

Mathematics Content Assessed by PAWS

GRADE 8

Wyoming Content Standard 1. Number Operations and Concepts		
Skill 1. Understand the meaning of arithmetic operations and make reasonable estimates.		
Benchmark	Where in CCSS	Content Limits:
<p>08.1.1 Students represent and apply numbers in a variety of equivalent forms (such as changing from percent to decimal to fraction, etc.) and in a problem-solving context:</p> <ul style="list-style-type: none"> • prime factors, factors, and multiples; • rational numbers and proportions; and • square roots and powers. 	<p>N1 is embedded in N2 and N3.</p>	
<p>08.1.3 Students explain their choice of estimation and problem solving strategies and justify results of solutions in problem-solving situations involving rational numbers.</p>		

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Scoring Rubrics

Wyoming Content Standard 1. Number Operations and Concepts		
Skill 2. Understand ways to represent numbers, relationships among numbers, and number systems.		
Benchmark	Where in CCSS	Content Limits:
<p>08.1.1 Students represent and apply numbers in a variety of equivalent forms (such as changing from percent to decimal to fraction, etc.) and in a problem-solving context:</p> <ul style="list-style-type: none"> • prime factors, factors, and multiples; • rational numbers and proportions; and • square roots and powers. 	<p>4.OA.4 (Find all factor pairs ... Determine...a number is prime or composite) 4.NF.2 (Compare two fractions with different numerators and different denominators,...) 6.EE.1 (Write and evaluate numerical expressions involving whole-number exponents) 6.RP.3 (Find a percent of a quantity...) 7.RP.3 (Use proportional relationships to solve multistep ratio and percent problems....) 8.EE.2 (Use square root and cube root symbols to . . .)</p>	<ul style="list-style-type: none"> • Items may compare and order fractions, decimals, integers, numbers with exponents, numbers expressed as percents, radicals, and ratios. • The data presented to students may be either precise values, a range of values, or a combination of precise values and estimates of other values. • Items may compare smaller or larger numbers, or compare the order of magnitude between numbers. Square roots must have radicands less than or equal to 1000. • Items may include the relationships among fractions, decimals, or numbers expressed as percents, given a real-world context. The place values of the fractional part of decimal numbers should range from tenths through ten-thousandths. • Words, number lines, drawings, numerals, or symbols (<, >, =, π, \leq, \geq) may be used. • Items may utilize one format or a variety of formats, such as fractions, decimals, and percents. • Items may ask for answers to be rounded to the nearest percent, whole number, dollar, cent, etc. as appropriate. • Items may include the conversion among fractions, decimals, or numbers expressed as percents. • Absolute values should not be assessed. • When multiple numbers are compared in the answer options, no more than four numbers may be compared in each option. • Items may contain multiple forms of a given value. • Items will not include repeating decimals. • Some items should include word names as well as numerals. • Items should be set in either a real-world or mathematical context. • CR items may have students "Show your work or explain your
<p>08.1.2 Students extend understanding and use of basic arithmetic operations on rational numbers.</p>	<p>7.NS.1 (Addition and subtraction of rational numbers...) 7.NS.2 (Multiplication and division of rational numbers...) 7.NS.3 (Solve real-world and mathematical problems involving the four operations with rational numbers.)</p>	<ul style="list-style-type: none"> • Items may compare and order fractions, decimals, integers, numbers with exponents, numbers expressed as percents, radicals, and ratios. • The data presented to students may be either precise values, a range of values, or a combination of precise values and estimates of other values. • Items may compare smaller or larger numbers, or compare the order of magnitude between numbers. Square roots must have radicands less than or equal to 1000. • Items may include the relationships among fractions, decimals, or numbers expressed as percents, given a real-world context. The place values of the fractional part of decimal numbers should range from tenths through ten-thousandths. • Words, number lines, drawings, numerals, or symbols (<, >, =, π, \leq, \geq) may be used. • Items may utilize one format or a variety of formats, such as fractions, decimals, and percents. • Items may ask for answers to be rounded to the nearest percent, whole number, dollar, cent, etc. as appropriate. • Items may include the conversion among fractions, decimals, or numbers expressed as percents. • Absolute values should not be assessed. • When multiple numbers are compared in the answer options, no more than four numbers may be compared in each option. • Items may contain multiple forms of a given value. • Items will not include repeating decimals. • Some items should include word names as well as numerals. • Items should be set in either a real-world or mathematical context. • CR items may have students "Show your work or explain your

