

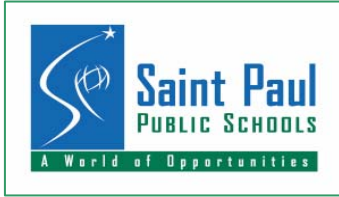
# Mathematics: High School

## Essential Standards

### I. Mathematical Reasoning

	1	2	3	4
<b>Note-Even though curriculum approaches vary, there was marked similarity as to the placement of standards. This document represents those similarities.</b>				
<b>Standard: Apply skills of mathematical representation, communication and reasoning throughout the remaining three content strands.</b>				
<b>The student will:</b>				
1. Assess the reasonableness of a solution by comparing the solution to appropriate graphical or numerical estimates or by recognizing the feasibility of solutions in a given context and rejecting extraneous solutions.	4	4	4	4
2. Appropriately use examples and counterexamples to make and test conjecture, justify solutions, and explain results.	4		4	4
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	4	4	4
4. Support mathematical results by explaining why the steps in a solution are valid and why a particular solution method is appropriate.	4		4	4
5. Determine whether or not relevant information is missing from a problem and if so, decide how to best express the results that can be obtained without that information.			4	4
6. Know and use the relationship that exists among a logical implication of the form “if A, then B,” its converse “if B, then A” its inverse “ if not A, then not B,” and its contra positive “if not B, then not A.”		4	4	

Key: 4 means the topic is introduced and assessed  
 X Means the topic is reviewed



# Mathematics: High School

## Essential Standards

### II. Number Sense, Computation and Operations

	1	2	3	4
<b>A. Number Sense</b>				
<b>Standard: Use real numbers, represented in a variety of ways, to qualify information and to solve real-world and mathematical problems.</b>				
<b>B. Computation and Operation</b>				
<b>Standard: Appropriately use calculators and other technologies to solve algebraic, geometric, probabilistic and statistical problems.</b>				
<b>The student will:</b>				
1. Apply the correct order of operations and grouping symbols when using calculators and other technologies.	4	4	4 X	4
2. Know, use and translate calculator notational conventions to mathematical notation.	4	4	4 X	4
3. Recognize the impact of units such as degrees and radians on calculations.		4	4 X	
4. Understanding the limitations of calculators such as missing or additional features on graphs due to viewing parameters or misleading representations of zero or very large numbers.	4	4	4 X	4
5. Trace the logical development of an author's argument, point of view or perspective and evaluate the adequacy, accuracy, and appropriateness of the author's evidence and information as well as the credibility of sources. *(Although this is difficult material, students are responsible for it on the MCA Reading test in 10 <sup>th</sup> grade.)		4	4 X	
6. Understand that use of calculator requires appropriate mathematical reasoning and does not replace the need for mental computation.	4	4	4 X	4

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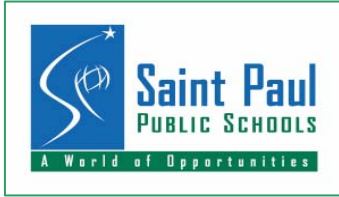
# Mathematics: High School

## Essential Standards

### III. Patterns, Functions and Algebra

	1	2	3	4
<b>A. Patterns and Functions</b>				
<b>Standard: Represent and analyze real-world and mathematical problems using numeric, graphic, and symbolic methods for a variety of functions.</b>				
<b>The student will:</b>				
1. Know the numeric, graphic and symbolic properties of linear, step, absolute value and quadratic functions. Graphic properties may include rates of change, intercepts, maxima and minima.	4 X		4	
2. Model exponential growth and decay, numerically, graphically, and symbolically, using exponential functions with integer inputs.	4 X		4	
3. Analyze the effects of coefficient changes on linear and quadratic functions and their graphs.	4 X		4	
4. Apply basic concepts of linear, quadratic and exponential expressions of equations in real-world problems such as loans, investments, and the path of a projectile.	4 X			
5. Distinguish functions from other relations using graphic and symbolic methods	4 X		4	
<b>B. Algebra (Algebraic Thinking)</b>				
<b>Standard: Solve simple equations and inequalities numerically, graphically, and symbolically. Use recursion to model and solve real-world mathematical problems.</b>				
<b>The student will:</b>				
1. Translate among equivalent forms of expressions, such as, simplify algebraic expressions involving nested pairs of parentheses and brackets, simplify rational expressions, factor a common term from an expression and apply associative, commutative and distributive laws.	4 X			

