Grade 8 Montana Standards	Novice A student who performed at this level did not meet grade-level expectations in this subject and needs considerable support to develop the required knowledge, skills, and practices necessary for future coursework in this content area. A student at this level:	Partially Proficient A student who performed at this level partially met grade-level expectations in this subject and needs support to develop the required knowledge, skills, and practices necessary for future coursework in this content area. A student at this level:	Proficient A student who performed at this level met grade-level expectations in this subject. The student has demonstrated the required knowledge, skills, and practices necessary for future coursework in this content area. A student at this level:	Advanced A student who performed at this level exceeded grade-level expectations. The student has demonstrated mastery of the required knowledge, skills, and practices necessary for future coursework in this content area. A student at this level:
The Number System (NS)				
8.NS.A Know that there are numbers that are not rational, and approximate them by rational numbers.				
8.NS.A.1 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.	Identifies fractions, whole numbers, square roots of perfect square whole numbers, and the cube root of a perfect cube whole number as rational numbers. Limit whole numbers from 0 to 1,000. Identifies pi, the square root of a non-perfect square whole number, and the cube root of a non-perfect cube whole number as irrational. Limit to whole numbers from 0 to 1,000. No calculator is allowed for this standard. See 7.NS.A.2d for converting rational numbers (fractions) to decimals. See 8.EE.A.2 for evaluating perfect squares and perfect cubes.	Identifies given decimals as rational or irrational numbers. Converts a common repeating decimal into a fraction (e.g., thirds, ninths). Identifies the cube root of a perfect cube integer as rational and the cube root of a non-perfect cube integer as irrational. Limited to integers from −1,000 to −1. No calculator is allowed for this standard.	Converts less common repeating decimals into fractions (e.g., sixths, sevenths, elevenths). No calculator is allowed for this standard.	Explains/justifies classifications of real numbers. Classifies the sums and differences of rational and irrational numbers as rational or irrational. No calculator is allowed for this standard.
8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). For example, by truncating the decimal expansion of √2 , show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	Places the value of the square root of a positive whole number less than 100 which is not a perfect square between two whole numbers which represent perfect squares on the number line (e.g., √5 is between 2 and 3). No calculator is allowed for this standard.	Places irrational numbers on a number line between two whole numbers. Estimates the value of an irrational number between two whole numbers using statements such as "between" or "approximately." Estimates the value of an irrational number to the nearest whole number (e.g., √5 is about 2). Irrational numbers must be less than 125 and may include square roots or cube roots. No calculator is allowed for this standard.	Compares two or more real numbers using comparison symbols (e.g., < or >). Must include at least one irrational number. Places irrational numbers on a number line between a whole number and ± 0.5. Estimates the value of an irrational number to the nearest ± 0.5. Irrational numbers must be less than 125 and may include square roots or cube roots. No calculator is allowed for this standard.	Places expressions involving irrational numbers on a number line between two whole numbers. Expressions limited to adding, subtracting, or multiplying one irrational number and one whole number or squaring of an irrational number resulting in an irrational number. Explains how to find better approximations of irrational numbers given a truncated decimal of an irrational number. No calculator is allowed for this standard.
Expressions and Equations (EE)				
8.EE.A Work with radicals and integer exponents.				

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	Applies properties of exponents when multiplying at least two numerical expressions with whole-number exponents and the same rational-number bases. Evaluates a numerical expression with a rational number base and a negative integer exponent or rewrites it in an equivalent form (e.g., $(-1/3)^{-3} = (-3)^3 = -27$). See 6.EE.A.1 for evaluating whole number exponents without using properties of exponents. See 7.NS.A for operations with rational numbers, including whole number exponents. No calculator is allowed for this standard.	Applies properties of exponents when multiplying at least two numerical expressions with integer exponents and the same rational-number bases. Must include a negative integer exponent. Applies properties of exponents when dividing two numerical expressions with whole-number exponents and the same rational-number bases. Determines the value of any number with an exponent of 0 or 1. Applies properties of exponents when multiplying at least three numerical expressions with integer exponents and rational-number bases. At least one base must be unique with two bases the same rational number [e.g., $(2^{-1})(3^2)(2^4)$]. No calculator is allowed for this standard.	Applies properties of exponents when numerical expressions involve both multiplying and dividing numerical expressions with integer exponents and rational-number bases. At least two of the bases must be the same rational number. Applies properties of exponents when dividing two numerical expressions with integer exponents. Must include a negative integer exponent. Compares and orders numerical expressions with the same rational-number base and integer exponents based on the properties of exponents (e.g., $3^{-2} < 3^0 < 3^2$). No calculator is allowed for this standard.	Analyzes the simplification of numerical expressions involving exponents. (e.g., Explain why $(1/3)^{-3}$ does not equal -27.) No calculator is allowed for this standard. Explains why any number raised to the first power is itself. Explains why any number raised to the zero power is 1.
