8th Grade Algebra I Curriculum Guide
Lunenburg County Public Schools
June 2014

Marking Period: 1
Days: 5
Reporting Category/Strand: EXPRESSIONS AND OPERATIONS

SOL A.1	The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Translate verbal quantitative situations into algebraic expressions and vice versa. • Model real-world situations with algebraic expressions in a variety of representations (concrete, pictorial, symbolic, verbal). • Evaluate algebraic expressions for a given replacement set to include rational numbers. • Evaluate expressions that contain absolute value, square roots, and cube roots. **ESSENTIAL UNDERSTANDINGS** • Algebra is a tool for reasoning about quantitative situations so that relationships become apparent. • Algebra is a tool for describing and representing patterns and relationships. • Mathematical modeling involves creating algebraic representations of quantitative real-world situations. • The numerical value of an expression is dependent 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. • The operations and the magnitude of the numbers in an expression impact the choice of an appropriate computational technique. • An appropriate computational technique could be mental mathematics, calculator, or paper and pencil.
Essential Questions	● What is algebra? ● How is a variable used in an algebraic expression? ● Why is it necessary to have an agreed upon order of operations? ● How are algebraic expressions modeled?

	• How is order of operations applied when simplifying and evaluating expressions?
Primary Resources	Translate & Evaluate ESS, Evaluating & Simplifying Expressions ESS, Notes- Translating Expressions, Notes- Translating Expressions KEY, Worksheet: Tricky Translations - Algebraic Writing Prompt (doc), Worksheet: Algebraic Expressions CW (doc), Worksheet: Algebraic Expressions HW (doc), Quiz: Algebraic Expressions (doc) Notes: Evaluating Expressions (doc), Notes: Evaluating Expressions KEY, Warm-up: Order of Operations (doc), Notes: Open Sentences (ppt), Worksheet: Evaluating Expressions CW (doc), Worksheet: Open Sentences HW (doc), Worksheet: Open Sentences (pdf),
Essential Vocabulary	

Marking Period: 1
Days: 15
Reporting Category/Strand: EQUATIONS AND INEQUALITIES

SOL A.4adf **A.5ac**	**A.4** The student will solve multistep linear and quadratic equations in two variables, including a) solving literal equations (formulas) for a given variable; d) solving multi-step linear equations algebraically and graphically;and f) solving real-world problems involving equations. **A.5** The student will solve multistep linear inequalities in two variables, including a) solving multi-step linear inequalities algebraically and graphically; and c) solving real-world problems involving inequalities.
Essential Knowledge/Skills/Understandings	**A.4 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Solve a literal equation (formula) for a specified variable. • Solve multistep linear equations in one variable. • Confirm algebraic solutions to linear equations, using a graphing calculator. • Determine if a linear equation in one variable has one, an infinite number, or no solutions.

	A.4 ESSENTIAL UNDERSTANDINGS • A solution to an equation is the value or set of values that can be substituted to make the equation true. • The solution of an equation in one variable can be found by graphing the expression on each side of the equation separately and finding the x-coordinate of the point of intersection. • Real-world problems can be interpreted, represented, and solved using linear and quadratic equations. • The process of solving linear and quadratic equations can be modeled in a variety of ways, using concrete, pictorial, and symbolic representations. • Equations and systems of equations can be used as mathematical models for real-world situations. • Set builder notation may be used to represent solution sets of equations. **A.5 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Solve multistep linear inequalities in one variable. • Solve real-world problems involving inequalities. **A.5 ESSENTIAL UNDERSTANDINGS** • A solution to an inequality is the value or set of values that can be substituted to make the inequality true. • Real-world problems can be modeled and solved using linear inequalities. • Set builder notation may be used to represent solution sets of inequalities.
Essential Questions	• What is a literal equation? • How are equations modeled? • What is the same about solving equations and solving inequalities and what is different? • How are solutions written in set builder notation? • What do the endpoints of the graph of an inequality represent?
Primary Resources	Solve for the Unknown ESS A.4abdf, Cover-up Problems ESS A.4bd, Algebra Tiles & Equation Solving ESS A.4bd, Solving Linear Equations ESS A.4d, Inequalities ESS A.5a, Greetings ESS A.5abc Notes: Literal Equations (doc), Notes: Literal Equations KEY, Activity: Using a Transformed Formula -

	Investigation (doc), Worksheet: Literal Equations CW (doc), Worksheet: Literal Equations HW (doc) Notes: Multi-Step Equations (doc), Notes: Multi-Step Equations KEY, Worksheet: Multi-Step Equations CW (doc), Worksheet: Multi-Step Equations HW (doc) Notes: Solving Equations with Variables on Both Sides (doc) , Notes: Solving Equations with Variables on Both Sides KEY, Worksheet: Solving Equations with Variables on Both Sides CW (doc), Worksheet: Solving Equations with Variables on Both Sides CW (doc), Quiz: Solving Equations with Variables on Both Sides (doc) Notes: Solving Inequalities (doc) Notes: Solving Inequalities KEY, Worksheet: Solving Inequalities Maze (doc), Worksheet: Solving Inequalities (doc), Worksheet: Applications of Inequalities Classwork (doc), Worksheet: Applications of Inequalities Homework (doc)
Essential Vocabulary	

