

Haddon Township School District

Curriculum Overview

Subject Area: Mathematics

Grade Level: 8th Grade

Course Name: Algebra I

Course Overview/Description:

Algebra I focuses on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling with linear equations, and solving linear equations and systems of linear equations; and quadratic relationships as well as polynomials; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) utilizing algebraic reasoning to solve real-world and mathematical problems.

Unit Title	Unit Summary	Student Learning Targets
Unit 1: Variables and Expressions	In Unit 1 students expand on their knowledge of variables and expressions. Students will learn to write and evaluate expressions with unknown values. Properties will be used to simplify expressions. Students will also explore real number operations.	Learners will demonstrate the ability to: <ul style="list-style-type: none">• Write algebraic expressions• Simplify expressions involving exponents• Use the order of operations to evaluate expressions• Classify, graph, and compare real numbers• Find and estimate square roots• Identify and use properties of real numbers• Find sums and differences of real numbers• Find products and quotients of real numbers• Use the distributive property to simplify expressions• Solve equations using tables and mental math

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		Use tables, equations, and graphs to describe relationships
Unit 2: Solving Equations	Unit 2 focuses on solving equations. Students will discover that equivalent equations are equations that have the same solution(s). Students will learn to use the properties of equality and inverse operations to find equivalent equations. Equations will be used to describe, explain, and predict various aspects of the real world. Students will solve one-step, two-step, and multi-step linear equations as well as equations with variables on both sides. Students will study proportional relationships and recognize that in these relationships the ratio of the two quantities remains constant as the corresponding values of the quantities change. Students will recognize that in proportional relationships there are an infinite number of ratios equal to this constant ratio. Solving proportions using the Multiplication Property and Cross Products Property will also be studied and applied to the concept of similar figures. Students will also study the percent proportion/equation as well as percent change.	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Find equivalent equations using inverse operations and simplification ● Solve equations using addition, subtraction, multiplication, or division ● Use the Distributive Property to simplify expressions and solve equations ● Use the Multiplication Property of Equality and the Cross Products Property to solve proportions. ● Calculate unit rates ● Use proportions to solve problems involving percents, measurements in similar figures, and indirect measurement ● Use scale drawings such as maps
Unit 3: Solve Inequalities	Unit 3 connects and extends the topics learned in the previous unit to solving inequalities. Similar to the previous unit students will write and graph inequalities as well as use properties to solve inequalities (including multi-step and compound inequalities). Students will discover that inequality symbols are used to compare the values of two expressions. Students will also examine absolute value equations and inequalities. In order to solve absolute value equations/inequalities students will	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Write, graph, and identify solutions of inequalities ● Use addition and subtraction to solve inequalities ● Use multiplication and division to solve inequalities ● Solve multi-step inequalities ● Write sets and identify subsets ● Find the complement of a set

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	<p>first isolate the absolute value then write a pair of equivalent equations or inequalities.</p>	<ul style="list-style-type: none"> ● Solve and graph inequalities containing the word <i>and</i> ● Solve and graph inequalities containing the word <i>or</i> ● Solve equations and inequalities involving absolute value ● Find the unions and intersections of sets
<p>Unit 4: An Introduction to Function</p>	<p>Unit 4 introduces functions. Students will represent functions using tables, equations, and graphs. Students will learn that the value of one variable may be uniquely determined by the value of another variable. Function rules will be used to represent arithmetic sequences. Students will model real world situations that are continuous and real world situations that are discrete. Students will represent real-world functional relationships using equations. The equations will be used to find the solution to real-world problems.</p>	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Represent functions using tables, equations, and graphs ● Identify and represent patterns that describe linear functions ● Identify and represent patterns that describe nonlinear functions ● Graph equations that represent functions ● Write equations that represent functions ● Determine whether a relation is a function ● Find domain and range and use function notation ● Identify and extend patterns in sequences ● Represent arithmetic sequences using function notation ● Use function notation ● Represent arithmetic sequences using function rules ● Use graphs to relate two quantities ● Model real world situations that are continuous and real world situations that are discrete
<p>Unit 5: Linear Functions</p>	<p>Unit 5 connects and extends the topics covered in the previous unit to graphing equations. In this unit</p>	<p>Learners will demonstrate the ability to:</p>

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	<p>students will focus on linear functions. They will analyze various slopes and describe their meaning. Students will use equations to determine the slope and y-intercept of a line. Students will apply what they know about slope and equations to create lines of best fit. They will use these lines to make predictions.</p>	<ul style="list-style-type: none"> ● Find rates of change from tables ● Find slope ● Write and graph an equation of a direct variation ● Write linear equations using slope-intercept form. ● Graph linear equations in slope-intercept form. ● Write and graph equations using point-slope form ● Graph linear equations using intercepts ● Write linear equations in standard form ● Determine whether lines are parallel, perpendicular, or neither ● Write equations of parallel and perpendicular lines ● Write an equation of a trend line and of a line of best fit ● Use a trend line and a line of best fit to make predictions ● Graph an absolute value function <p style="padding-left: 40px;">Translate the graph of an absolute value function</p>
<p>Unit 6: Systems of Equations and Inequalities</p>	<p>Unit 6 connects and extends the concepts associated with equations and inequalities to systems of equations and inequalities. Students will solve systems of equations/inequalities by using the graphing, substitution, and elimination methods. Students will write equations and inequalities to represent situations, including real world problems. Students will analyze real-world situations and examine their constraints.</p>	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Solve systems of equations by graphing ● Analyze special systems ● Solve systems of equations using substitution ● Solve systems by adding or subtracting to eliminate a variable ● Choose the best method for solving a system of linear equations ● Graph linear inequalities in two variables ● Use linear inequalities when modeling real-world situations

