Westmoreland County Public Schools
Pacing Guide and Checklist 2018-2019
Algebra 1

1st Quarter			
Verbal Situations/Evaluate Expressions (SOL A.1a, b) (5 days)			
Vocabulary	**Big Ideas/VDOE Lesson Plans**	**# of Days**	**Essential Knowledge & Skills**
translate algebraic symbolic quantitative situations represent variable verbal concrete pictorial evaluate orders of ops absolute value square root cube root rational number magnitude	**Big ideas:** Studying algebra helps your mind to think logically and break down and solve problems. One day you might reach a point where you don't use algebra on a daily basis. However your brain will have been trained to think in a logical way, which will not only help you in the workplace, but also in daily life, when choosing which mobile phone contract to select, or trying to work out if you have paid the right amount of tax. The fact is that all modern technology relies on mathematics and algebra - Google, the internet, mobile phones, satellites and digital televisions wouldn't exist without algebra. From 10 Reasons for Studying Algebra; http://www.mathscareers.org.uk/article/10-reasons-for-studying-algebra/ **A.1a** Algebra is the language of mathematics. Translating from a verbal algebraic expression or equation into an algebraic statement allows us to represent practical situations mathematically and eventually solve problems related to the situation. • Why do we use variables in algebra? • When is it helpful to translate between verbal quantitative situations and algebraic expressions and equations? • How can you represent practical situations with algebraic expressions in a variety of ways? **A.1b** There are a variety of ways to compute the value of a numerical expression and evaluate an algebraic expression. Often, a practical situation requires the input of various amounts in order to predict an outcome. • Why are orders of operations important?	**6**	• Translate between verbal quantitative situations and algebraic expressions and equations. (a) • Represent practical situations with algebraic expressions in a variety of representations (e.g., concrete, pictorial, symbolic, verbal). (a) • Evaluate algebraic expressions, using the order of operations, which include absolute value, square roots, and cube roots for given replacement values to include rational numbers, without rationalizing the denominator. (b)

Understanding the Standard

- Mathematical modeling involves creating algebraic representations of quantitative practical situations.
- The numerical value of an expression depends upon the values of the replacement set for the variables.
- There are a variety of ways to compute the value of a numerical expression and evaluate an algebraic expression using order of operations.
- The operations and the magnitude of the numbers in an expression affect the choice of an appropriate computational technique (e.g., mental mathematics, calculator, paper, and pencil).

Review: Combining Like Terms/Properties of Real Numbers/Equality/Inequality (SOL A.4a) (3 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
like-terms coefficients see properties list to the right properties of real #'s properties of equality properties of inequality	**Big ideas:** • How can combining like-terms help when solving multi-step equations? • How can fully understanding properties increase the accuracy rate when solving equations? • Properties of Real Numbers: – Associative Property of Addition – Associative Property of Multiplication – Commutative Property of Addition – Commutative Property of Multiplication – Identity Property of Addition (Additive Identity) – Identity Property of Multiplication (Multiplicative Identity) – Inverse Property of Addition (Additive Inverse) – Inverse Property of Multiplication (Multiplicative Inverse) – Distributive Property • Properties of Equality: – Multiplicative Property of Zero – Zero Product Property – Reflexive Property – Symmetric Property – Transitive Property of Equality – Addition Property of Equality – Subtraction Property of Equality – Multiplication Property of Equality – Division Property of Equality – Substitution	3	• Review: Combining like terms. This time will give students an opportunity to discover like-terms and how this skill will facilitate the process of solving equation. • Although the emphasis is placed on the application of properties, this will be a good time to review the properties in preparation for solving equations.

