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

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.					
 1.1 (Magnitude): Represent very large and very small numbers using multiple notations and interpret their effects in problem situations. 1.2 Estimation: Identify situations where estimation is appropriate and determine the needed degree of precision and accuracy. 1.3 Equivalence: Given a representation of a number or expression, find equivalent representations using multiple notations (e.g., exponents and roots). 1.4 Properties: Analyze and apply the properties of numbers and number systems. 1.5 Modeling: 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). 	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. Arithmetic manipulations of expressions. 1.4 Exponents (simplifying expressions) 1.3 1.4	 Algebra Numbers and Operations Algebra 	Combine like terms. Include problems like $5x^2 + 2x - (4x^2 - 8)$ Distributive property Laws of exponents $a^n a^m = a^{n+m}$ $\frac{a^n}{a^m} = a^{n-m}$ $(a^n)^m = a^{nm}$	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 & 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	

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Content Standard 1 - State Established Benchmark At the end of Grade 12, a proficient			ber sense and operations to represent nur tems, make reasonable estimates and com Assessment Statements (Specific Examples)	
 At the end of order 12, a protictent Student will: 1.1 (Magnitude): Represent very large and very small numbers using multiple notations and interpret their effects in problem situations. 1.2 Estimation: Identify situations where estimation is appropriate and determine the needed degree of accuracy. 1.3 Equivalence: Given a representation of a number or expression, find equivalent representations using multiple notations (e.g., exponents and roots). 1.4 Properties: Analyze and apply the properties of numbers and number systems. 1.5 Modeling: 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). 	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. Quadratics 1.3 Volume and surface area of prism, spheres, cones pyramids, cylinders. a. Solve for an unknown dimension 1.5 Polynomial Arithmetic 1.3 1.4 1.5	 Algebra Algebra Measurement Algebra Geometry 	Factoring a. $ax^2 + bx = x(ax + b)$ a. $ax^2 + bx + c, a = 1$ b. $ax(bx + c)$ ($ax + b$)($cx + d$) Measurement Design two boxes that have a volume of 480 cm ³ . Multiplying polynomials ax(bx + c) ($ax + b$)($cx + d$)	

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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 Represent Data: 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).	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.	Data Analysis and Probability	Curve fitting/modeling a. given data create scatter plot b. draw fitted line.	
2.2 Evaluate Data: 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).			c. write equation of fitted line.	
2.3 Regression: 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.				
 Probability: Use basic rules to compute probabilities and use probability to evaluate problem solving. 				
2.5 Counting: Determine the number of outcomes for an event or compound events using permutations, combinations, and other counting methods.				

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Content Standard 3 -	Geometric Reasoning A student, applying reasoning and problem solving, spatial reasoning and geometric models to analyze		perties and spatial relationships, transformation of shap	bes, representational systems
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 Reasoning: Use inductive and deductive reasoning to verify conjectures about relationships (e.g., congruence) between two-and three-dimensional objects. 3.2 Transformations: Apply transformations on figures (e.g. dilations, rotations, translations, reflections) to solve problems, and interpret the results of composite transformations. 3.3 Triangle Relationships: Solve problems using triangles, including special triangles (e.g., 30-6-0-90) and properties of triangles (e.g. sine, cosine, tangent). 3.4 Methods of Proof: Make, test, and validate conjectures using a variety of techniques (e.g., counterexample, indirect proof). 3.5 Applications: Use spatial reasoning and geometric models to solve real world problems involving regular and irregular shapes. 	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. Transformational Geometry 3.2 3.5	• Geometry	Transformational Geometry: Represent the following with algebraic and geometric transformations. a. translation b. rotation c. dilation d. reflection	

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Content Standard 4 -	Algebraic Reasoning A student, applying reasoning and problem solving, relationships, algebraic representations, models and		al concepts and procedures to understand patterns, quavant cultural contexts.	antitative and functional
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)
 4.1 Symbols: Choose appropriate variables to construct expressions and equations representing given problem situations (e.g., linear, quadratic, exponential). 4.2 Solving: Solve a variety of equations, inequalities and their systems; justify the solution process using properties of numbers; and interpret solutions in context. 4.3 Functions: Represent functions in a variety of ways including tabular, graphic, symbolic, and verbal, and select an appropriate form for 	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. Single variable equations 4.2	• Algebra	Solve Equations and Inequalities similar to: ax + b = c ax + b = cx + d a(bx + c) = d a(bx + c) = d(ex + f) ax + b = c $\sqrt{ax + b} = c$	
 solving a given problem. 4.4 Transforming Functions: Analyze the effects of transformations on families of functions, recognize their characteristics, and represent functions in equivalent forms. 	Systems of Equations	• Algebra	Solve systems using graphing and substitution a. Two equations in $y = mx + b$ form. b. Two equations in standard form.	
 4.5 Modeling: Given data or a problem situation, select and use an appropriate function model to analyze results or make a prediction 4.6 Connections with Geometry: Represent geometric problems algebraically and algebraic situation geometrically. 	Quadratics 4.3	• Algebra	Find vertex, line of symmetry, x and y intercepts Solve: $ax^{2} + b = c$ $(Ax + B)(Cx + D) = 0$ $x^{2} + bx + c = 0$ Graphing $y = ax^{2} + bx + c$ and including $c = 0$	