8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.	Evaluates square roots of perfect square whole numbers. Evaluates cube roots of perfect cube whole numbers. No calculator is allowed for this standard.	Evaluates square roots of perfect square rational numbers, except whole numbers. Evaluates cube roots of perfect cube rational numbers, except whole numbers. No calculator is allowed for this standard.	Solves equations of the form $x^2 = p$ where p is a perfect square rational number. Includes requiring ± as part of the solution. Solves equations of the form and $x^3 = p$, where p is a perfect cube rational number. Solves equations of the form $x^2 = p$ where p is a positive rational number and the solution requires the use of the square root symbol. Does not need to simplify the radical. Includes requiring ± as part of the solution. Solves equations of the form $x^3 = p$ where p is a rational number and the solution requires the use of the cube root symbol. Does not need to simplify the radical (e.g., What value of x makes $x^3 = -2$ true?). Identifies an exponential equation given the square root or cube root of a number in both mathematical and real world situations (e.g., Which equation has √2 as a solution?). Identifies √2 as an irrational number. No calculator is allowed for this standard.	Writes an exponential equation that results in the given square root or cube root of a number in both mathematical and real-world situations (e.g., Write an equation for which -√3 is a solution.). Evaluates square roots of fractions of perfect squares or cube roots of fraction of perfect cubes. No calculator is allowed for this standard.
8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.	Given exact quantities, expresses estimates of very large quantities by using numbers in the form of a single digit times an integer power of 10. May include context. No calculator is allowed for this standard.	Given exact quantities, expresses estimates of very small quantities by using numbers in the form of a single digit times an integer power of 10. May include context. No calculator is allowed for this standard.	Expresses how many times as much one quantity is than another quantity when both are written as a single digit times an integer power of 10. May include context. No calculator is allowed for this standard.	Expresses how many times as much one quantity is than another quantity when at least one of the quantities has not been written as a single digit times an integer power of 10. May include context. No calculator is allowed for this standard.

8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	Converts between scientific notation with positive exponents of 10 and decimals. No calculator is allowed for this standard.	Converts between scientific notation with negative exponents of 10 and decimals. Interprets scientific notation that has been generated by technology. Performs operations with numbers expressed in scientific notation within a mathematical problem (e.g., Determines that 2.8×10^6 divided by 4.0×10^4 is 7.0×10^1). No calculator is allowed for this standard.	Performs operations with numbers expressed in scientific notation within a real-world context. Chooses units appropriate to the problem. Performs operations with numbers expressed in scientific and decimal notation within the same mathematical problem. When a calculator is not allowed, decimals must convert to scientific notation such that working with scientific notation and not operations with decimals are what is being assessed (e.g., Determines that 2.8×10^6 times 0.005 is 1.4×10^4). Compare and order values expressed in scientific and decimal notation. At least one value must be in scientific notation. No calculator is allowed for this standard.	Performs operations with numbers expressed in scientific and decimal notation within the same real-world context. Chooses units appropriate to the problem. When a calculator is not allowed, decimals must convert to scientific notation such that working with scientific notation and not operations with decimals are what is being assessed. No calculator is allowed for this standard.
8.EE.B Understand the connections between proportional relationships, lines, and linear equations.				
8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	Graphs a proportional relationship given the unit rate (slope). Determines the unit rate from the graph of a proportional relationship. See 7.RP.A.2 for determining whether a relationship between two quantities is proportional. See 8.EE.B.6 for using "slope" vocabulary instead of unit rate.	Makes comparisons about two different proportional relationships represented in the same way (e.g., both graphs, both tables, both descriptions). Graphs a proportional relationship where the unit rate must be determined from information provided in the problem.	Makes comparisons about two different proportional relationships represented in two different ways.	Given a proportional relationship represented in one way, explains whether the proportional relationship meets a set of given criteria. May represent the relationship in a different way to justify the explanation.
8.EE.B.6 Use similar triangles to 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 b.	Determines the slope of a non-vertical line from its graph. See 8.EE.B.5 for using "unit rate" vocabulary instead of slope. See 8.F.B.4 for identifying and deriving equations of functions.	Uses points from the given graph of a non-vertical line through the origin to explain why $y = mx$ represents all points on the line passing through the origin with a slope m.	Uses points from a given graph of a line not passing through the origin to explain why the slope is the same between any two points on the line. Uses points from the given graph of a non-vertical line not passing through the origin to explain why $y = mx + b$ (b not equal to zero) represents all points on the line passing through a y-intercept (0, b) with slope m.	Explains why the slope is the same between any two points on a given graph of a line using similar triangles and the graph of the line.