Solving Multi-Step Equations (SOL A.4a, A.4e) (10 Days)

		# of	

Vocabulary	Big Ideas/VDOE Lesson Plans	Days	Essential Knowledge & Skills
equation multi-step linear infinite algebraically properties equality practical problems (properties: listed above and below)	**Big ideas:** Equations give us a precise way to represent many situations that arise in the world. As such, solving equations allows us to answer questions about those situations and sometimes even determine that there is no solution. Although practical situations can be modeled by a variety of equations, this unit provides the foundation of solving linear equations. These fundamental solving skills are built upon in all future mathematics courses to address an even wider variety of practical situations. • How can you determine whether a linear equation has one, an infinite number, or no solution? • Why is it important to understand the properties of real numbers and properties of equality? • **VDOE Lesson Plan**	**10**	• Determine whether a linear equation in one variable has one, an infinite number, or no solutions. (a) • Apply the properties of real numbers and properties of equality to simplify expressions and solve equations. (a, b) • Solve multistep linear equations in one variable algebraically. (a) • Solve practical problems involving equations. (e)

Understanding the Standard

- A solution to an equation is the value or set of values that can be substituted to make the equation true.
- Practical problems may be interpreted, represented, and solved using linear equations.
- The process of solving linear equations can be modeled in a variety of ways, using concrete, pictorial, and symbolic representations.
- Properties of real numbers and properties of equality are applied to solve equations.
- Properties of Real Numbers:
  - Associative Property of Addition
  - Associative Property of Multiplication
  - Commutative Property of Addition
  - Commutative Property of Multiplication
  - Identity Property of Addition (Additive Identity)
  - Identity Property of Multiplication (Multiplicative Identity)
  - Inverse Property of Addition (Additive Inverse)
  - Inverse Property of Multiplication (Multiplicative Inverse)
  - Distributive Property
- Properties of Equality:
  - Multiplicative Property of Zero
  - Zero Product Property
  - Reflexive Property
  - Symmetric Property
  - Transitive Property of Equality

- Addition Property of Equality
- Subtraction Property of Equality
- Multiplication Property of Equality
- Division Property of Equality
- Substitution

- Equations can be used as mathematical models for practical situations.
- Solutions and intervals may be expressed in different formats, including set notation or using equations and inequalities.
  - Examples may include:

Equation/ Inequality	Set Notation
$x = 3$	{3}
$x = 3$ or $x = 5$	{3, 5}
$y \geq 3$	$\{y: y \geq 3\}$
Empty (null) set Ø	{ }

Literal Equations (SOL A.4c) (5 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
literal equation	**Big ideas:** **A.4c** • How would solving a literal equation for a specified variable be helpful? • When would you want to solve a literal equation for a specified variable? **VDOE Lesson Plan**	**5**	• Solve a literal equation for a specified variable. (c)

Understanding the Standard

- Literal equations include formulas.

Solving Multi-Step Linear Inequalities (SOL A.5a, A.5c) (7 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
linear inequalities graphically ordered pair a solution multiple	**Big ideas:** Inequalities, like equations, give us a precise way to represent many situations that arise in the world. As such, solving inequalities allows us to answer questions about those situations and sometimes even determine that there is no solution. Although practical situations can be modeled by a variety of inequalities, this course provides the foundation of solving linear inequalities as well as systems of linear	**7**	• Solve multistep linear inequalities in one variable algebraically and represent the solution graphically. (a) • Apply the properties of real numbers and properties of inequality to solve multistep linear inequalities in one variable algebraically. (a) • Solve practical problems involving linear inequalities. (c) • Determine and verify algebraic solutions using a graphing

solutions	inequalities. These fundamental solving skills are built upon in future mathematics courses to address an even wider variety of practical situations. **A.5a** • How is solving a multistep linear inequality the same as solving a multistep linear equation? How is it different? • Why is it important to represent the solutions to a multistep linear inequality on a number line? • How can understanding the properties of real numbers and properties of inequality help when solving a multistep linear inequality? **A.5c** • What does the solution of a linear inequality represent? **A.5abcd** • How can using a graphing utility help you to understand solving and representing inequalities? **VDOE Lesson Plan**		utility. (a, b, c, d)

Understanding the Standard

A solution to an inequality is the value or set of values that can be substituted to make the inequality true.

