Montana Instructional Alignment
HPS Critical Competencies
Mathematics
Eighth Grade

Content Standards

Content Standard 1 - Number Sense and operations:

A student, applying reasoning and problem solving, will use number sense and operations to represent numbers in multiple ways, understand relationships among numbers and number systems, make reasonable estimates and compute fluently within a variety of relevant cultural contexts.

Content Standard 2 - Data Analysis:

A student, applying reasoning and problem solving, will use data representation and analysis, probability, statistics and statistical methods to evaluate information and make informed decisions within a variety of relevant cultural contexts.

Content Standard 3 - Geometric Reasoning:

A student, applying reasoning and problem solving, will understand geometric properties and spatial relationships, transformation of shapes, representational systems, spatial reasoning and geometric models to analyze mathematical situations within a variety of relevant cultural contexts.

Content Standard 4 - Algebraic and Functional Reasoning:

A student, applying reasoning and problem solving, will use algebraic and functional concepts and procedures to understand patterns, quantitative and functional relationships, algebraic representations, models and change within a variety of relevant cultural contexts.

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Content Standard 1 -	**Number Sense and operations:** A student, applying reasoning and problem solving, will use number sense and operations to represent numbers in multiple ways, understand relationships among numbers and number systems, make reasonable estimates and compute fluently within a variety of relevant cultural contexts.

Essential Learning Expectations (ELE's / Critical Competencies) should be addressed in contexts that promote problem solving, reasoning, communication, making connections, and designing and analyzing representations. – *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics – NCTM – National Council for Teachers of Mathematics*

State Established Benchmark At the end of 8th grade, a proficient student will:	**OPI Essential Learning Expectation** (ELE) *(HPS Critical Competencies)*	**NCTM**	**Assessment Statements** *(Specific Examples)*	**Vocabulary** *(for instructional purposes)*
1.1 **Number Theory**: Apply number theory concepts (e.g. primes, factors, and multiples) in mathematical problem situations.				
1.2 **Estimation**: Select and apply appropriate estimation strategies to measure, compute, and judge results in terms of reasonableness and accuracy. (E.g., estimate an irrational number using the square roots of perfect square numbers.)				
1.3 **Rational Numbers:** Recognize relationships among different representations of rational numbers and identify, compare and order rational numbers as well as common irrational numbers.	• Compute with rational numbers • Fluency in fractions operations		• -6 – 4 • $2\frac{1}{4}+3\frac{5}{6}$	rational numbers, irrational numbers
1.4 **Rational Number Operations:** Compute fluently and solve multi-step problems using integers, fractions, decimals, percents, and numbers in exponential form.	• Order of operations including parentheses and brackets • Solve 2-step equations	• Analyzing and representing linear functions and solving 2-step linear equations	• Solve $\frac{x}{7}+8=12$ • $3(2+6)+[4(19-12)+4]$	commutative, associative, distributive, identity
1.5 **Proportional Reasoning:** Understand and apply proportional relationships and solve problems involving rates, ratios, proportions, and percents.	• Basic applications of proportions and percents. • Use proportions to solve real-world problems.		• Find 25% of $250.00 • Given a scale 2 to 1, find the dimensions of a room that is 36ft. X 33 ft.	proportion, ratio
1.6 **Measurement:** Demonstrate an understanding of measurable attributes of objects, and the units, systems, and processes of measurement within relevant cultural contexts.				

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Content Standard 2 - **Data Analysis:**
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State Established Benchmark **At the end of 8th grade, a proficient student will:**	**OPI Essential Learning Expectation** (ELE) ***(HPS Critical Competencies)***	**NCTM**	**Assessment Statements** ***(Specific Examples)***	**Vocabulary** ***(for instructional purposes)***
2.1 **Represent Data**: Collect, organize and represent data (e.g. box plots, histograms, scatter plots, circle graphs) in culturally relevant contexts.	• Display and organize data using graphs	• Analyze and summarize data sets	• Given a set of data, determine the appropriate display, intervals, scale and graph the data using bar gram, circle graph, and stem-and-leaf plot.	frequency chart, line of best fit
2.2 **Evaluate Data:** Interpret, analyze, and evaluate data to make decisions and predictions (e.g. trends in data)				mean, median, mode, range, stem-and-leaf plot, scatter plot
2.3 **Descriptive Statistics:** Compute and apply mean, median, mode, and range to compare and describe data.		• Analyze and summarize data sets	• Find the mean, median, mode, range and draw a stem-and-leaf plot for 6, 5, 28, 9, 6, 5, 58, 43, 5.4, 8.9, 12.4, 6.3	
2.4 **Probability:** Using real-life contexts or simulation create sample spaces, determine experimental and theoretical probabilities (e.g. using tree diagrams), and make predictions.	• Construct a sample space, compare and contrast permutations and combinations, and theoretical and experimental probability		• Find the odds of rolling a prime number on a standard die. • Find the probability of rolling a prime number on a standard die.	odds, combinations, permutations, equally likely

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Content Standard 3 - **Geometric Reasoning:**
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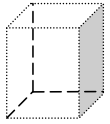
State Established Benchmark **At the end of 8th grade, a proficient student will:**	**OPI Essential Learning Expectation** (ELE) ***(HPS Critical Competencies)***	**NCTM**	**Assessment Statements** ***(Specific Examples)***	**Vocabulary** ***(for instructional purposes)***
3.1 **Properties**: Define, classify, and compare properties of solids and plane figures, including angles.	• Identify, describe, construct, and compare plane and solid geometric figures.		• Name the solid shown. State the number of faces, vertices, edges, and draw from a different perspective 	solid, formula
3.2 **Relationships**: Determine congruence, similarity, and symmetry of objects in mathematics and in the contexts of art, science, and culture.				
3.3 **Transformations**: Define, identify, and apply transformations (e.g. translations, rotations, reflections, dilations) on the coordinate plane).				
3.4 **Measurement**: Select appropriate metric or standard units and formulas to measure and compute angles, perimeter, area, surface area, and volume.	• Find volume of pyramids, prisms, cylinders, and cones. • Use formulas for area, perimeter, and circumference of 3 and 4-sided geometric figures and circles		• Find the volume of a cylinder whose diameter is 6 inches and height is 10 inches. • Find the area of a rectangle whose base is 6 cm and height is 8 cm.	radius, diameter, circumference
3.5 **Justification:** Develop informal arguments to verify geometric relationships (e.g. Pythagorean Theorem) and solve problems.				

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Content Standard 4 - **Algebraic and Functional Reasoning:**
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4.1 **Patterns**: Create and use tables, graphs, words, and symbols/variables to represent, analyze, and generalize a variety of patterns.				
4.2 **Equivalence**: Recognize, simplify, and generate equivalent forms for algebraic expressions.				
4.3 **Solving**: Use number properties and inverse operations to solve single-variable equations and inequalities.	• Solve 2-step equations • Graph simple linear equations		• Graph $y = 3x - 1$	equation of a line, linear relationship, simplify an expression, value of an expression
4.4 **Function**: Identify linear and non-linear functional relationships and contrast their properties from tables, graphs, or equations.				
4.5 **Modeling:** Identify and compute rate of change/slope and intercepts from equations, graphs, and tables; model and solve contextual problems involving linear proportions.	• Use a coordinate plane to represent equations and solve problems		• Make a table and graph the equation $y = 2x - 4$ (where m and b are whole numbers) • Use slope intercept form to graph the equation $y - 7 = 4x$	slope, y-intercept, x-intercept, linear equations, origin, y=mx+b, slope, intercept, form