

STANDARDS ACROSS ALGEBRA I, GEOMETRY, ALGEBRA II

Revised September 2006

A. Numbers and Operations

Algebra I	Geometry	Algebra II	Grade 11
1.6 Express numbers and/or simplify expressions using scientific notation (including numbers less than 1).			M11.A.1.1.2 Express numbers and/or simplify expressions using scientific notation (including numbers less than 1).
1.3 Find the square root of an integer using a calculator or estimation. Perform operations and simplify square roots in radical form.			M11.A.1.1.1 Find the square root of an integer to the nearest tenth using either a calculator or estimation. M11.A.1.1.3 Simplify square roots (e.g., the square root of 24).

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A. Numbers and Operations			
Algebra I	Geometry	Algebra II	Grade 11
<p>1.7 Locate/identify irrational numbers at the approximate location on a number line.</p>		<p>3.1 Demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically, and plot complex numbers as points in the plane.</p> <p>3.2 Add, subtract, multiply, and divide complex numbers.</p>	<p>M11.A.1.3.1 Locate/identify irrational numbers at the approximate location on a number line.</p> <p>M11.A.1.3.2 Compare and/or order any real numbers (rational and irrational may be mixed).</p>
<p>3.4 Apply basic factoring techniques to second- and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, recognizing perfect squares of binomials and grouping terms.</p>		<p>2.2 Factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.</p>	<p>M11.A.1.2.1 Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.</p>

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A. Numbers and Operations

Algebra I	Geometry	Algebra II	Grade 11
<p>3.1 Understand and use the rules of exponents, including positive and negative.</p>			<p>M11.A.3.1.1 Simplify/ evaluate expressions using the order of operations to solve problems (any rational numbers may be used).</p> <p>M11.A.2.2.1 Simplify and evaluate expressions involving positive and negative exponents, roots and/or absolute value (may contain all types of real numbers - exponents should not exceed 10).</p> <p>M11.A.2.2.2 Simplify/evaluate expressions involving multiplying with exponents (e.g., $x^6 * x^7 = x^{13}$), powers of powers (e.g., $(x^6)^7 = x^{42}$) and powers of products $(2x^2)^3 = 8x^6$ (positive exponents only).</p>

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A. Numbers and Operations			
Algebra I	Geometry	Algebra II	Grade 11
<p>3.8 Apply algebraic techniques to solve rate problems, consecutive integer problems, and all types of distance problems.</p> <p>4.9 Identify and/or use proportional relationships in problem solving settings.</p> <p>4.10 Solve problems using direct and inverse proportions.</p>	<p>3.2 Use proportional relationships when solving similarity problems.</p>	<p>2.4 Apply algebraic techniques to solve work problems, percent, and mixture problems.</p>	<p>M11.A.2.1.1 Solve problems using operations with rational numbers including rates and percents (single and multi-step and multiple procedure operations) (e.g., distance, work and mixture problems, etc.).</p> <p>M11.A.2.1.3 Identify and/or use proportional relationships in problem solving settings.</p> <p>M11.A.2.1.2 Solve problems using direct and inverse proportions.</p>
	<p>1.7 Use estimation to solve problems.</p>	<p>10.3 Use estimation to check reasonableness of calculations in problem solving situations involving rational numbers (e.g., significant digits; rounding not to exceed 3 decimal places).</p>	<p>M11.A.3.2.1 Use estimation to solve problems.</p>

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B. Measurement			
Algebra I	Geometry	Algebra II	Grade 11
	<p>1.8 Calculate and/or estimate area, perimeter, or circumference of a figure (including inscribed and circumscribed).</p> <p>1.9 Calculate the surface area and volume of solids (prisms, cylinders, pyramids, cones & spheres).</p>		<p>M11.B.2.2.3 Estimate area, perimeter or circumference of an irregular figure.</p> <p>M11.B.2.2.1 Calculate surface area of prisms, cylinders, cones, pyramids and/or spheres. Formulas are provided on the reference sheet.</p> <p>M11.B.2.2.2 Calculate the volume of prisms, cylinders, cones, pyramids and/or spheres. Formulas are provided on the reference sheet.</p> <p>M11.B.2.2.4 Find the measurement of a missing length given the perimeter, circumference, area or volume.</p>
	<p>1.5 Measure and compare angles in degrees.</p>		<p>M11.B.2.1.1 Measure and/or compare angles in degrees (up to 360°) (protractor must be provided or drawn).</p>