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		answer.” <ul style="list-style-type: none">• Graphics should be used in some of these items, as appropriate.
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Wyoming Content Standard 1. Number Operations and Concepts		
Skill 3. Develop the connection between conceptual understanding and computational proficiency.		
Benchmark	Where in CCSS	Content Limits:
<p>08.1.1 Students represent and apply numbers in a variety of equivalent forms (such as changing from percent to decimal to fraction, etc.) and in a problem-solving context:</p> <ul style="list-style-type: none"> • prime factors, factors, and multiples; • rational numbers and proportions; and • square roots and powers. 	<p>5.NBT.7 (Add, subtract, multiply, and divide decimals (only to hundredths). . .) 6.EE.2 (...Perform arithmetic operations including...whole number exponents...(Order of Operations)) 7.NS.1 (Addition and subtraction of rational numbers...) 7.NS.2 (Multiplication and division of rational numbers...) 7.NS.3 (Solve real-world and mathematical problems involving the four operations with rational numbers.) 8.EE.1,2 (Know and apply the properties of integer exponents . . . Use square root and cube root symbols . . .)</p>	<ul style="list-style-type: none"> • Items will include the effects of the four basic operations on integers, fractions, mixed numbers, and decimals, and the use of properties of real numbers to solve problems (commutative, associative, distributive, identity, equality, and the inverse relationship of rational numbers). • Items may include the conversion among fractions, decimals, or numbers expressed as percents. • Items can use positive fractions with no more than two-digit numerators and denominators or decimals less than ten-thousandths. • Items may provide expressions of rational numbers in exponential notation. • Expressions may include parentheses, exponents, multiplication, division, addition, and/or subtraction. • Items should use whole numbers with no more than two digits and exponents no larger than five. • Items may include rational expressions. • Items may include problems dealing with percents used to find sales tax, discount, simple interest, and percent increase or decrease using whole numbers, fractions, and decimals. • Items may ask for answers to be rounded to the nearest percent, whole number, dollar, cent, etc. as appropriate • Items should be set in either a real-world or mathematical context • CR items may have students "Show your work or explain your answer." • Item contexts may require students to make an estimate and not to calculate an exact amount
<p>08.1.4 Students understand properties of operations with rational numbers.</p>	<p>7.NS.1 (Addition and subtraction of rational numbers...) 7.NS.2 (Multiplication and division of rational numbers...) 7.NS.3 (Solve real-world and mathematical problems involving the four operations with rational numbers.)</p>	

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<p>08.1.3 Students explain their choice of estimation and problem solving strategies and justify results of solutions in problem-solving situations involving rational numbers.</p>	<p>7.EE.3 (Solve . . .l problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals),. . . .assess the reasonableness of answers using mental computation and estimation strategies.) Core Practice #6</p>	
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Wyoming Content Standard 2. Geometry		
Skill 1. Specify locations and describe spatial relationships using coordinate geometry and other representational systems.		
Benchmark	Where in CCSS	Content Limits:
<p>08.2.1 Students classify and describe one-, two-, and three-dimensional geometric objects, including:</p> <ul style="list-style-type: none"> • lines, rays, segments, and angles; • parallel and perpendicular relationships; • circles and spheres; • regular polygon types; • right prisms, cylinders, cones, and pyramids. 	<p>4.G.1 (Draw points, lines, line segments, rays,...perpendicular and parallel lines...) 4.G.2 (Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines...) 6.G.4 (Represent three-dimensional figures using nets ...) 7.G.5 (Use facts about supplementary, complementary, vertical,...) 8.G.5 (Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal . . .)</p>	<ul style="list-style-type: none"> • Items will assess identifying basic properties of lines and angle relationships (including complementary, supplementary, and vertical angles). • Items may assess understanding and application of perpendicularity and parallelism including congruent angles formed when a transversal intersects parallel lines. • Items will assess attributes of regular and irregular polygons, and three-dimensional figures represented as flat patterns/nets or isometric drawings. • Items utilizing cones and pyramids should include the slant height if possible. • Items may assess grade-level appropriate applications of the Pythagorean Theorem. • Items should be set in a real-world or mathematical context. • Graphics should be used in all of these items. • CR items may have students “Show your work or explain your answer.” • Rectangular coordinate planes should be used in some items.
<p>08.2.3 Students use geometric formulas including the Pythagorean Theorem.</p>	<p>8.G.6 – 8.G.8 (Explain a proof of the Pythagorean Theorem . . . Apply the Pythagorean Theorem to determine unknown side lengths . . . Apply the Pythagorean Theorem to find the distance between two points . . .)</p>	
<p>08.2.4</p>	<p>5.G.3 (Understand that</p>	