8.EE.C Analyze and solve linear equations and pairs of simultaneous linear equations.				
8.EE.C.7 Solve linear equations in one variable.	See 8.EE.C.7a - 8.EE.C.7b.	See 8.EE.C.7a - 8.EE.C.7b.	See 8.EE.C.7a - 8.EE.C.7b.	See 8.EE.C.7a - 8.EE.C.7b.
8.EE.C.7a Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).	Determines the number of solutions for linear equations in one variable in the form $ax + b = c$ where a, b, and c are rational numbers. May include carrying out operations/properties that result in this form except distribution. See 8.EE.C.7b for determining the solutions value for equations with only one solution.	Determines the number of solutions for linear equations in one variable in the form $ax + b = ax + c$ or $ax + b = cx + d$ where a, b, c, and d are rational numbers. May include carrying out operations/properties except distribution that result in this form. Identifies linear equations in one variable with a specified number of solutions when distribution is not required.	Writes linear equations in one variable when given the criteria of having one solution, infinitely many solutions, or no solutions. Determines the number of solutions for linear equations in one variable when distribution is required. Identifies linear equations in one variable with a specified number of solutions when distribution is required.	Explains or justifies why a linear equation in one variable has one solution, infinitely many solutions, or no solution.

8.EE.C.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	Solves two-step linear equations with rational-number coefficients when the same variable appears on both sides of the equal sign (e.g., $6x = 2x - 8$). Solves equations with the variable on one side of the equation where adding, subtracting, factoring, and expanding linear expressions with rational coefficients on one side of the equation results in an equation in the form $px + q = r$, $px - q = r$, $p(x + q) = r$, and $p(x - q) = r$ where p, q, r, and x are rational numbers. See 8.EE.C.7a for equations with no solution or infinitely many solutions.	Solves multi-step linear equations (three or more steps) with rational-number coefficients when the same variable appears on both sides of the equal sign. The distributive property may be required or implied on at most one side of the equal sign (e.g., $4(x + 3) = 2x - 6$ or $4(x + 2) = 7x$).	Solves multi-step linear equations (three or more steps) with rational-number coefficients when the same variable appears on both sides of the equal sign and the distributive property is required or implied on both sides of the equal sign [e.g., $4(x + 3) - \frac{1}{5}(x) = 3(x - 4)$ or $3(x + 2) = 3(2x - 2)$].	Analyzes solutions to multi-step linear equations (three or more steps) with rational-number coefficients with the same variable appearing on both sides of the equal sign and the distributive property is required or implied on at least one side of the equal sign.
8.EE.C.8 Analyze and solve pairs of simultaneous linear equations.	Determines whether a system of two linear equations in two variables has one solution, infinitely many solutions, or no solution given their graph. Solves a system of two linear equations in two variables given their graphs. When writing/estimating coordinates from the graph are required, the solution needs to be a grid-line intersection of the provided graph. Coefficients and constants are rational numbers. Systems of equations can be solved algebraically with basic substitution or elimination.	Determines whether a system of two linear equations in two variables has one solution, no solution, or infinitely many solutions when both equations are provided in the same form, without their graphs (e.g., both in $y = mx + b$ form or both in $ax + by = c$ form). Solves a system of two linear equations in two variables given both equations in the form $y = mx + b$. Identifies a system of two linear equations in two variables that represents a real-world problem. Coefficients and constants are rational numbers. Systems of equations can be solved algebraically with basic substitution or elimination.	Determines whether a system of two linear equations in two variables has one solution, no solution, or infinitely many solutions when both equations are not in the same form (e.g., one in $y = mx + b$ form and one in in $ax + by = c$ form) or both graphs are not provided. Solves a system of two linear equations in two variables when both graphs are not provided or both equations are not in $y = mx + b$ form. Solves real-world problems, from a variety of cultural contexts, including those of Montana American Indians, that can be modeled by a given system of two linear equations in two variables. Coefficients and constants are rational numbers. Systems of equations can be solved algebraically with basic substitution or elimination.	Writes a system of two linear equations in two variables that represents a given real-world problem, from a variety of cultural contexts, including those of Montana American Indians. Given a solution and parameters, determines a system of two linear equations in two variables. Explains why the point of intersection for two graphs of an equation is a solution to both equations. Coefficients and constants are rational numbers. Systems of equations can be solved algebraically with basic substitution or elimination.