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# Mathematics: High School

## Essential Standards

<b>B. Algebra (Algebraic Thinking) (Continued)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
2. Understand the relationship between absolute value and distance on the number line and graph simple expressions involving absolute value such as, $[x-3] = 6$ or $[x + 2] < 5$ .	4		4	
3. Find equations of a line given two points on the line, a point and the slope of the line or the slope and the y-intercept of the line.	4			
4. Translate among equivalent forms of linear equations and inequalities.	4		4	
5. Use a variety of models such as equations, inequalities, algebraic formulas, written statements, tables and graphs or spreadsheets to represent functions and patterns in real-world and mathematic problems.	4		4	
6. Apply the laws of exponents to perform operations on expressions with integer exponents.	4		4	
7. Solve linear equations and inequalities in one variable with numeric, graphic and symbolic methods.	4		4	
8. Find real solutions to quadratic equations in one variable with numeric, graphic and symbolic methods.	4		4	
9. Use appropriate terminology and mathematical notation to define and represent recursion.	4		4	
10. Create and use recursive formulas to model and solve real-world and mathematical problems.	4		4	
11. Solve systems of two linear equations and inequalities with two variables using numeric, graphic, and symbolic methods.	4	4	4	
12. Understand how slopes can be used to determine whether lines are parallel or perpendicular. Given a line and a point not on the line, find the equations for the lines passing through that point and parallel or perpendicular to the given line.	4	4		

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# Mathematics: High School

## Essential Standards

<b>B. Probability</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Standard: Use appropriate counting procedures, calculate probabilities in various ways and apply theoretical probability concepts to solve real-world and mathematical problems.</b>				
<b>The student will:</b>				
1. Select and apply appropriate counting procedures to solve real-world and mathematical problems, including probability problems.	4	4		
2. Use areas, trees, unions and intersections to calculate probabilities and relate the results to mutual exclusiveness, independence and conditional probabilities in real-world and mathematical problems.			4	
3. Use probability models, including area and binomial models, in real-world and mathematical problems.			4	
4. For simple probability models, determine the expected values of random variables.				
5. Know the effect of sample size on experimental and simulation probabilities.				
6. Use a variety of experimental, simulation and theoretical methods to calculate probabilities.			4 X	
7. Distinguish between reliable and questionable Internet sources and apply responsible use of technology.	4		4 X	

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# Mathematics: High School

## Essential Standards

### V. Spatial Sense, Geometry and Measurement

	1	2	3	4
<b>A. Spatial Sense</b>				
<b>Standard: Use models to represent and understand two and three-dimensional shapes and how various motions affect representations of the same shape.</b>				
<b>The student will:</b>				
1. Use models and visualization to understand and represent three-dimensional objects and their cross sections from different perspectives.		4		
<b>B. Geometry</b>				
<b>Standard: Apply basic theorems of plane geometry, right triangle trigonometry, coordinate geometry and a variety of visualization tools to solve real-world and mathematical problems.</b>				
<b>The student will:</b>				
1. Know the theorems about triangles and parallel lines in elementary geometry to justify facts about various geometrical figures and solve real-world and mathematical problems. These theorems include criteria for two triangles to be congruent or similar and facts about parallel lines cut by a transversal.		4 X	4 X	
2. Know and use theorems about circles to justify geometrical facts and solve real-world and mathematical problems. These theorems include the relationship involving tangent lines and radii, the relationship between inscribed and central angles and the relationship between the measure of a central angle and arc length.		4	4 X	
3. Know and use properties of two and three dimensional figures to solve real-world and mathematical problems such as: finding area, perimeter, volume surface area; applying direct or indirect methods of measurement; the Pythagorean theorem and its converse; and properties of 45 degrees, -45 degrees, -90 degrees, and 30 degrees - 60 degrees - 90 degree triangles.		4 X	4 X	
4. Apply the basic concepts of right triangle trigonometry including sine, cosine and tangent to solve real-world and mathematical problems.		4 X	4 X	

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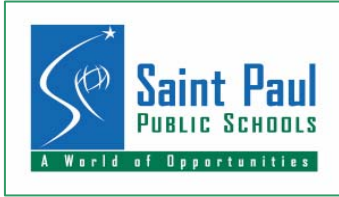