The graph of the solutions of a linear inequality is a half-plane bounded by the graph of its related linear equation. Points on the boundary are included unless the inequality contains only < or > (no equality condition).

Practical problems may be modeled and solved using linear inequalities.

- Solutions and intervals may be expressed in different formats, including set notation or using equations and inequalities.
  - Examples may include:

Equation/ Inequality	Set Notation
$x = 3$	{3}
$x = 3$ or $x = 5$	{3, 5}
$y \geq 3$	$\{y: y \geq 3\}$
Empty (null) set Ø	{ }

Properties of Real Numbers and Properties of Inequality are applied to solve inequalities.

Properties of Real Numbers:

- Associative Property of Addition
- Associative Property of Multiplication
- Commutative Property of Addition
- Commutative Property of Multiplication

- Identity Property of Addition (Additive Identity)
- Identity Property of Multiplication (Multiplicative Identity)
- Inverse Property of Addition (Additive Inverse)
- Inverse Property of Multiplication (Multiplicative Inverse)
- Distributive Property

Properties of Inequality:

- Transitive Property of Inequality
- Addition Property of Inequality
- Subtraction Property of Inequality
- Multiplication Property of Inequality
- Division Property of Inequality
- Substitution

Radicals (SOL A.3a, b, c) (8 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
square roots cube roots monomial numerical expression radical expressions consecutive integers radicand perfect square prime factorization	**Big ideas:** Square and cube roots are important because they show up in many practical applications. Square roots (and Pythagorean Theorem) are useful when computing distances, finding the length of a side of a square room, architecture, web design, electrical work, carpentry, linear and cubic regressions, and so much more. Cube roots are useful for architecture, cubic regressions, and many science topics. **A.3ab** • How is finding the square root of a whole number different from finding the square root of an algebraic expression? How are they the same? • What is the relationship between perfect squares and square roots? Perfect cubes and cube roots? **A.3c** • How does an understanding of combining like terms help when simplifying radical expressions? • How does understanding the concept of simplifying radicals help when simplifying radical expressions? **VDOE Lesson Plan**	**8**	• Express the square root of a whole number in simplest form. (a) • Express the principal square root of a monomial algebraic expression in simplest form where variables are assumed to have positive values. (a) • Express the cube root of an integer in simplest form. (b) • Simplify a numerical expression containing square or cube roots. (c) • Add, subtract, and multiply two monomial radical expressions that are limited to a numerical radicand. (c)

Understanding the Standard

- A radical expression in Algebra I contains the square root symbol ($\sqrt{}$) or the cube root symbol ($\sqrt[3]{}$).
- A square root of a number *a* is a number *y* such that $y^2 = a$.
- A cube root of a number *b* is a number *y* such that $y^3 = b$.

- A square root in simplest form is one in which the radicand has no perfect square factors other than one.
- The inverse of squaring a number is determining the square root.
- Any non-negative number other than a perfect square has a principal square root that lies between two consecutive whole numbers.
- A cube root in simplest form is one in which the radicand has no perfect cube factors other than one.
- The cube root of a perfect cube is an integer.
- The cube root of a non-perfect cube lies between two consecutive integers.
- The inverse of cubing a number is determining the cube root.

Laws of Exponents (SOL A.2a) (5 Days) (8-Day Unit)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
exponents base power squared cubed monomial laws of exponents scientific notation	**Big ideas:** The laws of exponents are taught to simplify the process of performing operations on expressions. The laws of exponents are especially useful in the study of science where very large and very small quantities are utilized. **A.2a** • Why is it important to understand exponents? **VDOE Lesson Plan**	**5 of 8**	• Simplify monomial expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents. (a)

Understanding the Standard

- The laws of exponents can be applied to perform operations involving numbers written in scientific notation.