8.EE.C.8a 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.	See 8.EE.C.8.	See 8.EE.C.8.	See 8.EE.C.8.	See 8.EE.C.8.
8.EE.C.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.	See 8.EE.C.8.	See 8.EE.C.8.	See 8.EE.C.8.	See 8.EE.C.8.
8.EE.C.8c Solve real-world and mathematical problems from a variety of cultural contexts, including those of Montana American Indians, leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.	See 8.EE.C.8.	See 8.EE.C.8.	See 8.EE.C.8.	See 8.EE.C.8.
Functions (F)				
8.F.A Define, evaluate, and compare functions.				
8.F.A.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.	Identifies a relation as a function given its graph, a table or list of ordered pairs, or a mapping. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Identifies a relation as a function given its equation. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Graphs ordered pairs of a given function, including functions in the form $y = mx + b$. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Explains why a relation, presented in any format, is or is not a function. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.

8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.	Compares the *y*-intercepts of two linear functions represented in the same way when the *y*-intercepts can be directly determined from the given representations (e.g. equations in the form $y = mx + b$, graphs that show the intersection of the graphed line and the *y*-axis, tables containing an ordered pair where $x = 0$). Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Compares properties of two linear functions represented in the same way (e.g., both graphs, both tables, both descriptions, both equations), with at least one function being non-proportional. Properties may include slope, *y*-intercept and *x*-intercept. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Compares properties of two linear functions represented in different ways, with at least one function being non-proportional. Properties may include slope, *y*-intercept and *x*-intercept. Identifies a linear function when given distinguishing factors between it and another linear function represented in a different way, with at least one function being non-proportional. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Represents a linear function in a specified way (algebraically, graphically, numerically, tables/ordered pairs, verbally) when given distinguishing factors between it and another linear function represented in a different way, with at least one function being non-proportional. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.
8.F.A.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. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.	Identifies linear and nonlinear functions from their graphs. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Identifies linear equations in the form $y = mx + b$ as linear functions, including when $b = 0$. Identifies nonlinear functions from an equation. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Identifies linear and nonlinear functions from a table or list of ordered pairs. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Explains why a function is linear or nonlinear when given as graph, equation, or table/list of ordered pairs. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.
8.F.B Use functions to model relationships between quantities.				
8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	Determines the rate of change of a linear function from a verbal description of the function (e.g., two units left and up four units). Determines the rate of change and/or initial value from the graph of a linear function where the points $(0, y)$ and $(1, y)$ are easily read from the graph. Determines the meaning of variables in a given function in relation to its context. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Determines the rate of change and/or initial value of a linear function given two or more (x, y) values of the function in a table, list, or description. Determines the rate of change and/or initial value of a linear function from a graph where the point $(0, y)$ or the point $(1, y)$ is not easily read from the graph but other ordered pairs are. Identifies a function, in various forms, that models a linear relationship between two quantities. Includes interpreting rate of change and initial value in terms of its graph or a table of values. Includes identifying the equation that represents the function. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Writes a function to model a linear relationship between two quantities. Includes writing the equation that represents the function. Interprets the rate of change and initial value in terms of the context. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Analyzes the rate of change or initial value and/or use them to make a prediction. Coefficients and constants are rational numbers. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.

8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	Determines whether a section of a graph of a function is linear or nonlinear. Functions can include piecewise functions and/or discrete functions. Students will not be expected to write equations for piecewise functions. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Determines whether a graph is increasing or decreasing within specific intervals. Students will not be required to use/know formal interval notation. Functions can include piecewise functions and/or discrete functions. Students will not be expected to write equations for piecewise functions. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Determines the graph of a function that exhibits features described qualitatively. (mathematical context - not real-world) Determines a graph that models a description of a real-world situation. (Must include qualitative features. See 8.F.B.4 for interpreting rate of change and initial value in terms of its graph.) Identifies a real-world situation that could be modeled by a function represented by a graph. (Must include qualitative features. See 8.F.B.4 for interpreting rate of change and initial value in terms of its graph.) Functions can include piecewise functions and/or discrete functions. Students will not be expected to write equations for piecewise functions. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.	Explains/interprets qualitative features of a function in terms of the context. Creates a real-world situation that a function represented by a graph could model. Functions can include piecewise functions and/or discrete functions. Students will not be expected to write equations for piecewise functions. Understanding of function notation is not required. See HS.IF.A.1 for first use of function notation.
Geometry (G)				
8.G.A Understand congruence and similarity using physical models, transparencies, or geometry software.				
