi-step real-world and mathematical problems involving rational numbers. Include fraction bars as a grouping symbol.

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.

GEOMETRY [18-22%]

E Draw, construct, and describe geometrical figures and describe the relationships between them.

7.G.E.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing.

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.

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.

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 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.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 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.

STATISTICS AND PROBABILITY [16-20%]

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 nonrandom 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.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.

H Draw informal comparative inferences about two populations.

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.

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.

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EXPRESSIONS AND EQUATIONS [27-33%]

C Understand the connections between proportional relationships, lines, and linear equations.

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.

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 $(0, b)$.

D Analyze and solve linear equations and pairs of simultaneous linear equations.

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.

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.

FUNCTIONS [22-27%]

E Define, evaluate, and compare functions.

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.)

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

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.

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.

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.

GEOMETRY [22-29%]

G. Understand congruence and similarity using physical models, transparencies, or geometry software.

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.

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.

8.G.G.3 Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.

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.

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.

H. Understand and apply the Pythagorean Theorem.

8.G.H.6 Use models or diagrams to explain the Pythagorean Theorem and its converse.

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

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

I. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

8.G.I.9 Given the formulas, solve real-world and mathematical problems involving volume and surface area of cylinders.

STATISTICS AND PROBABILITY [16-18%]

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.

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.

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.

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.

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NUMBER AND QUANTITY [15-20%]

The Real Number System [8 Items Max]

RN.A. Extend the properties of exponents to rational exponents.

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.

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

RN.B. Use properties of rational and irrational numbers.

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.

ALGEBRA [30-38%]

Seeing Structure and Expressions [9 Items Max]

SSE.A. Interpret the structure of expressions.

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.

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.

Creating Equations [2 Items Max]

CED.G Create equations that describe numbers or relationships.

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.



Reasoning with Equations and Inequalities [9 Items Max]

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.

REI.I Solve equations and inequalities in one variable.

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

REI.J Solve systems of equations.

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.

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

FUNCTIONS [33-40%]

Interpreting Functions [12 Items Max]

IF.A Understand the concept of a function and use function notation.

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 $y = f(x)$.

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.

F.IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

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.

F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

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.

Building Functions [3 Items Max]

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.



Linear, Quadratic, and Exponential [3 Items Max]

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.

C. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another

STATISTICS AND PROBABILITY [15-18%]

Interpreting Categorical and Quantitative Data [7 Items Max]

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.

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.

ID.C Interpret linear models.

S.ID.C.9 Distinguish between correlation and causation.

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GEOMETRY [100% - broken out as follows]

Congruence [33-38%]

CO.A Experiment with transformations in the plane.

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.

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).

G.CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G.CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

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.

CO.B Understand congruence in terms of rigid motions.

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.

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.

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.

CO.C Prove geometric theorems.

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.

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.

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.

CO.D Make geometric constructions.

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.

G.CO.D.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, Trigonometry, and Circles [23-28%]

SRT.E Understand similarity in terms of similarity transformations.

G.SRT.E.1 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.

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.

G.SRT.E.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

SRT.F Prove Theorems involving similarity.

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.

G.SRT.F.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

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.

G.SRT.G.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

C.I Understand and apply theorems and circles.

G.C.I.1 Prove that all circles are similar.

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.

Expressing Geometric Properties with Equations [20-25%]

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.

GPE.L Use coordinates to prove simple geometric theorems algebraically.

G.GPE.L.4 Use coordinates to prove simple geometric theorems algebraically.

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).

G.GPE.L.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

G.GPE.L.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles (e.g., using the distance formula).

Geometric Measurement and Dimension & Modeling [20-25%]

GMD.M Explain volume formulas and use them to solve problems.

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.

G.GMD.M.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

GMD.N Visualize relationships between two-dimensional and three-dimensional objects.

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.

MG.O Apply geometric concepts in modeling situations.

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).

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).

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 topographic grid systems based on ratios).