Quarter 1: (43 Instructional Days)

2nd Quarter

(Continued) Laws of Exponents (SOL A.2a) (3 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
exponents base power squared cubed monomial laws of exponents scientific notation	**Big ideas:** The laws of exponents are taught to simplify the process of performing operations on expressions. The laws of exponents are especially useful in the study of science where very large and very small quantities are utilized. **A.2a** • Why is it important to understand exponents? **VDOE Lesson Plan**	**3 of 8**	• Simplify monomial expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents. (a)

Understanding the Standard
• The laws of exponents can be applied to perform operations involving numbers written in scientific notation.

Polynomials (SOL A.2b) (12 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
polynomials exponent binomial trinomial 1st-degree 2nd-degree leading coefficient binomial divisor	**Big ideas:** **A.2b** Operations with polynomials can be represented concretely, pictorially, and symbolically. Polynomial expressions can be used to model real-world situations such as combinations of polynomial functions used in economics to do cost analysis. **A.2b** • Can two algebraic expressions that appear to be different be equivalent? • How can we use the polynomial operations in practical situations? • How is modeling operations of polynomials with concrete objects, pictures, and symbols useful? • What are some practical situations that would require operations with polynomials? **VDOE Lesson Plan**	**12**	• Model sums, differences, products, and quotients of polynomials with concrete objects and their related pictorial and symbolic representations. (b) • Determine sums and differences of polynomials. (b) • Determine products of polynomials. The factors should be limited to five or fewer terms (i.e., $(4x + 2)(3x + 5)$ represents four terms and $(x + 1)(2x^2 + x + 3)$ represents five terms). (b) • Determine the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor. (b)

Understanding the Standard
• Operations with polynomials can be represented concretely, pictorially, and symbolically. • Polynomial expressions can be used to model practical situations. • For division of polynomials in this standard, instruction on the use of long or synthetic division is not required, but students may benefit from experiences with these methods, which become more useful and prevalent in the study of advanced levels of algebra.

Factoring (SOL A.2C) (12 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
factoring binomial trinomial polynomial 1st degree 2nd degree	**Big ideas:** **A.2c** Multiplying polynomials and factoring polynomials are inverse operations. Factoring reverses polynomial multiplication. Many students see them as a distinct set of rules independent of one another. In order to solve quadratic equations algebraically, students must understand factoring. **A.2c** • Why do we factor polynomials?	**12**	• Factor completely first- and second-degree polynomials in one variable with integral coefficients. After factoring out the greatest common factor (GCF), leading coefficients should have no more than four factors. (c) • Factor and verify algebraic factorizations of polynomials with a graphing utility. (c)

	• How is a difference of squares different from other polynomials? How is it the same? • What is the relationship between the factor(s) of a polynomial and the graph of the polynomial? **VDOE lesson Plan**		

Understanding the Standard

- Factoring reverses polynomial multiplication.
- Trinomials may be factored by various methods including factoring by grouping.
  - Example of factoring by grouping
    $2x^2 + 5x - 3$
    $2x^2 + 6x - x - 3$
    $2x(x + 3) - (x + 3)$
    $(x + 3)(2x - 1)$
- Prime polynomials cannot be factored over the set of integers into two or more factors, each of lesser degree than the original polynomial.

Quadratics (SOL A.4b) (SOL A.7c, d) (6 days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
quadratic algebraically graphically rational irrational zeros roots x-intercepts factors function	**Big ideas:** This unit provides the foundation of solving quadratic equations. These fundamental solving skills are built upon in all future mathematics courses to address an even wider variety of practical situations. **A.4b** • What methods can you use to solve a quadratic equation algebraically? **A.7cd** • is also part of the Quadratics unit. This unit follows the Polynomials and Factoring unit. **A.7c** • How can you identify the zeros of a function? • How can you use the x-intercepts from a quadratic function to determine its factors? **A.7d** • How can you identify the intercepts of a function? • How can you use the x-intercepts from a quadratic function to determine its factors? **VDOE Lesson Plan**	**6**	• Solve quadratic equations in one variable algebraically. Solutions may be rational or irrational. (4b) • Identify the zeros, roots, and intercepts of a function presented algebraically or graphically. (7b, c, d) • Use the *x*-intercepts from the graphical representation of a quadratic function to determine and confirm its factors. (7c, d)