8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations from a variety of cultural contexts, including those of Montana American Indians.	See 8.G.A.1a - 8.G.A.1c.	See 8.G.A.1a - 8.G.A.1c.	See 8.G.A.1a - 8.G.A.1c.	See 8.G.A.1a - 8.G.A.1c.
8.G.A.1a Lines are taken to lines, and line segments to line segments of the same length.	Identifies a translation, rotation, or reflection of a line or a line segment on or off the coordinate plane. Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.	Identifies a transformation or sequence of transformations of a line or a line segment using rotations, reflections, and/or translations that preserves congruence on or off the coordinate plane. Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.	Uses a single translation, rotation, or reflection or sequence of translations, rotations, and/or reflections to create an image of a line or a line segment on or off the coordinate plane. Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.	Explains congruence properties, after rigid transformations on or off the coordinate plane, of the lines taken to lines or line segments taken to line segments (e.g., answers questions about the length, position, or orientation of a line segment after a rigid transformation). Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.
8.G.A.1b Angles are taken to angles of the same measure.	Identifies a translation, rotation, or reflection of an angle on or off the coordinate plane. Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.	Identifies a transformation or sequence of transformations of an angle on or off the coordinate plane using rotations, reflections, and/or translations that preserves congruence. Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.	Uses a single translation, rotation, or reflection or sequence of translations, rotations, and/or reflections on or off the coordinate plane to create an image of an angle. Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.	Explains congruence properties, after rigid transformations on or off the coordinate plane of angles taken to angles (e.g., answers questions about the degree measure, position, or orientation of an angle after a rigid transformation). Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.

8.G.A.1c Parallel lines are taken to parallel lines.	Identifies a translation, rotation, or reflection of parallel lines or parallel line segments. (May be on or off the coordinate plane. See 8.G.A.3 for formally defining coordinates.) Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center.	Identifies a transformation or sequence of transformations of parallel lines or parallel line segments using rotations, reflections, and/or translations that preserves congruence. (May be on or off the coordinate plane. See 8.G.A.3 for formally defining coordinates.) Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center.	Uses a single translation, rotation, or reflection or sequence of translations, rotations, and/or reflections to create an image of parallel lines or parallel line segments. (May be on or off the coordinate plane. See 8.G.A.3 for formally defining coordinates.) Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center.	Explains congruence properties, after rigid transformations on or off the coordinate plane, of parallel lines taken to parallel lines, and/or parallel line segments taken to parallel line segments (e.g., answers questions about the length, position, or orientation of a line segment after a rigid transformation). Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.3, for formally defining coordinates.
8.G.A.2 Understand 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.	Identifies two congruent figures from a set of figures. Given one figure, identifies a figure congruent to it from a list. May or may not be on a coordinate plane. Determines congruency among multiple figures with all side measures shown on the figures. Names which types of transformations preserve congruence. (May be on or off the coordinate plane. See 8.G.A.3 for formally defining coordinates.) Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center.	Determines one transformation (translation, rotation, or reflection) that exhibits the congruence between two given congruent figures. Determines congruency of two or more figures when shown multiple figures and not all required side lengths are labeled. Side lengths can be determined based on information given or from the diagram. (May be on or off the coordinate plane. See 8.G.A.3 for formally defining coordinates.) Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center.	Determines the series of transformations that maps one shape onto the other when given a congruent image and pre-image. Determines whether the image and pre-image are congruent when given a series of transformations. (May be on or off the coordinate plane. See 8.G.A.3 for formally defining coordinates.) Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center.	Explains/justifies how two different sequences of transformations can result in the same congruent figure. (May be on or off the coordinate plane. See 8.A.G.3 for formally defining coordinates.) Coordinates used for endpoints or vertices of pre-images on the coordinate plane are limited to integers. Units for translation are limited to integers. Rotations are limited to 90° increments with the origin as the center.
8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures from a variety of cultural contexts, including those of Montana American Indians, using coordinates.	Identifies a dilation of a geometric figure on or off the coordinate plane. All dilations are performed with respect to the origin on a coordinate grid. See 8.G.A.4 for connecting dilations to similarity.	Determines the effect of a translation or reflection on two-dimensional figures using coordinates, including but not limited to calculating coordinates before or after the transformation. Coordinates are limited to integers. Units for translation are limited to integers. See 8.G.A.2 for connecting translations and reflections to congruence.	Determines the effect of a rotation or dilation on two-dimensional figures using coordinates, including but not limited to calculating coordinates before or after the transformation. For one transformation, determine the type, magnitude, and direction based on the coordinates of the image and pre-image. Coordinates are limited to integers. Units for translation are limited to integers. Dilations are limited to using benchmark fractions or whole numbers other than 1 for the scale factor and with the origin as the center. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.2 for connecting translations, rotations, and reflections to congruence. See 8.G.A.4 for connecting dilations to similarity.	Determines the effect of multiple transformations on two-dimensional figures using coordinates, including but not limited to calculating coordinates before or after the transformation. Coordinates are limited to integers. Units for translation are limited to integers. Dilations are limited to using benchmark fractions or integers other than 1 or 0 for the scale factor, integers for the *x* - and *y* -coordinates, and with the origin as the center. Rotations are limited to 90° increments with the origin as the center. See 8.G.A.2 for connecting to congruence. See 8.G.A.4 for connecting to similarity.

