Montana Instructional Alignment
HPS Critical Competencies
Mathematics
Sixth 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.	• Square and cube single digit numbers • Distinguish between prime and composite numbers • Distinguish between factors and multiples of whole numbers		• $4^2 = 16$ • $2^3 = 8$ • Prime numbers = 2,3,5,29 • Composite numbers – 4,6,8,9 • Factors of 4 = 1. 2. 4 • Multiples of 4 = 4, 8, 12, 16…	prime, composite factors, multiples, exponents, squared, cubed
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.)	• Estimation Strategies: a. Rounding b. Front-end estimation c. Compatible #5 d. Clustering e. Patterns		• $89.6 + 13.1 \approx 90 + 13 = 103$ • $1{,}438 + 2{,}962 \approx 1{,}400 + 2{,}900 = 4{,}300$ • $6{,}391 \div 72 \approx 6{,}300 \div 70 = 90$ • $202 + 198 + 210 + 189 \approx 200 \times 4 = 800$ • $4{,}000 \times 6{,}000 = 24{,}000{,}000$	
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.	• Comparing and ordering decimals:	• Developing an understanding of fluency with multiplication and division of decimals.	• $0.5 > 0.45$ • 1.2, 1.21, 2.1, 2.21	sum, difference, product, quotient, dividend, divisor
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 with whole numbers using all steps including parenthesis and exponents. • Make equivalent fractions, compare, and order fractions. • Add and subtract fractions with like denominators. • Fluency in decimal calculations to ten-thousandths place.		• $3^2 + 18 \div 2 - (6 + 4) = 8$ • $\frac{3}{4} = \frac{6}{8} = \frac{9}{12}$ • $\frac{1}{4}, \frac{1}{2}, \frac{2}{3}$ • $\frac{4}{11} + \frac{3}{11} = \frac{7}{11}$ • 8.2 X 2.65 = 21.730	equivalent fractions, numerator, denominator, proper fraction, improper fraction, mixed number
1.5 **Proportional Reasoning:** Understand and apply proportional relationships and solve problems involving rates, ratios, proportions, and percents.				
1.6 **Measurement:** Demonstrate an understanding of measurable attributes of objects, and the units, systems, and processes of measurement within relevant cultural contexts.	• Estimate and accurately use measurements in both metric and standard systems.		• Measure line segment to the nearest millimeter.	meter, gram, liter, metric system, customary system

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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.

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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.	• Collect, organize and describe data		• Students can draw accurate conclusions by examining a graph.	bar graph, line graph, line plot, stem and leaf plot, frequency table, pictograph
2.2 **Evaluate Data:** Interpret, analyze, and evaluate data to make decisions and predictions (e.g. trends in data)	• Construct various graphs and tables		• Accurately construct and interpret graphs and tables.	
2.3 **Descriptive Statistics:** Compute and apply mean, median, mode, and range to compare and describe data.	• Compute mean, median, mode and range		• 2,3,3,4,6,7,7,7,15 Range: 2-15, or 13 Median: 6 Mode: 7 Mean: 6	mean, median, mode, range
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.				

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Content Standard 3 - **Geometric Reasoning:**
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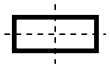
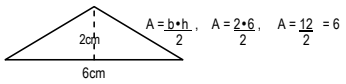
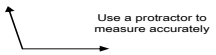
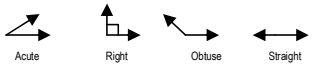
State Established Benchmark **At the end of 8th grade, a proficient student will:**	**OPI Essential Learning Expectation** (ELE) ***(HPS Critical Competencies)***	**NCTM**	**Assessment Statements** ***(Specific Examples)***	**Vocabulary** ***(for instructional purposes)***
3.1 **Properties**: Define, classify, and compare properties of solids and plane figures, including angles.	• Identify two-dimensional shapes		• Square, rectangle, parallelogram, triangle, circle, rhombus, trapezoid	polygon
3.2 **Relationships**: Determine congruence, similarity, and symmetry of objects in mathematics and in the contexts of art, science, and culture.	• Determine line of symmetry in regular polygons		• 	line of symmetry
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.	• Calculate the area and perimeter of squares, rectangles, triangles, circles, and parallelograms. • Measure angles to the nearest degree. • Use formulas to find the perimeter and area of triangles, squares, rectangles, parallelograms, and circles.		•  •  • 	area, perimeter, circumference, base, height, diameter, radius, pi
3.5 **Justification:** Develop informal arguments to verify geometric relationships (e.g. Pythagorean Theorem) and solve problems.	• Classify angles		• 	parallel, perpendicular, congruent, obtuse angle, acute angle, right angle, straight angle

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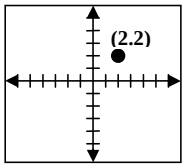
4.1 **Patterns**: Create and use tables, graphs, words, and symbols/variables to represent, analyze, and generalize a variety of patterns.	• Recognize and predict arithmetic patterns		• 	numerical pattern
4.2 **Equivalence**: Recognize, simplify, and generate equivalent forms for algebraic expressions.				
4.3 **Solving**: Use number properties and inverse operations to solve single-variable equations and inequalities.	• Solve a one-step equation	• Writing, interpreting and using mathematical expressions and equations.	• $\frac{2x}{2} = \frac{8}{2}$ $x = 4$ $2.4 = 8$ $8 = 8$	variables, constants, expressions, equations
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.	• Graph ordered pairs on a coordinate plane		• 	ordered pair, coordinate plane, x-axis, y-axis