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Students communicate the reasoning used in identifying geometric relationships in problem-solving situations appropriate to grade level.	attributes belonging to a category of two-dimensional...) 5.G.4 (Classify two-dimensional figures in a hierarchy...) Core Practice #6	
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Wyoming Content Standard 2. Geometry		
Skill 2. Analyze characteristics and properties of two- and three-dimensional geometric shapes.		
Benchmark	Where in CCSS	Content Limits:
No Benchmarks for this Skill	Not Assessed at this Grade	----

Wyoming Content Standard 2. Geometry		
Skill 3. Apply transformations and use symmetry to analyze mathematical situations.		
Benchmark	Where in CCSS	Content Limits:
<p>08.2.2 Students make conjectures about geometric objects based on knowledge of geometric transformations, congruence, and similarity.</p>	<p>8.G.1 – 8.G.4 (. . . properties of rotations, reflections, and translations: . . . Understand that a two-dimensional figure is congruent to another if . . . Describe the effect of dilations, translations, rotations, and reflections . . . Understand that a two-dimensional figure is similar to another if . . .)</p>	<ul style="list-style-type: none"> Items may assess properties and relationships pertaining to regular two-dimensional shapes, and the concepts of symmetry, congruency, similarity, and transformations including reflections and translations. Items may assess understanding and application of symmetry, congruency, and similarity. Three-dimensional figures in a coordinate system will not be assessed. Verification and explanation of geometric properties. Rectangular coordinate planes should be used in most of these items. Items may be set in either real-world or mathematical contexts. CR items may have students “Show your work or explain your answer.” Graphics should be used in most of these items, as appropriate
<p>08.2.4 Students communicate the reasoning used in identifying geometric relationships in problem-solving situations appropriate to grade level.</p>	<p>8.G.2 – 8.G.4 (See above) Core Practice #6</p>	

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Wyoming Content Standard 3. Measurement		
Skill 1. Understand measurable attributes of objects and the units, systems, and processes of measurement.		
Benchmark	Where in CCSS	Content Limits:
<p>08.3.1 Students apply estimation and measurement of weight/mass to content problems and convert within U.S. customary and within metric units (mg, g, kg).</p>	<p>4.MD.1 (Know relative sizes of measurement units within one system of units...) 4.MD.2 (Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses,...) 5.MD.1 (Convert among different-sized standard measurement units...) 6.RP.3 (Use ratio reasoning to convert measurement units; ...)</p>	<ul style="list-style-type: none"> • Items may assess finding linear measure, weight, capacity, time, and/or temperature. • Items involving derived measures should not be limited to time/distance problems, but should include other derived measures. • Items may require students to demonstrate knowledge of proportional relationships in scale drawings or solve real-world problems, including distance, using a scale drawing. • Measurements may be in either metric or customary units. • Items should involve interpreting and applying various scales including those based on number lines, graphs, models, and maps. • Scales should use only rational numbers. • All conversions of units must be within the same system of measurement (metric or customary). • Items may involve mixed units within each system, such as converting hours and minutes to seconds. • Items will assess identifying basic properties of angle relationships (including complementary, supplementary, and vertical angles). • Items should be set in either a real-world or mathematical context. • CR items may have students “Show your work or explain your answer.” • Graphics should be used in most of these items, as appropriate.
<p>08.3.2 Students apply estimation and measurement of capacity/volume to content problems and convert within metric units (ml, l).</p>	<p>4.MD.2 (Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses,...) 5.MD.1 (Convert among different-sized standard measurement units)</p>	
<p>08.3.3 Students select and use the appropriate methods, tools, and units to solve problems involving angle measure, perimeter, circumference, area (including circles), and volume of rectangular solids.</p>	<p>6.G.1 (Find the area of right triangles, other triangles, special quadrilaterals, and polygons. . .) 6.G.2 (Find the volume of a right rectangular prism. . .) 7.G.1 (Solve problems involving scale drawings...) 7.G.4 (Know the formulas for</p>	