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B. Measurement			
Algebra I	Geometry	Algebra II	Grade 11
	<p>1.10 Determine how changes in dimensions affect the perimeter, area, and volume of geometric figures and solids.</p>		<p>M11.B.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, area or volume.</p> <ul style="list-style-type: none">• How does changing the length of the radius of a circle affect the circumference of the circle?• How does changing the length of the edge of a cube affect the volume of the cube?• How does changing the length of the base of a triangle affect the area of the triangle?

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C. Geometry			
Algebra I	Geometry	Algebra II	Grade 11
	<p>1.2 Identify and/or use the properties of a radius, diameter, tangent, chord, and secant of a circle.</p> <p>1.3 Identify and/or use the properties of arcs, semicircles, inscribed angles, and/or central angles of a circle.</p>		<p>M11.C.1.1.1 Identify and/or use the properties of a radius, diameter and/or tangent of a circle (given numbers should be whole).</p> <p>M11.C.1.1.2 Identify and/or use the properties of arcs, semicircles, inscribed angles and/or central angles.</p>
	<p>1.6 Identify and/or use properties of quadrilaterals (parallel sides, diagonals, bisectors, congruent sides and angles, and supplementary angles).</p> <p>1.4 Prove and use theorems of angles including the properties of parallel lines cut by a transversal (vertical, corresponding, complementary, supplementary, alternate interior, alternate exterior, and same side angles).</p>		<p>M11.C.1.2.2 Identify and/or use properties of quadrilaterals (e.g., parallel sides, diagonals, bisectors, congruent sides/angles and supplementary angles).</p>

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C. Geometry			
Algebra I	Geometry	Algebra II	Grade 11
	<p>1.1 Identify and/or use properties of triangles (medians, altitudes, angle bisectors, side-angle relationships, triangle inequality theorem, and equilateral triangles).</p>		<p>M11.C.1.2.1 Identify and/or use properties of triangles (e.g., medians, altitudes, angle bisectors, side/angle relationships, Triangle Inequality Theorem).</p> <p>M11.C.1.2.3 Identify and/or use properties of isosceles and equilateral triangles.</p>
<p>7.1 Use the Pythagorean Theorem to solve problems.</p>	<p>4.1 Prove and use the Pythagorean Theorem to determine distance and find missing lengths of sides (to the nearest tenth or simplified square root form) of right triangles.</p> <p>4.2 Know and use the definitions of the basic trigonometric functions defined by the angles of a right triangle.</p> <p>4.3 Know and use angle and side relationships to solve problems with special right triangles, such as 30° - 60° - 90° triangles and 45° - 45° - 90° triangles.</p>		<p>M11.C.1.4.1 Find the measure of a side of a right triangle using the Pythagorean Theorem (Pythagorean Theorem included on the reference sheet).</p>

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C. Geometry			
Algebra I	Geometry	Algebra II	Grade 11
7.2 Use indirect measurements for lengths of sides of triangles to solve problems.	2.1 Identify and/or use properties of congruent polygons or solids. 2.2 Use the concept of corresponding parts to identify congruent triangles. 3.1 Identify and/or use properties of similar polygons or solids.		M11.C.1.3.1 Identify and/or use properties of congruent and similar polygons or solids.
7.3 Use the distance formula to determine the length of a segment. 7.4 Find the midpoint of a line segment.	5.1 Calculate the distance and/or midpoint between two points.		M11.C.3.1.1 Calculate the distance and/or midpoint between 2 points on a number line or on a coordinate plane (formula provided on the reference sheet).
2.11 Understand the concepts of parallel lines and perpendicular lines and how those slopes are related.			M11.C.3.1.2 Relate slope to perpendicularity and/or parallelism (limit to linear algebraic expressions; slope formula provided on the reference sheet).
	6.1 Know the effect of rigid motions on figures in the coordinate plane and space, including rotations, translations, reflections, and tessellations. 6.2 Analyze figures in terms of the kinds of symmetries they have.	4.1 Describe the effect of rigid motions on figures in the coordinate plane and space, including rotations, translations, and reflections.	

