

# Montana Instructional Alignment

## HPS Critical Competencies

### Mathematics

#### Math I

#### 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 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.

# Montana Instructional Alignment HPS Critical Competencies Mathematics Math I

Content Standard 1 -	Number Sense and Operations		
<p>1.1 <b>(Magnitude):</b> Represent very large and very small numbers using multiple notations and interpret their effects in problem situations.</p> <p>1.2 <b>Estimation:</b> Identify situations where estimation is appropriate and determine the needed degree of precision and accuracy.</p> <p>1.3 <b>Equivalence:</b> Given a representation of a number or expression, find equivalent representations using multiple notations (e.g., exponents and roots).</p> <p>1.4 <b>Properties:</b> Analyze and apply the properties of numbers and number systems.</p> <p>1.5 <b>Modeling:</b> Identify givens and unknowns in an unfamiliar situation and describe relationships between variables (e.g., the effect of changing an interest rate on monthly payments).</p>	<p><i>Implicit in all the standards below is the process standard specifying that all topics are taught with multiple representations through problem solving with appropriate technology.</i></p> <p><b>Arithmetic manipulations of expressions. 1.4</b></p> <p><b>Exponents (simplifying expressions) 1.3 1.4</b></p>	<ul style="list-style-type: none"> <li>• Algebra</li>   <li>• Numbers and Operations</li> <li>• Algebra</li> </ul>	<p>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.</p> <p><b>Combine like terms.</b> Include problems like <math>5x^2 + 2x - (4x^2 - 8)</math> Distributive property</p> <p><b>Laws of exponents</b>  <math>a^n a^m = a^{n+m}</math>  <math>\frac{a^n}{a^m} = a^{n-m}</math>  <math>(a^n)^m = a^{nm}</math></p> <p>absolute value, additive identity, additive inverse, algebra, axis of symmetry, binomial, Cartesian coordinate system, coefficient, constant, correlation, cube root, domain, exponent (positive, negative), exponential change growth &amp; decay factor, function, intercepts (x, y), linear, linear regression, parabola polynomial, quadratic, quadratic formula discriminant, radical, range, roots, solutions intercepts, simple interest, slope, systems, linear equations, inequalities, term, variation, direct, inverse</p>

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Content Standard 1 -		Number Sense and Operations		
State Established Benchmark		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.		
At the end of Grade 12, a proficient Student will:	OPI Essential Learning Expectation (ELE) HPS Critical (Competencies)	NCTM Draft Standard	Assessment Statements (Specific Examples)	Vocabulary <i>(for instructional purposes)</i>
1.1 <b>(Magnitude):</b> Represent very large and very small numbers using multiple notations and interpret their effects in problem situations. 1.2 <b>Estimation:</b> Identify situations where estimation is appropriate and determine the needed degree of accuracy. 1.3 <b>Equivalence:</b> Given a representation of a number or expression, find equivalent representations using multiple notations (e.g., exponents and roots). 1.4 <b>Properties:</b> Analyze and apply the properties of numbers and number systems. 1.5 <b>Modeling:</b> Identify givens and unknowns in an unfamiliar situation and describe relationships between variables (e.g., the effect of changing an interest rate on monthly payments).	<i>Implicit in all the standards below is the process standard specifying that all topics are taught with multiple representations through problem solving with appropriate technology.</i>  <b>Quadratics 1.3</b>          <b>Volume and surface area of prism, spheres, cones pyramids, cylinders.</b> <b>a. Solve for an unknown dimension 1.5</b>  <b>Polynomial Arithmetic 1.3 1.4 1.5</b>	<ul style="list-style-type: none"> <li>• Algebra</li>            <li>• Algebra</li> <li>• Measurement</li>            <li>• Algebra</li> <li>• Geometry</li> </ul>	<b>Factoring</b> a. $ax^2 + bx = x(ax + b)$ $ax^2 + bx + c, a = 1$ Multiplying polynomials b. $ax(bx + c)$ $(ax + b)(cx + d)$  <b>Measurement</b> Design two boxes that have a volume of $480 \text{ cm}^3$ .  <b>Multiplying polynomials</b> $ax(bx + c)$ $(ax + b)(cx + d)$	

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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.		
State Established Benchmark At the end of Grade 12, a proficient Student will:	OPI Essential Learning Expectation (ELE) HPS Critical (Competencies)	NCTM	Assessment Statements (Specific Examples)	Vocabulary (for instructional purposes)
2.1 <b>Represent Data:</b> Using technology when appropriate, select and create graphical or numerical representations for data set and compare different data sets using measures of central tendency and spread (e.g., percentiles, quartiles, inter-quartile range, and standard deviation). 2.2 <b>Evaluate Data:</b> Evaluate reports based on data collected and/or published by considering the source of the data, the design of the study, and the way data are analyzed and displayed (e.g. correlation does not prove causation). 2.3 <b>Regression:</b> Given two variable data, decide on an appropriate model, determine a regression equation using technology, and decide when predictions based on such regression equations are valid. 2.4 <b>Probability:</b> Use basic rules to compute probabilities and use probability to evaluate problem solving. 2.5 <b>Counting:</b> Determine the number of outcomes for an event or compound events using permutations, combinations, and other counting methods.	<i>Implicit in all the standards below is the process standard specifying that all topics are taught with multiple representations through problem solving with appropriate technology.</i>  <b>Linear relationships 2.3</b>	<ul style="list-style-type: none"> <li>• Data Analysis and Probability</li> </ul>	<b>Curve fitting/modeling</b> a. given data create scatter plot b. draw fitted line. c. write equation of fitted line.	

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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.				
State Established Benchmark At the end of Grade 12, a proficient Student will:	OPI Essential Learning Expectation (ELE) HPS Critical (Competencies)	NCTM	Assessment Statements (Specific Examples)	Vocabulary (for instructional purposes)
3.1 <b>Reasoning:</b> Use inductive and deductive reasoning to verify conjectures about relationships (e.g., congruence) between two- and three-dimensional objects. 3.2 <b>Transformations:</b> Apply transformations on figures (e.g. dilations, rotations, translations, reflections) to solve problems, and interpret the results of composite transformations. 3.3 <b>Triangle Relationships:</b> Solve problems using triangles, including special triangles (e.g., 30-60-90) and properties of triangles (e.g. sine, cosine, tangent). 3.4 <b>Methods of Proof:</b> Make, test, and validate conjectures using a variety of techniques (e.g., counterexample, indirect proof). 3.5 <b>Applications:</b> Use spatial reasoning and geometric models to solve real world problems involving regular and irregular shapes.	<i>Implicit in all the standards below is the process standard specifying that all topics are taught with multiple representations through problem solving with appropriate technology.</i>  <b>Transformational Geometry 3.2 3.5</b>	<ul style="list-style-type: none"> <li>• Geometry</li> </ul>	Transformational Geometry: Represent the following with algebraic and geometric transformations. <ul style="list-style-type: none"> <li>a. translation</li> <li>b. rotation</li> <li>c. dilation</li> <li>d. reflection</li> </ul>	