Understanding the Standard

- Each point on the graph of a quadratic equation in two variables is a solution of the equation.
- Practical problems may be interpreted, represented, and solved using quadratic equations.
- The process of solving quadratic equations can be modeled in a variety of ways, using concrete, pictorial, and symbolic representations.
- Quadratic equations in one variable may be solved algebraically by factoring and applying properties of equality or by using the quadratic formula over the set of real numbers (Algebra I) or the set of complex numbers (Algebra II).
- The *x*-intercept is the point at which the graph of a relation or function intersects with the *x*-axis. It can be expressed as a value or a coordinate.

Functions/Relations (SOL A.7 a, b, e, f) (7 days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
function relation ordered pairs mapping tables graphs domain range algebraically graphically f(x) vertical line test multiple representations verbal descriptions	**Big ideas:** Functions are a unifying idea in mathematics because they represent many input-output situations that arise in practical situations, especially with technological advances. Functions are a powerful tool to simplify complex situations and predict outcomes. **A.7a** • What is the difference between a relation and a function? • What are the different ways functions can be represented? • How can you determine whether a relation is a function when given a set of ordered pairs, a table, or a mapping? • How can you determine whether a relation is a function when given a graph? **A.7b** • How can you identify the domain and range of a function? **A.7e** • How can you find f(x) for a given value or set of given values of x? **A.7f** • How can you represent relations and functions using verbal descriptions, tables, equations, and graphs? **A.7abcdef** • How do you investigate characteristics of functions with a graphing utility? **VDOE Lesson Plan**	**7**	• Determine whether a relation, represented by a set of ordered pairs, a table, a mapping, or a graph is a function. (a) • Identify the domain and range of a function presented algebraically or graphically. (b, c, d) • For any value, *x,* in the domain of *f*, determine *f*(*x*). (e) • Represent relations and functions using verbal descriptions, tables, equations, and graph. Given one representation, represent the relation in another form. (f) • Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f)

Understanding the Standard

- A relation is a function if and only if each element in the domain is paired with a unique element of the range.

- Functions describe the relationship between two variables where each input is paired to a unique output.
- Function families consist of a parent function and all transformations of the parent function.
- The domain of a function is the set of all possible values of the independent variable.
- The range of a function is the set of all possible values of the dependent variable.
- For each x in the domain of f, x is a member of the input of the function f, $f(x)$ is a member of the output of f, and the ordered pair (x, $f(x)$) is a member of f.
- A value x in the domain of f is an x-intercept or a zero of a function f if and only if $f(x) = 0$.

- Given a polynomial function $f(x)$, the following statements are equivalent for any real number, k, such that $f(k) = 0$:
  - k is a zero of the polynomial function $f(x)$, located at (k, 0);
  - $(x – k)$ is a factor of $f(x)$;
  - k is a solution or root of the polynomial equation $f(x) =0$; and
  - the point (k, 0) is an x-intercept for the graph of $y = f(x)$.
- The x-intercept is the point at which the graph of a relation or function intersects with the x-axis. It can be expressed as a value or a coordinate.
- The y-intercept is the point at which the graph of a relation or function intersects with the y-axis. It can be expressed as a value or a coordinate.
- The domain of a function may be restricted by the practical situation modeled by a function.
- Solutions and intervals may be expressed in different formats, including set notation or using equations and inequalities.
  - Examples may include:

Equation/ Inequality	Set Notation
$x = 3$	{3}
$x = 3$ or $x = 5$	{3, 5}
$y \geq 3$	{y: $y \geq 3$}
Empty (null) set Ø	{ }

Quarter 2: (40 Instructional Days)