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D. Algebraic Concepts			
Algebra I	Geometry	Algebra II	Grade 11
<p>1.4 Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically. Use patterns to solve routine and non-routine problems.</p> <p>1.5 Give examples of patterns that occur in data from other disciplines.</p>			<p>M11.D.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.</p>
		<p>7.1 Find the general term of a finite arithmetic sequence and the common ratio of finite and infinite geometric sequences.</p> <p>7.2 Derive the summation formulas for an arithmetic series and for both finite and infinite geometric series.</p>	
<p>4.1 Determine the domain of independent variables and the range of dependent variables in a relation that is defined by a graph, a set of ordered pairs, or a symbolic expression.</p> <p>4.3 Understand the concepts of a relation and a function.</p> <p>4.4 Determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion.</p> <p>4.5 Represent functional relationships in tables, charts, and graphs.</p>			<p>M11.D.1.1.3 Identify the domain, range or inverse of a relation (may be presented as ordered pairs or a table).</p> <p>M11.D.1.1.2 Determine if a relation is a function given a set of points or a graph.</p>

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D. Algebraic Concepts			
Algebra I	Geometry	Algebra II	Grade 11
<p>2.1 Simplify embedded expressions before solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$.</p> <p>2.2 Solve linear equations and inequalities.</p> <p>2.3 Solve literal equations.</p> <p>2.5 Solve multi-step problems word problems involving linear equations and linear inequalities in one variable, provide justification for each step, and check the reasonableness of the answer in context.</p> <p>2.6 Graph, manually and with graphing calculators, a linear equation and compute the x- and y-intercepts (e.g., graph $2x + 6y = 4$).</p>			<p>M11.D.2.1.3 Write, solve and/or apply a linear equation (including problem situations).</p> <p>M11.D.4.1.1 Match the graph of a given function to its table or equation.</p>
		<p>6.1 Solve problems involving function concepts, such as composition, defining the inverse function, and performing arithmetic operations on functions.</p>	

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D. Algebraic Concepts			
Algebra I	Geometry	Algebra II	Grade 11
<p>4.2 Analyze relations involving direct and inverse variation and represent them algebraically.</p> <p>2.9 Calculate the slope and y-intercept of a line and interpret the slope as a rate of change.</p> <p>2.10 Derive linear equations by using the point-slope formula.</p> <p>2.12 Find the equation of a line perpendicular to a given line that passes through a given point.</p> <p>2.13 Graph a linear function in two variables using the slope-intercept method.</p> <p>2.14 Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line.</p> <p>2.8 Verify that a point lies on a line, given an equation of the line.</p>			<p>M11.D.3.1.1 Identify, describe and/or use constant or varying rates of change.</p> <p>M11.D.3.1.2 Determine how a change in one variable relates to a change in a second variable (e.g., $y=4/x$, if x doubles, what happens to y?).</p> <p>M11.D.3.2.1 Apply the formula for the slope of a line to solve problems (formula given on reference sheet).</p> <p>M11.D.3.2.3 Compute the slope and/or y-intercept represented by a linear equation or graph.</p> <p>M11.D.3.2.2 Given the graph of the line, 2 points on the line or the slope and a point on a line, write or identify the linear equation in point-slope, standard and/or slope-intercept form.</p>