8.G.A.4 Understand 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.	Identifies the outcome of a dilation on or off the coordinate plane as a similar figure to the pre-image. Names which types of transformations exhibit similarity. See 8.G.A.3 for formally defining coordinates.	Creates a similar figure on or off the coordinate plane using a dilation when the given scale factor is a benchmark fraction or whole number other than 1. Determines similarity of two or more figures on or off the coordinate plane when shown multiple figures with required side measures labeled. See 8.G.A.3 for formally defining coordinates.	Determines the series of transformations on or off the coordinate plane that maps one shape onto the other when given a similar image and pre-image. Determines whether an image and pre-image on or off the coordinate plane are similar when given a series of transformations. Identifies that the outcome of a dilation on or off the coordinate plane with a scale factor of 1 is a congruent figure. Determines similarity of two or more figures on or off the coordinate plane when shown multiple figures and not all required side lengths are labeled. Side lengths can be determined based on information given or from the diagram. See 8.G.A.3 for formally defining coordinates.	Compares transformations on or off the coordinate plane (translations, rotations, reflections, and dilations) and explains their effect on congruence and similarity. Must include reference to similarity. Explains or justifies why a series of transformations does or does not exhibit similarity (e.g., explain why two different sets of transformations on the same pre-image results in different images). See 8.G.A.3 for formally defining coordinates.
8.G.A.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. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	Identifies angle pairs by name when parallel lines are cut by a transversal (corresponding, alternate exterior, alternate interior, same side exterior, and same side interior) in a diagram. Identifies angles that are congruent when parallel lines are cut by a transversal. Identifies the sum of the angles of a triangle as 180°. Determines a single missing angle measure in a triangle when given a diagram and the other interior angle measurements are given numerically or as a right angle. Determines missing angle measures from two parallel lines cut by a single transversal when angle measurements are given numerically.	Determines a single missing angle measure in a triangle when the other interior angle measurements are given numerically or as a right angle without a diagram. Determines the measure of an exterior angle of a triangle given the adjacent interior angle or two non-adjacent interior angles when the angle measurements are given numerically. Determines missing angle measures from parallel lines cut by a transversal when three or more parallel lines and/or two or more transversals are involved and angles measurements are given numerically.	Determines the interior angles of a triangle given an exterior angle and one non-adjacent interior angle. Determines the value of one or more variables or the missing angle measures of a triangle when the angle measurements are given as algebraic expressions. Determines the value of one or more variables or the measure of an exterior angle of a triangle given the adjacent interior angle or two non-adjacent interior angles when the angle measurements are given as algebraic expressions. Determines the value of one or more variables or missing angle measures from parallel lines cut by a transversal when angle measurements are given as algebraic expressions. Determines angles in one triangle given a similar triangle.	Determines missing interior or exterior angles of figures with at least one pair of parallel sides by applying geometric properties of parallel lines cut by a transversal (e.g., use properties of parallel lines to determine the missing interior base angle of a trapezoid when given the corresponding angle). Determines the missing angle measure of a triangle when given angle characteristics of the triangle (e.g., determine the missing angles in an isosceles triangle when given the non-congruent angle).
8.G.A.5 continued			Determines informal arguments for facts about the angle sum and exterior angles of triangles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. Includes representing informal arguments with equations.	
8.G.B Understand and apply the Pythagorean Theorem.				
8.G.B.6 Explain a proof of the Pythagorean Theorem and its converse.	Identifies a proof of the Pythagorean Theorem. May include a variety of proving strategies (e.g., dissection, algebraic). Distinguish between the Pythagorean Theorem and its converse. When finding distance between two points, points should be represented on a coordinate grid.	Orders steps in a proof of the Pythagorean Theorem. Orders steps in a proof of the converse of the Pythagorean Theorem. When finding distance between two points, points should be represented on a coordinate grid.	Completes a proof of the Pythagorean Theorem Completes a proof of the converse of the Pythagorean Theorem. When finding distance between two points, points should be represented on a coordinate grid.	Explains a proof of the Pythagorean Theorem. Explains a proof of the converse of the Pythagorean Theorem. When finding distance between two points, points should be represented on a coordinate grid.