3rd Quarter

Direct & Inverse Variation (SOL A.8) (8 days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
variation direct y = kx proportionality inverse	**Big ideas:** Proportional reasoning is making comparisons between objects using multiplicative thinking. This proportional reasoning can be used to solve a variety of practical problems where two variables are directly or inversely related to one another. • How can you determine whether a direct variation exists in a	**8**	• Given a data set or practical situation, determine whether a direct variation exists. • Given a data set or practical situation, determine whether an inverse variation exists. • Given a data set or practical situation, write an equation for a

y = k/x constant origin directly proportional constant of variation dependent variable independent variable	data set or practical situation? • How can you determine whether an inverse variation exists in a data set or practical situation? • What is the difference between direct and inverse variation? • How do you write an equation for a direct variation situation? • How do you write an equation for an inverse variation situation? • How do you graph an equation representing a direct variation? **VDOE Lesson Plan**		direct variation. • Given a data set or practical situation, write an equation for an inverse variation. • Given a data set or practical situation, graph an equation representing a direct variation.

Understanding the Standard

- Practical problems may be represented and solved by using direct variation or inverse variation.
- A direct variation represents a proportional relationship between two quantities. The statement "*y* is directly proportional to *x*" is translated as $y = kx$.
- The constant of proportionality (*k*) in a direct variation is represented by the ratio of the dependent variable to the independent variable and can be referred to as the constant of variation.
- A direct variation can be represented by a line passing through the origin.
- An inverse variation represents an inversely proportional relationship between two quantities. The statement "*y* is inversely proportional to *x*" is translated as $y = \frac{k}{x}$.
- The constant of proportionality (*k*) in an inverse variation is represented by the product of the dependent variable and the independent variable and can be referred to as the constant of variation.
- The value of the constant of proportionality is typically positive when applied in practical situations.

Slope (SOL A.6a) (8 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
slope of a line rate of change positive negative zero horizontal line undefined	**Big ideas:** **A.6a** The slope of a line represents a constant rate of change. Many practical situations including science, construction, and business all represent various situations in terms of rate of change. In addition, rate of change is the foundation of calculus where interpretation is also essential with correct units of measure. **A.6a**	**8**	• Determine the slope of the line, given the equation of a linear function. (a) • Determine the slope of a line, given the coordinates of two points on the line. (a) • Determine the slope of a line, given the graph of a line. (a)

vertical line	• How is slope the same or different in an equation of a line, graph of a line, or from two points on a line? • What does it mean if a line that has a slope that is positive, negative, zero, or undefined? **VDOE Lesson Plan**		• Recognize and describe a line with a slope or rate of change that is positive, negative, zero, or undefined. (a)

Understanding the Standard

- Changes in slope may be described by dilations or reflections or both.
- Linear equations can be graphed using slope, *x*- and *y*-intercepts, and/or transformations of the parent function.
- The slope of a line represents a constant rate of change in the dependent variable when the independent variable changes by a constant amount.
- Parallel lines have equal slopes.
- The product of the slopes of perpendicular lines is -1 unless one of the lines has an undefined slope.
- Slope can be described as a rate of change and will be positive, negative, zero, or undefined.

Equations of Lines (SOL A.6b, c) Inequalities in Two Variables (SOL A.5b, c) (15 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
equation of a line parent function transformation x-intercept y-intercept standard form slope-intercept form point-slope form parallel lines perpendicular lines solid line dotted line shading graph	**Big ideas:** **A.6b** Lines are all around us in everything we see every day. Buildings have lines; paintings and drawings have lines; just about anything you can think of has lines. A line can be represented by its graph or by an equation. Different forms of linear equations lend themselves to different situations. Practical applications using parallel and perpendicular lines include road construction (most American towns are laid out with parallel and perpendicular lines), architectural design, railroad tracks, building frameworks, window panes and blinds, power lines, and the goal posts on a football field. **A.6b** • How do you determine the best method to use when writing the equation of a line? • What is the relationship between the slopes of parallel lines? • What is the relationship between the slopes of perpendicular lines? • How can you write the equation of a line parallel or perpendicular to a given line through a given point? **A.6c** The graph of a line represents the set of points that satisfies the equation of a line. Graphs can be used as visual representations to	**15**	• Write the equation of a line when given the graph of a line. (6b) • Write the equation of a line when given two points on the line whose coordinates are integers. (6b) • Write the equation of a line when given the slope and a point on the line whose coordinates are integers. 6(b) • Write the equation of a vertical line as $x = a$. (6b) • Write the equation of a horizontal line as $y = c$. (6b) • Write the equation of a line parallel or perpendicular to a given line through a given point. (6b) • Graph a linear equation in two variables, including those that arise from a variety of practical situations. (6c) • Use the parent function $y = x$ and describe transformations defined by changes in the slope or *y*-intercept. (6c) • Represent the solution of a linear inequality in two variables graphically. (5b) • Determine whether a coordinate pair is a solution of a linear inequality. (5c)