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D. Algebraic Concepts			
Algebra I	Geometry	Algebra II	Grade 11
<p>2.4 Solve equations and inequalities involving absolute values.</p> <p>2.7 Sketch the region defined by a linear inequality (e.g., sketch the region defined by $2x + 6y < 4$).</p>			<p>M11.D.2.1.1 Solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).</p> <p>M11.D.2.1.2 Identify or graph functions, linear equations or linear inequalities on a coordinate plane.</p>
<p>2.15 Solve, manually and with graphing calculators, a system of two linear equations in two variables algebraically and interpret the answer graphically.</p> <p>2.16 Solve a system of two linear inequalities in two variables and sketch the solution set.</p> <p>2.17 Determine the number of solutions for systems of equations.</p> <p>2.18 Analyze and explain systems of equations and systems of inequalities.</p>		<p>1.1 Solve systems of linear equations and inequalities (in two or three variables) by substitution, elimination, with graphs, or with matrices.</p> <p>1.2 Solve systems of equations and inequalities using graphing calculators.</p> <p>1.3 Identify systems of equations and inequalities as independent, dependent, or inconsistent.</p>	<p>M11.D.2.1.4 Write and/or solve systems of equations using graphing, substitution and/or elimination (limit systems to 2 equations).</p>

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D. Algebraic Concepts			
Algebra I	Geometry	Algebra II	Grade 11
		9.1 Analyze and explain matrices. 9.2 Perform addition, subtraction, multiplication, and scalar multiplication with matrices. 9.3 Formulate matrices to model routine and non-routine problem situations.	
5.3 Solve a quadratic equation by factoring and square roots. 5.1 Graph quadratic functions manually and with graphing calculators, and know that their roots are the x-intercepts. 5.2 Determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points. 5.4 Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.		3.3 Solve and graph quadratic equations, including those in the complex number system, by factoring, completing the square, or using the quadratic formula. Apply these techniques in solving word problems. 3.4 Demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, determine how the graph of a parabola changes as a, b, and c vary in the equation $y = a(x-b)^2 + c$. 3.5 Graph quadratic functions and determine the maxima, minima, and zeros of the function. 3.6 Interpret maximum and minimum values in problem situations.	M11.D.2.1.5 Solve quadratic equations using factoring (integers only – not including completing the square or the Quadratic Formula).

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D. Algebraic Concepts			
Algebra I	Geometry	Algebra II	Grade 11
<p>4.6 Create and interpret functional models (e.g. growth and decay, maximum and minimum values).</p> <p>4.7 Analyze properties and relationships of functions (e.g., linear, polynomial, rational).</p> <p>4.8 Analyze and categorize functions by their characteristics.</p>			
		<p>5.1 Know and apply the laws of fractional exponents, exponential functions, and use these functions symbolically and graphically to solve problems involving exponential growth and decay.</p> <p>5.2 Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.</p> <p>5.3 Use the definition of logarithms to translate between logarithms in any base.</p> <p>5.4 Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving exponents and logarithms.</p>	

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D. Algebraic Concepts			
Algebra I	Geometry	Algebra II	Grade 11
<p>3.2 Define and determine the degree of algebraic expressions.</p> <p>3.3 Add, subtract, and multiply monomials and polynomials.</p> <p>3.6 Add, subtract, multiply, and divide rational expressions and functions. Solve both computationally and conceptually challenging problems by using these techniques.</p> <p>3.5 Simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.</p> <p>3.7 Identify an undefined expression.</p>		<p>2.1 Demonstrate proficiency performing operations on polynomials, including synthetic division.</p> <p>2.3 Add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.</p> <p>8.3 Know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.</p>	<p>M11.D.2.2.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial).</p> <p>M11.D.2.2.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form $ax^2 + bx + c$ where a is not equal to 0).</p> <p>M11.D.2.2.3 Simplify algebraic fractions.</p>

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E. Data Analysis and Probability

Algebra I	Geometry	Algebra II	Grade 11
			<p>M11.E.1.1.2 Analyze data and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots or scatter plots.</p> <p>M11.E.1.1.1 Create and/or use appropriate graphical representations of data, including box-and-whisker plots, stem-and-leaf plots or scatter plots.</p>
<p>6.1 Review measures of central tendency (mean, median, mode) and range.</p> <p>6.2 Describe how outliers affect measures of central tendency.</p>		<p>8.5 Calculate and/or interpret the range, quartiles and interquartile range of sets of data.</p> <p>8.4 Describe how outliers affect measures of central tendency.</p>	<p>M11.E.2.1.2 Calculate and/or interpret the range, quartiles and interquartile range of data.</p> <p>M11.E.2.1.1 Calculate or select the appropriate measure of central tendency (mean, mode or median) of a set of data given or represented on a table, line plot, or stem-and-leaf plot.</p> <p>M11.E.2.1.3 Describe how outliers affect measures of central tendency.</p>