8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. For example, determine the unknown height of a Plains Indian tipi when given the side length and radius	Determines the length of the hypotenuse of a right triangle given the lengths of the two legs in a diagram (not the coordinate plane/grid) and all lengths are rational numbers. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares are greater than 625 and other than 1,000. See 8.G.C.8 for hypotenuse on the coordinate plane or a grid.	Determines the length of a leg of a right triangle given the length of the hypotenuse and the other leg in a diagram and all lengths are rational numbers. Determines the length of one side of a right triangle when given the lengths of the other two sides with a diagram and the missing length is an irrational number. Determines the length of one side of a right triangle when given the lengths of the other two sides without a diagram. The missing length may be a rational or irrational number. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares are greater than 625 and other than 1,000. When finding distance between two points, points should be represented on a coordinate grid.	Solves multi-step mathematical problems involving two-dimensional figures that require application of the Pythagorean Theorem with or without a diagram. Process must include steps before and/or after applying the Pythagorean Theorem. Solves real-world problems that require application of the Pythagorean Theorem in a two-dimensional figure. May be multi-step. Determines the length of a missing measurement (side or diagonal) in a three-dimensional figure with or without a diagram that requires application of the Pythagorean Theorem. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares and perfect cubes are greater than 625 and other than 1,000. When finding distance between two points, points should be represented on a coordinate grid.	Solves multi-step mathematical problems in three-dimensional figures that require application of the Pythagorean Theorem with or without a diagram. Process must include steps before and/or after applying Pythagorean Theorem. Solves real-world problems that require application of the Pythagorean Theorem in a three-dimensional figure. May be multi-step. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares and perfect cubes are greater than 625 and other than 1,000. When finding distance between two points, points should be represented on a coordinate grid.
8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	Given a right triangle on a grid, determines the length of the hypotenuse. May include context. Negative numbers should not be involved. When finding distance between two points, points should be represented on a coordinate grid. See 6.NS.C.8 for horizontal or vertical distances.	Given a right triangle on the coordinate plane, determines the shortest distance between the endpoints of the hypotenuse. May include context. Coordinates of points used may be rational numbers if provided. If only being read from the graph, coordinates should be integers. Negative numbers should not be involved. When finding distance between two points, points should be represented on a coordinate grid. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares are greater than 625 and other than 1,000.	Determines the shortest distance between any two given ordered pairs on the coordinate plane (non-vertical and non-horizontal). May include context. May be multi-step with steps before or after determining the distance. Coordinates of points used may be rational numbers if provided. If only being read from the graph, coordinates should be integers. When finding distance between two points, points should be represented on a coordinate grid. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares are greater than 625 and other than 1,000.	Determines coordinates of a point that is a specified distance at a diagonal to a given point. May include context [e.g., when given the point (1, 2) and a distance of 5 units, calculates the point (4, 6) or any other diagonal point 5 units from (1, 2)]. Compares distances among multiple points on the coordinate plane. At least one pair of points must be non-vertical and non-horizontal. Coordinates of points used may be rational numbers if provided. If only being read from the graph, coordinates should be integers. When finding distance between two points, points should be represented on a coordinate grid. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares are greater than 625 and other than 1,000.
8.G.C Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.				

8.G.C.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	Determines the volume of cones, cylinders, and spheres when given the height and the radius or diameter in a mathematical problem. No calculator is allowed for this standard.	Determines the volume of cones, cylinders, and spheres when given the height and the radius or diameter in a real-world problem. Determines which dimensions result in the desired volume when given the volume of a cone, cylinder, or sphere in real-world or mathematical problems. Compares the volumes of cones, cylinders, and spheres when given their dimensions in real-world or mathematical problems. Determines the radius, diameter, and/or circumference of a circle when given the area and the radius is less than or equal to 25. May include context. When finding distance between two points, points should be represented on a coordinate grid. Formulas are provided on the reference sheet. No calculator is allowed for this standard.	Determines the volume of cones, cylinders, and spheres when one or more steps are required to determine one or more dimensions in real-world or mathematical problems. Calculating the radius from the diameter or vice versa does not count as a step (e.g., given the volume of a cone and its height, find the volume of a cylinder with the same height and a radius that is 3 times as long). Determines the unknown dimension of a cone or cylinder when given the volume and another dimension in real-world or mathematical problems. Determines the radius or diameter of a cone, cylinder, or sphere when given the volume in real-world and mathematical problems. In problems that involve cones or spheres, the quantity next to the fraction 1/3 or 4/3 should be a multiple of 3. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares and perfect cubes are greater than 625 and other than 1,000. When finding distance between two points, points should be represented on a coordinate grid. No calculator is allowed for this standard.	Determines the volume of composite shapes involving cones, cylinders, and spheres in real-world and mathematical problems. Explains or justifies reasoning about a method for solving a real-world problem using volumes of cylinders, cones, and spheres. Answers may be written as non-simplified radicals if outside the limits of Grade 8. Perfect squares and perfect cubes are greater than 625 and other than 1,000. When finding distance between two points, points should be represented on a coordinate grid. No calculator is allowed for this standard.
