

MINNESOTA ACADEMIC STANDARDS GRADE 8

MATH			
STRAND	SUB-STRAND	STANDARD	BENCHMARKS
I. MATHEMATICAL REASONING		Apply skills of mathematical representation, communication and reasoning throughout the remaining four content strands.	<ol style="list-style-type: none"> 1. Assess the reasonableness of a solution by comparing the solution to appropriate graphical or numerical estimates or by recognizing the feasibility of a solution in a given context. 2. Appropriately use examples and counterexamples to make and test conjectures, justify solutions and explain results. 3. Translate a problem described verbally or by tables, diagrams or graphs, into suitable mathematical language, solve the problem mathematically and interpret the result in the original context. 4. Support mathematical results by explaining why the steps in a solution are valid and why a particular solution method is appropriate. 5. Determine whether or not relevant information is missing from a problem. 6. Use accurately common logical words and phrases such as "and," "or," "if ... then ...," "unique," "only if."
II. NUMBER SENSE, COMPUTATION AND OPERATIONS	A. Number Sense	Use rational and irrational numbers, represented in a variety of ways, to quantify information and to solve real -world and mathematical problems.	<ol style="list-style-type: none"> 1. Represent and compare rational and irrational numbers symbolically and on a number line. 2. Use rational and irrational numbers to solve real-world and mathematical problems. 3. Use scientific notation with positive and negative powers of 10, with appropriate treatment of significant digits, to solve real-world and mathematical problems. 4. Classify numbers as rational or irrational.
II. NUMBER SENSE, COMPUTATION, AND OPERATIONS	B. Computation and Operation	Compute fluently and make reasonable estimates with rational and irrational numbers in real-world and mathematical problems.	<ol style="list-style-type: none"> 1. Use calculator approximations of irrational and rational numbers in multi-step real-world and mathematical problems. 2. Find integer approximations of square roots of positive

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		Understand the meanings of the basic operations, including the use of integer exponents and nth roots, and how the operations relate to one another. Appropriately use calculators and other technologies to solve problems.	integers without a calculator. 3. Multiply and divide expressions involving exponents with a common base. 4. Use the inverse relationship between nth roots and nth powers of rational numbers to solve real-world and mathematical problems. 5. Apply the correct order of operations and grouping symbols when using calculators and other technologies. 6. Know, use and translate calculator notational conventions to mathematical notation. 7. Understand that use of a calculator requires appropriate mathematical reasoning and does not replace the need for mental computation.
III. PATTERNS, FUNCTIONS AND ALGEBRA	A. Patterns and Functions	Understand and describe progressions. Use graphs and tables to solve real-world and mathematical problems.	1. Recognize when a list of numbers forms an arithmetic or geometric progression and be able to determine subsequent terms in the progression. 2. Represent quantitative relationships graphically and use the graphs to solve real-world and mathematical problems. 3. Generate a table of values from a formula and graph the resulting ordered pairs on a grid.
III. PATTERNS, FUNCTIONS AND ALGEBRA	B. Algebra (Algebraic Thinking)	Use algebraic operations to generate equivalent expressions, and use proportional reasoning to solve real-world and mathematical problems. Demonstrate the ability to manipulate an equation by applying arithmetic operations to both sides to maintain equivalence.	1. Multiply and divide expressions of the form ax^n . 2. Use simple formulas with more than one variable to solve real-world and mathematical problems. 3. Use proportions and percents with one unknown quantity to solve real-world and mathematical problems. 4. Apply the correct order of operations including addition, subtraction, multiplication, division, grouping symbols and powers, to simplify and evaluate algebraic expressions.
IV. DATA ANALYSIS, STATISTICS AND PROBABILITY	A. Data and Statistics	Represent data and use various measures associated with data to draw conclusions and identify trends.	1. Construct and analyze histograms, circle graphs, stem-and-leaf plots and box-and-whisker plots. 2. Compute the quartiles of a data set.
IV. DATA ANALYSIS, STATISTICS AND PROBABILITY	B. Probability	Calculate and express probabilities numerically and apply probability concepts to solve real-	1. Understand that if p is the probability of an event occurring, then $1 - p$ is the probability of the event not occurring.

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		world and mathematical problems.	<ol style="list-style-type: none"> 2. Convert between odds and probabilities. 3. Use a variety of experiments to explore the relationship between experimental and theoretical probabilities and the effect of sample size on this relationship.
V. SPATIAL SENSE, GEOMETRY AND MEASUREMENT	A. Spatial Sense	Recognize the relationship between different representations of two- and three-dimensional shapes. Understand the effect of various transformations.	<ol style="list-style-type: none"> 1. Use models and visualization to understand and create various two-dimensional diagrams of three-dimensional shapes. 2. Predict the position and orientation of simple three-dimensional geometric shapes under transformations such as reflections, rotations and translations.
V. SPATIAL SENSE, GEOMETRY AND MEASUREMENT	B. Geometry	Use basic geometric principles and proportional reasoning to solve real-world and mathematical problems.	<ol style="list-style-type: none"> 1. Apply the relationship between changes in one or more linear distances in a planar figure and the change in area. 2. Use the concept of similarity in simple two-dimensional figures to solve real-world and mathematical problems involving proportionality. 3. Know how to find the volumes of cubes, prisms, spheres and cylinders. 4. Know how to find the surface areas of cubes, prisms and cylinders. 5. Calculate perimeter and area of two-dimensional figures obtained by putting together triangles, parallelograms, and sectors of circles to solve real-world and mathematical problems.
	C. Measurement	Make calculations of time, length, area and volume within and between standard measuring systems using good judgment in choice of units.	<ol style="list-style-type: none"> 1. Find approximate equivalent measures of length, temperature and weight for common units in U.S. customary and metric measuring systems. 2. Use arithmetic to solve simple real-world and mathematical problems involving mixed units such as minutes and hours in elapsed time, degrees and minutes in latitude and longitude and feet and inches in distance.