# Mathematics: High School

## Essential Standards

<b>B. Geometry (continued)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
5. Use numeric, graphic and symbolic representations of transformations such as reflections, translations and change of scale in one, two and three dimensions to solve real-world and mathematical problems.		4 X	4 X	
6. Perform basic constructions with a straightedge and compass.		4		
7. Draw accurate representations of planar figures using a variety of tools.	4	4 X	4 X	
<b>C. Measurement</b>				
<b>Standard: Use the interconnectedness of geometry, algebra, and measurement to explore real-world and mathematical problems.</b>				
<b>D. Statistics</b>				
<b>Standard: Use tables of the normal distribution and properties of that distribution to make judgments about populations based on random samples from these populations.</b>				
<b>The students will:</b>				
1. Use the concept of normal distribution and its properties to answer questions about sets of data				4
2. Describe and use sampling distributions and the central limit theorem. Calculate confidence intervals when appropriate.				4
3. Understand the importance of appropriate sampling methods. For instance, the time of day of a survey could lead to inaccuracies in the outcome.				4

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# Mathematics: High School

## Essential Standards

E. Algebra	1	2	3	4
<b>Standard: Demonstrate facility with a wide range of algebraic operations and use the relationship between coordinate geometry and algebraic equations to solve real-world and mathematical problems.</b>				
<b>The student will:</b>				
1. Solve systems of two, three or more simultaneous linear equations or inequalities, in particular, deciding whether a given system of equations has one solution, no solution or infinitely many solutions and, in this latter case, describing them parametrically.				4
2. Solve problems with quadratic functions and equations, where some the coefficients may be expressed in terms of parameters.				4
3. Perform the four arithmetic operations with polynomials, except that division is restricted to division by monomials and linear binomials.	4	4	4 X	
4. Simplify a wide variety of algebraic expression, including those in which numerator or denominator needs to be rationalized.				4
5. Apply the laws of exponents to perform operations on expressions with fractional exponents.	4			4
6. Know the numeric, graphic and symbolic properties of power, logarithmic and exponential functions.				4
7. Solve a wide variety of mathematical real-world problems involving power, exponential and logarithmic functions and equations, discard extraneous solutions and present results graphically.				4
8. Know the numeric, graphic and symbolic properties of rational functions.				4
9. Solve a wide variety of mathematical and real-world problems involving rational functions, discard extraneous solutions and present results graphically.				4

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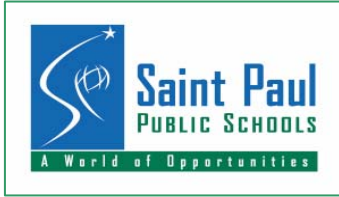


# Mathematics: High School

## Essential Standards

E. Algebra (Continued)	1	2	3	4
10. Find equations of parabolas, ellipses and hyperbolas when presented with their graphs having axes parallel to the coordinate axes.			4	
11. Add, subtract, multiply and divide complex numbers, interpret sums geometrically, and find complex solutions of quadratic equations.				4
12. Know and use the Factor and Remainder Theorems.				4
13. Find the inverse of a function and composition of functions by numeric and symbolic methods. Know the relationship between the graphs of a function and its inverse.			4	
14. Know and use formal notation for sequences and series to solve related problems.				4
<b>F. Trigonometry &amp; Geometry</b>				
<b>Standard: Understand the properties of the standard trigonometric functions and apply them to real-world and mathematical problems, especially geometrical problems. Develop increased mastery of geometric proof methodology.</b>				
<b>The student will:</b>				
1. Know the six trigonometric functions defined for an angle in a right triangle.		4 X		4
2. Given the coordinates of a point on the terminal side of an angle in standard position in the plane, find the values of the trigonometric functions.		4		4
3. Convert between degrees and radian measures.		4	4	4
4. Solve applied problems about triangles using the law of sines including the ambiguous case.		4	4	4
5. Solve applied problems about triangles using the law of cosines.			4	4
6. Graph the functions of the form $A \sin(Bt + C)$ , $A \cos(Bt + C)$ , and $A \tan(Bt + C)$ and know the meaning of the terms frequency, amplitude, phase shift and period.			4	4

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## Essential Standards

<b>F. Trigonometry &amp; Geometry (continued)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
7. Simplify trigonometric expressions using identities and verify simple trigonometric identities including $\sin 2x + \cos 2x = 1$ , sum, difference, double angle, and half-angle formulas for sine and cosine.				4
8. Find all solutions of a trigonometric equation on various intervals.				4
9. Know and be able to use the definitions of the inverse trigonometric functions and related methods to solve problems such as find $\cos(x)$ and $\tan(x)$ given the value of $\sin x$ and the quadrant containing the terminal side.				4

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