Statistics and Probability (SP)				
8.SP.A Investigate patterns of association in bivariate data.				
8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	Identifies scatter plots that represent specific data.	Determines the pattern of data represented in a scatter plot as positive or negative associations. Determines when scatter plots are representing data that has no relationship. Determines clustering, outliers, linear, or non linear relationships from scatter plots.	Creates a scatter plot of given data, including determining the appropriate scale, labels, and which information belongs on the *x* - or *y* -axis when appropriate (may include context).	Makes general predictions about continued data collection based on patterns in collected bivariate data. Evaluates or critiques predictions that are based on the trend of the data in a scatter plot. Explains why a scatter plot fits a given real-world scenario or description of data (or trend) (e.g., given a real-world scenario, identify the scatter plot that is appropriate). The scenario does not include providing ordered pairs in any format.
8.SP.A.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.	Identifies which straight line drawn on a scatter plot best represents the data. Includes use of the term "line of best fit." See 8.EE.B.5 for comparing two proportional relationships.	Identifies which straight line described by a given equation best represents the data. Given lines must have different slopes. Includes the term "line of best fit."	Places a straight line on a scatter plot that closely fits the points. Describes how well one line fits the data in a scatter plot based on the closeness of the data points to the line. Includes use of the term "line of best fit."	Evaluates and explains why one line better fits the data than another. Includes use of the term "line of best fit."

8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height	Makes a prediction for a given value when the line of best fit is graphed on the scatter plot and the equation for the line of best fit is given.	Solves problems about what the slope or intercept of the line of best fit means within the context of the data when the line of best fit is graphed on the scatter plot and its equation is given. Must require interpreting the slope or intercept within the context. Makes a prediction about the *y* -value for a given *x* -value (or corresponding value based on the context) when the line of best fit graphed on the scatter plot but an equation of the line of best fit is not given. Makes a prediction about the *y* -value for a given *x* -value (or corresponding value based on the context) when the equation of the line of best fit is given but the line is not graphed.	Solves problems about what the slope or intercept of the line of best fit means within the context of the data when the line of best fit is graphed on the scatter plot but its equation is not given. Must require interpreting the slope or intercept within the context. Solves problems about what the slope or intercept of the line of best fit means within the context of the data when the equation of the line of best fit is given but the line is not graphed. Must require interpreting the slope or intercept within the context. Makes a prediction about the *x* -value for a given *y* -value (or corresponding value based on the context) when the line of best fit is graphed but an equation of the line not given. Makes a prediction about the *x* -value for a given y-value (or corresponding value based on the context) when the equation of the line of best fit given but the line is not graphed.	Writes a linear equation that models a set of bivariate data using two reasonable points from the scatter plot or list of data. Justifies or critiques predictions that are based on the line of best fit. Makes a reasonable prediction about the *y* -value for a given *x* -value and vice versa or about the *x* -value for a given *y* -value (or corresponding values based on the context) given the scatter plot but no line or equation.
8.SP.A.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. Construct and interpret a two-way table summarizing data including data from Montana American Indian sources on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	Completes the relative frequency for a single event in an otherwise completed two-way relative frequency table summarizing data, including data from Montana American Indian sources, on two categorical variables collected from the same subjects. See 8.EE.B.5 for comparing two proportional relationships.	Completes a partially filled-in two-way frequency or relative frequency table summarizing data, including data from Montana American Indian sources, on two categorial variables collected from the same subjects. Table must have two or more missing values. Uses information from a frequency or relative frequency table by row or column to answer specific questions about the data.	Constructs a frequency or relative frequency table to summarize data, including data from Montana American Indian sources, on two categorial variables collected from the same subjects.	Interprets frequency or relative frequency tables to describe possible associations between the two categorial variables that cannot be read directly from the table. Explains or justifies statements based on frequency or relative frequency tables on two categorical variables collected from the same subjects.