	investigate relationships between quantitative data. **A.6c** • How can you graph a linear equation? • How do you describe transformations of linear equations based on the parent function y = x? **A.5b** • How is the graph of a linear inequality in two variables similar to the graph of a linear equation in two variables? How are they different? **A.5c** • What does the solution of a linear inequality represent? **VDOE Lesson Plan**		

Understanding the Standard

A.6

- Changes in the *y*-intercept may be described by translations.
- Linear equations can be graphed using slope, *x*- and *y*-intercepts, and/or transformations of the parent function.
- The slope of a line represents a constant rate of change in the dependent variable when the independent variable changes by a constant amount.
- The equation of a line defines the relationship between two variables.
- The graph of a line represents the set of points that satisfies the equation of a line.
- A line can be represented by its graph or by an equation. Students should have experiences writing equations of lines in various forms, including standard form, slope-intercept form, or point-slope form.
- Parallel lines have equal slopes.
- The product of the slopes of perpendicular lines is -1 unless one of the lines has an undefined slope.

A.5

- A solution to an inequality is the value or set of values that can be substituted to make the inequality true.
- The graph of the solutions of a linear inequality is a half-plane bounded by the graph of its related linear equation. Points on the boundary are included unless the inequality contains only < or > (no equality condition).

Curves of Best Fit (SOL A.9) (8 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
curve of best fit scatterplot predict	**Big ideas:** In many practical situations in a variety of areas such as business and science, observational data is gathered and graphed so that a unifying model can be determined to make predictions about unobserved input		• Determine an equation of a curve of best fit, using a graphing utility, given a set of no more than twenty data points in a table, a graph, or a practical situation.

data analyze reasonableness data points patterns	values. These predictions assist researchers in making important decisions about the situation of study. Therefore, it is also important that the reasonableness of predictions be addressed. • What is the process to determine an equation of a curve of best fit? • How do you make predictions using data, scatterplots, or the equation of the curve of best fit? • How can you solve practical problems involving an equation of the curve of best fit? • How can you evaluate the reasonableness of a curve of best fit for a practical situation? **VDOE Lesson Plan**	**8**	• Make predictions, using data, scatterplots, or the equation of the curve of best fit. • Solve practical problems involving an equation of the curve of best fit. • Evaluate the reasonableness of a mathematical model of a practical situation.

Understanding the Standard

- Data and scatterplots may indicate patterns that can be modeled with an algebraic equation.
- Determining the curve of best fit for a relationship among a set of data points is a tool for algebraic analysis of data. In Algebra I, curves of best fit are limited to linear or quadratic functions.
- The curve of best fit for the relationship among a set of data points can be used to make predictions where appropriate.
- Knowledge of transformational graphing using parent functions can be used to verify a mathematical model from a scatterplot that approximates the data.
- Graphing utilities can be used to collect, organize, represent, and generate an equation of a curve of best fit for a set of data.
- Many problems can be solved by using a mathematical model as an interpretation of a practical situation. The solution must then refer to the original practical situation.
- Data that fit linear $y = mx + b$ and quadratic $y = ax^2 + bx + c$ functions arise from practical situations.
- Rounding that occurs during intermediate steps of problem solving may reduce the accuracy of the final answer.
- Evaluation of the reasonableness of a mathematical model of a practical situation involves asking questions including:
  - "Is there another linear or quadratic curve that better fits the data?"
  - "Does the curve of best fit make sense?"
- "Could the curve of best fit be used to make reasonable predictions?"