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	the area and circumference of a circle. . .) 7.G.5 (Use facts about supplementary, complementary, vertical,...)	
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Wyoming Content Standard 3. Measurement		
Skill 2. Apply appropriate techniques, tools, and formulas to determine perimeter, area or volume.		
Benchmark	Where in CCSS	Content Limits:
<p>08.3.3 Students select and use the appropriate methods, tools, and units to solve problems involving angle measure, perimeter, circumference, area (including circles), and volume of rectangular solids.</p>	<p>6.G.4 (Represent three-dimensional figures using nets ... to find surface area) 7.G.1 (Solve problems involving scale drawings of geometric figures...) 7.G.4 (Know the formulas for the area and circumference of a circle...) 7.G.6 (Solve real-world and mathematical problems involving area, volume and surface area...) 8.G.9 (Know the formulas for the volumes of cones, cylinders, and spheres and use them to . . .)</p>	<ul style="list-style-type: none"> • Items may assess finding perimeter, area, circumference, surface area, and/or volume. • Items may include circumference and area of circles in terms of • Items may require isolation of a dimension from a perimeter or area problem. • Short-response items may use graphic models to derive formulas for surface area and volume of three-dimensional regular shapes. • Items may assess how a change in a figure's dimensions affects its perimeter (including circumference), area, surface area, or volume, or how changes in the volume, surface area, area, or perimeter of a figure affect the dimensions of the figure. • Items utilizing cones and pyramids should include the slant height if possible. • The changes in dimensions of a figure that are increases should use scale factors that are whole numbers. • Changes in figures involving volume should be based primarily on rectangular prisms. • The number of two- or three-dimensional figures assessed in an item should not exceed two. • Items requiring three-dimensional graphics must be realistic and must include verbal descriptions. • Items may include composite figures. • Items should be set in a real-world context. • CR items may have students "Show your work or explain your answer." • Graphics should be used in most of these items, as appropriate.

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Wyoming Content Standard 4. Algebra		
Skill 1. Understand patterns, relations, and functions.		
Benchmark	Where in CCSS	Content Limits:
<p>08.4.2 Students solve one- and two- step linear equations each with an integer coefficient and integer solutions.</p>	<p>8.EE.7 (Solve linear equations in one variable . . .)</p>	<ul style="list-style-type: none"> • Items should not use more than one variable or include more than two operations. • Items may include evaluating expressions using integer values for the variables. • Non-linear relationships may be used to assess the order of operations and/or to evaluate formulas. • Items will use tables and graphs as well as words to state patterns. • Items may include graphic representations of a pattern, sequence, relationship, or function to present cause-and-effect relationships. • Items may be set in either a real-world or mathematical context. • CR items may have students “Show your work or explain your answer.” • Graphics should be used in some of these items, as appropriate.
<p>08.4.3 Students evaluate algebraic expressions and formulas given integer values for variables.</p>	<p>6.EE.1 (Write and evaluate numerical expressions ...) 6.EE.2 (Write, read, and evaluate expressions in which letters stand for numbers...)</p>	