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E. Data Analysis and Probability

Algebra I	Geometry	Algebra II	Grade 11
<p>6.5 Make predictions using interpolation, extrapolation, regression, and estimation. Use technology to verify results.</p> <p>6.3 Find the line of best fit for a given distribution of data by using least squares regression.</p> <p>6.4 Determine lines of best fit using mathematical models and estimate values of related quantities.</p>			<p>M11.E.4.1.1 Estimate or calculate to make predictions based on a circle, line, bar graphs or given situation.</p> <p>M11.E.4.2.1 Draw, find and/or write an equation for a line of best fit for a scatter plot.</p> <p>M11.E.4.2.2 Make predictions using the equations or graphs of best-fit lines of scatter plots.</p>

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F. Mathematical Reasoning

Algebra I	Geometry	Algebra II	Grade 11
8.2 Use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.	5.2 Use direct proofs, indirect proofs or proofs by contradiction to validate conjectures.		2.4.11.A. Use direct proofs, indirect proofs or proof by contradiction to validate conjectures.
	5.3 Construct valid arguments from stated facts.		2.4.11.B. Construct valid arguments from stated facts.
8.3 Judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.	5.4 Determine the validity of an argument.	5.5 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. 8.11 Analyze an experimental design to draw and justify conclusions regarding the validity of an argument.	2.4.11.C. Determine the validity of an argument.
	5.5 Use truth tables to reveal the logic of mathematical statements.		2.4.11.D. Use truth tables to reveal the logic of mathematical statements.
	5.6 Change a given statement to a conditional or bi-conditional statement, and state its converse, inverse, or contrapositive.		

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F. Mathematical Reasoning			
Algebra I	Geometry	Algebra II	Grade 11
<p>8.5 Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.</p> <p>2.19 Formulate expressions, equations, inequalities, systems of equations and systems of inequalities to model routine and non-routine problem situations.</p>	<p>5.7 Given appropriate construction instruments and dynamic media (where available) construct geometric figures.</p>	<p>10.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.</p>	<p>2.5.11.A. Select & use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.</p>
<p>1.1 Identify and use the arithmetic properties of subsets of integers and rational, irrational, and real numbers, including closure properties for the four basic arithmetic operations where applicable.</p> <p>1.2 Use arithmetic properties of numbers to demonstrate whether assertions are true or false.</p> <p>8.4 Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, determine whether the statement is true sometimes, always, or never.</p>		<p>8.6 Describe a normal distribution curve and apply its properties to analyze sets of data assumed to be normally distributed.</p>	<p>2.5.11.B. Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.</p>

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F. Mathematical Reasoning			
Algebra I	Geometry	Algebra II	Grade 11
8.1 Use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements.		10.2 Apply the method of mathematical induction to prove general statements about the positive integers.	2.5.11.C. Present mathematical procedures and results clearly, systematically, succinctly and correctly.
		8.7 Create a survey within the local community to collect, organize, and analyze data. 8.8 Use sampling techniques to draw inferences about large populations. 8.9 Determine the validity of the sampling method used in an experiment. 8.10 Design and conduct an experiment using random sampling, graph the results, describe the distribution using statistical measures, and use the results to generalize to the entire population.	2.5.11.D. Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid.
(1.4, 1.5, 2.5, 2.19, 3.8, 4.6, 4.9, 5.4, 6.5, 6.7, 7.1, 7.2)	(1.10, 3.2, 4.1, 4.3, 6.1)	(2.4, 3.3, 3.6, 5.1, 8.10, 8.13, 9.3)	2.4.11.E. Demonstrate mathematical solutions to problems (e.g., in the physical sciences).

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