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		<ul style="list-style-type: none"> ● Solve systems of linear inequalities by graphing ● Model real-world situations using systems of linear inequalities
Unit 7: Exponents and Exponential Functions	<p>Unit 7 expands students' understandings and skills related to exponential expressions. It will be discovered that quantities can be represented by many different expressions. Students will define and use zero and negative. They will learn to represent numbers less than one using negative exponents. Students will learn the rules for multiplying and dividing powers. Exponential functions will be used to show growth and decay. Students will analyze exponential growth situations that provide real world applications of exponents and exponential functions.</p>	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Simplify expressions involving zero and negative exponents ● Multiply powers with the same base ● Raise a power to a power ● Raise a product to a power ● Divide powers with the same base ● Raise a quotient to a power ● Rewrite expressions involving radicals and rational exponents ● Evaluate and graph exponential functions ● Model exponential growth and decay ● Write and use recursive formulas for geometric sequences
Unit 8: Polynomials and Factoring	<p>Unit 8 connects and extends the topics covered in the last unit (exponents and exponential Functions) to polynomials. Students will apply the rules of exponents in order to add, subtract, and multiply polynomial expressions. The distributive property will be used to multiply and factor polynomials. Students will also use the Properties of Real Numbers to manipulate polynomial expressions.</p>	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Classify, add, and subtract polynomials ● Multiply a monomial by a polynomial ● Factor a monomial from a polynomial ● Multiply two binomials or a binomial by a trinomial ● Find the square of a binomial and find the product of a sum and difference ● Factor trinomials of the form x^2+bx+c ● Factor trinomials of the form ax^2+bx+c ● Factor perfect-square trinomials and the differences of two squares

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		<ul style="list-style-type: none"> ● Factor higher degree polynomials by grouping
Unit 9:	<p>Unit 9 focuses on solving quadratic equations. In this unit students will solve quadratic equations by graphing, factoring, completing the square, and using the quadratic formula. Students will study quadratic graphs and their properties. Quadratic functions will be used to model real world situations. Students will decide if linear, quadratic, or exponential functions appropriately model a set of data.</p>	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Graph quadratic functions of the form $y=ax^2$ and $y= ax^2+c$ ● Graph quadratic functions of the form $y= ax^2+bx+c$ ● Solve quadratic equations by graphing and using square roots ● Solve quadratic equations by factoring ● Solve quadratic equations by completing the square ● Solve quadratic equations by using the quadratic formula ● Determine the number of solutions of a quadratic equation ● Choose a linear, quadratic, or exponential model for data <p>Solve a system of linear and quadratic equations</p>
Unit 10:	<p>Unit 10 introduces concepts related to the square root operations. Students will add, subtract, multiply, and divide with radicals. Students will learn to rationalize the denominators of radical expressions. They will also draw graphs and examine square root functions. Students will also apply previously learned methods to solve equations that contain square roots. Students will also be introduced to the Pythagorean Theorem. They will apply the Pythagorean Theorem to real-world applications.</p>	<p>Learners will demonstrate the ability to:</p> <ul style="list-style-type: none"> ● Solve problems using the Pythagorean Theorem ● Identify right triangles ● Simplify radicals involving products and quotients ● Simplify sums and differences of radical expressions ● Simplify products and quotients of radical expressions ● Graph square root functions ● Translate graphs of square root functions <p>Find and use trigonometric ratios</p>

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Unit 11:	Unit 11 connects and extends the topics introduced in previous units to rational expressions and functions. Students will graph and simplify rational expressions. Students will add, subtract, multiply, and divide rational expressions and use inverse operations to solve rational equations. Students will also identify extraneous solutions when solving rational equations. They will also explore the concept of inverse variation.	Learners will demonstrate the ability to: <ul style="list-style-type: none">● Simplify rational expressions● Simplify and divide rational expressions● Simplify complex fractions● Divide polynomials● Add and subtract rational expressions● Solve rational equations and proportions● Write and graph equations for inverse variations● Compare direct and inverse variations● Graph rational functions
Unit 12:	Unit 12 introduces the topics of data analysis and probability. In this unit students will examine samples and conduct surveys. They will organize data in displays such as matrices, frequency tables, histograms, and box-and-whisker plots. They will describe data using measures of central tendency. Students will make predictions based on the data they collect and observe. Students will also compare theoretical and experimental probabilities.	Learners will demonstrate the ability to: <ul style="list-style-type: none">● Organize data in a matrix● Add and subtract matrices and multiply a matrix by a scalar● Make and interpret frequency tables and histograms● Find mean, median, mode, and range● Make and interpret box-and-whisker plots● Find quartiles and percentiles● Classify data and analyze samples and surveys● Find permutations and combinations● Find theoretical and experimental probabilities● Find probabilities of mutually exclusive and overlapping events Find probabilities of independent and dependent events