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Wyoming Content Standard 4. Algebra		
Skill 2. Use mathematical models to represent and understand quantitative relationships.		
Benchmark	Where in CCSS	Content Limits:
<p>08.4.1 Students translate word phrases, which involve the four basic operations to mathematical expressions.</p>	<p>6.EE.9 (Use variables to . . . write an equation to express one quantity, . . . , in terms of the other quantity, . . . using graphs and tables, and relate these to the equation.) 7.EE.4 (Use variables to represent quantities in real-world or mathematical problem, and construct simple equations...) 8.F.4 – 8.F.5 (Construct a function to model a linear relationship between two quantities. . . . Describe qualitatively the functional relationship between two quantities by analyzing a graph . . .)</p>	<ul style="list-style-type: none"> • Items should include no more than two variables and no more than two operations. • Values in expressions should be rational numbers. • Objects or points on the coordinate grid should be placed on the points of intersection of the grid lines. • MC items should rely primarily on translating among written descriptions, expressions, equations, and graphic representations. • In items that contain equations, the equation should be linear. • Items may be presented on a coordinate plane. • Items can be assessed in all four quadrants. • Items may assess the slope of lines (including the slope of vertical and horizontal lines) and determine the y-intercept of a line. • Items should be set in a real-world or mathematical context. • CR items may have students “Show your work or explain your answer.” • Graphics should be used in some of these items, as appropriate.
<p>08.4.4 Using simple linear equations, students create a table, and graph the solutions on the coordinate system.</p>	<p>6.NS.6 (...find and position pairs of integers and other rational numbers on a coordinate plane.) 6.NS.8 (Solve real-world...by graphing points in all four quadrants of the coordinate plane.) 8.EE.5 – 8.EE.6 (Graph proportional relationships, interpreting the unit rate as the slope of the graph. . . . Use similar triangles to</p>	

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	explain why the slope m is. .)	
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Wyoming Content Standard 5. Data Analysis and Probability		
Skill 1. Collect, organize, and display relevant data to answer questions and use appropriate statistical methods to analyze the data.		
Benchmark	Where in CCSS	Content Limits:
<p>08.5.1 Students systematically collect, organize, describe, analyze, and represent data using tables, charts, diagrams, and graphs.</p>	<p>3.MD.3 (Draw a scaled picture graph and a scaled bar graph to represent ...) 6.SP.1—6.SP.5 (Recognize, use, and summarize statistical data ...) 8.SP.1 (Construct and interpret scatter plots for bivariate . . .)</p>	<ul style="list-style-type: none"> • Items may include pictographs, charts, stem-and-leaf plots, scatter plots, data tables, circle graphs, single- and multiple-bar graphs, and single- and multiple-line graphs, and Venn diagrams, and histograms. • Items will assess finding the range, mean, median, or mode of a set of data presented in a chart, table, graph, or plot (e.g., scatter plot, stem-and-leaf plot or line plot). • No more than 12 sets of data are to be displayed. • Items that assess understanding of these concepts may ask students to draw conclusions from an analysis of range and/or central tendency measures. • No more than 12 pieces of data should be used for calculations of the mean. • Data contained in these items need not be ordered. • CR items may have students “Show your work or explain your answer.” • Graphics should be used in most of these items, as appropriate. • Items should be set in a real-world context.
<p>08.5.2 Students calculate mean, median, mode, and range for data sets and use in a real-world setting appropriate to grade level.</p>	<p>6.SP.1—6.SP.5 (Recognize, use, and summarize statistical data ...) 7.SP.4 (Use measures of center and measures of variability for numerical data....)</p>	

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Wyoming Content Standard 5. Data Analysis and Probability		
Skill 2. Develop and evaluate inferences and predictions that are based on data.		
Benchmark	Where in CCSS	Content Limits:
<p>08.5.3 Students predict, compare, and calculate probable outcomes of experiments or simulations.</p>	<p>7.SP.5 – 7.SP.8 (Understand ... predict ...develop probability models ...find probability...)</p>	<ul style="list-style-type: none"> • Items may include probabilities for independent and dependent events. • Mathematical expectations of probabilities will be assessed using empirical data or theoretical probabilities. • Most items developed for this context should assess simple events. • Compound events are limited to independent occurrences. • Items assessing compound events should not exceed 36 outcomes (e.g. a pair of number cubes) in a sample space. • Probabilities should be based on whole numbers, fractions, or decimals, and should not include negative numbers. • Items should be set in a real-world context. • Students may be presented with word problems and/or tables. • CR items may have students “Show your work or explain your answer.” • Graphics should be used in most of these items, as appropriate.
<p>08.5.4 Students communicate about the likelihood of events using concepts from probability such as impossible, equally likely and certain appropriate to grade level.</p>	<p>7.SP.5 – 7.SP.8 (See above) Core Practice #6</p>	