Quarter 3: (39 Instructional Days)

4th Quarter

Systems of Equations (SOL A.4d, e) (9 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
system of equations elimination substitution unique solution	**Big ideas:** Equations give us a precise way to represent many situations that arise in the world. As such, solving equations allows us to answer questions about those situations and sometimes even determine that there is no solution. Although practical situations can be modeled by a variety of equations, this unit provides the foundation of solving systems of	**9**	• Given a system of two linear equations in two variables that has a unique solution, solve the system by substitution or elimination to identify the ordered pair which satisfies both equations. (d) • Given a system of two linear equations in two variables that

point of intersection infinite solutions no solution algebraically graphically ordered pair	linear equations. These fundamental solving skills are built upon in all future mathematics courses to address an even wider variety of practical situations. **A.4d** • How is the graph of a system of equations related to its solution? • What does it mean if a system of two linear equations has one solution? An infinite number of solutions? No solutions? • How can you determine the most efficient method for solving a system of linear equations? **A.4e** • Why is it important to interpret the solution to a system of equations? • How can you determine if the solution to a system of two linear equations is reasonable for a practical situation? Why is this important? • How can a system of equations be used to solve a practical problem? **VDOE Lesson Plan**		has a unique solution, solve the system graphically by identifying the point of intersection. (d) • Solve and confirm algebraic solutions to a system of two linear equations using a graphing utility. (d) • Determine whether a system of two linear equations has one, an infinite number, or no solutions. (d) • Write a system of two linear equations that models a practical situation. (e) • Interpret and determine the reasonableness of the algebraic or graphical solution of a system of two linear equations that models a practical situation. (e) • Solve practical problems involving equations and systems of equations. (e)

Understanding the Standard

- A solution to an equation is the value or set of values that can be substituted to make the equation true.
- A system of linear equations with exactly one solution is characterized by the graphs of two lines whose intersection is a single point, and the coordinates of this point satisfy both equations.
- A system of two linear equations with no solution is characterized by the graphs of two parallel lines that do not intersect.
- A system of two linear equations having an infinite number of solutions is characterized by two lines that coincide (the lines appear to be the graph of one line), and the coordinates of all points on the line that satisfy both equations. These lines will have the same slope and *y*-intercept.
- Systems of two linear equations can be used to model two practical conditions that must be satisfied simultaneously.
- Systems of equations can be used as mathematical models for practical situations.

Systems of Inequalities (SOL A.5d) (6 Days)

Vocabulary	Big Ideas/VDOE Lesson Plans	# of Days	Essential Knowledge & Skills
system of inequalities solid lines dotted lines shading half-plane bounded	**Big ideas:** Inequalities give us a precise way to represent many situations that arise in the world. As such, solving inequalities allows us to answer questions about those situations and sometimes even determine that there is no solution. Although practical situations can be modeled by a variety of inequalities, this course provides the foundation of solving linear inequalities as well as systems of linear inequalities. These fundamental solving skills are built upon in future mathematics	**6**	• Represent the solution of a system of two linear inequalities graphically. (d) • Determine and verify algebraic solutions using a graphing utility. (a, b, c, d)

	courses to address an even wider variety of practical situations. **A.5d** • What does the solution of a system of linear inequalities represent? **A.5abcd** • How can using a graphing utility help you to understand solving and representing inequalities? **VDOE Lesson Plans**		

Understanding the Standard

- A solution to an inequality is the value or set of values that can be substituted to make the inequality true.
- The graph of the solutions of a linear inequality is a half-plane bounded by the graph of its related linear equation. Points on the boundary are included unless the inequality contains only < or > (no equality condition).

SOL Review (25 Days)