Marking Period: 1
Days: 10
Reporting Category/Strand: EQUATIONS AND INEQUALITIES

SOL A.4b **A.5b**	**A.4** The student will solve multistep linear and quadratic equations in two variables, including: b) justifying steps used in simplifying expressions and solving equations, using field properties and axioms of equality that are valid for the set of real numbers and its subsets; **A.5** The student will solve multistep linear inequalities in two variables, including: b) justifying steps used in solving inequalities, using axioms of inequality and properties of order that are valid for the set of real numbers and its subsets;
Essential Knowledge/Skills/Understandings	**A.4 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Simplify expressions and solve equations, using the field properties of the real numbers and properties of equality to justify simplification and solution. **A.4 ESSENTIAL UNDERSTANDINGS**

	• Properties of real numbers and properties of equality can be used to justify equation solutions and expression simplification. **A.5 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Justify steps used in solving inequalities, using axioms of inequality and properties of order that are valid for the set of real numbers. **A.5 ESSENTIAL UNDERSTANDINGS** • Properties of inequality and order can be used to solve inequalities.
Essential Questions	How are the field properties and properties of equality of real numbers used to solve equations? How are the properties of real numbers used to solve inequalities?
Primary Resources	A Mystery to Solve ESS A.4b, Properties Template
Essential Vocabulary	

Marking Period: 1
Days: 5
Reporting Category/Strand: FUNCTIONS

SOL A.8	The student, given a situation in a real-world context, will analyze a relation to determine whether a direct or inverse variation exists, and represent a direct variation algebraically and graphically and an inverse variation algebraically.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Given a situation, including a real-world situation, determine whether a direct variation exists. • Given a situation, including a real-world situation, determine whether an inverse variation exists. • Write an equation for a direct variation, given a set of data. • Write an equation for an inverse variation, given a set of data.

	• Graph an equation representing a direct variation, given a set of data. **ESSENTIAL UNDERSTANDINGS** • The constant of proportionality in a direct variation is represented by the ratio of the dependent variable to the independent variable. • The constant of proportionality in an inverse variation is represented by the product of the dependent variable and the independent variable. • A direct variation can be represented by a line passing through the origin. • Real-world problems may be modeled using direct and/or inverse variations.
Essential Questions	• What is direct variation? • What is inverse variation? • How is a relation analyzed to determine direct variation? • How is a relation analyzed to determine inverse variation? • What is the constant of proportionality in a direct variation? • What is the constant of proportionality in an inverse variation? • How do you represent a direct variation algebraically and graphically? • How do you represent an inverse variation algebraically?
Primary Resources	Direct Variation ESS A.8, Inverse Variation ESS A.8 Notes: Variation (doc) , Notes: Variation key, Notes: Direct and Inverse Variation (ppt), Guided Notes: Direct and Inverse Variation (doc), Worksheet: Variations CW (doc), Worksheet: Variations HW (doc)
Essential Vocabulary	

Marking Period: 2
Days: 10
Reporting Category/Strand: FUNCTIONS

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SOL A.7abf	The student will investigate and analyze function (linear and quadratic) families and their characteristics both algebraically and graphically, including: a) determining whether a relation is a function; b) domain and range;and f) making connections between and among multiple representations of functions including concrete, verbal, numeric, graphic, and algebraic.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Determine whether a relation, represented by a set of ordered pairs, a table, or a graph is a function. • Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. • Represent relations and functions using concrete, verbal, numeric, graphic, and algebraic forms. Given one representation, students will be able to represent the relation in another form. • Detect patterns in data and represent arithmetic and geometric patterns algebraically. **ESSENTIAL UNDERSTANDINGS** • A set of data may be characterized by patterns, and those patterns can be represented in multiple ways. • Graphs can be used as visual representations to investigate relationships between quantitative data. • Inductive reasoning may be used to make conjectures about characteristics of function families. • Each element in the domain of a relation is the abscissa of a point of the graph of the relation. • Each element in the range of a relation is the ordinate of a point of the graph of the relation. • A relation is a function if and only if each element in the domain is paired with a unique element of the range. • Set builder notation may be used to represent domain and range of a relation.
Essential Questions	● What is a relation and when does it become a function? ● How are domain/range, abscissa/ordinate, and independent/dependent variables related in a set of ordered pairs, table, or a graph?

	• How can the ordered pair (x, y) be represented using function notation? • What is the zero of a function? • How are domain and range represented in set builder notation?
Primary Resources	Square Patios ESS A.7aef, Functions 1 ESS A.7ab, Function Sort Cards (pdf) Functions 2 ESS A.7bcdef Notes: Functions and Relations (doc) Notes: Functions and Relations KEY, Notes: Domain and Range, Worksheet: Relations CW (doc), Worksheet: Relations HW (doc)
Essential Vocabulary	

Marking Period: 2
Days: 5
Reporting Category/Strand: FUNCTIONS

SOL A.7ce	The student will investigate and analyze function (linear and quadratic) families and their characteristics both algebraically and graphically, including: c) zeros of a function; e) finding the values of a function for elements in its domain;
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. • For each x in the domain of f, find f(x). **ESSENTIAL UNDERSTANDINGS** • The values of f(x) are the ordinates of the points of the graph of f.

	• The object f(x) is the unique object in the range of the function f that is associated with the object x in the domain of f. • 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. • An object x in the domain of f is an x-intercept or a zero of a function f if and only if f(x) = 0.
Essential Questions	● How can the ordered pair (x, y) be represented using function notation? ● What is the zero of a function?
Primary Resources	Factoring for Zeros ESS A.4c, A.7c, Notes: Zeros and Intercepts (doc) Notes: Zeros and Intercepts KEY, Worksheet: Zeros and Intercepts CW (doc), Worksheet: Zeros and Intercepts HW (doc) Notes: Finding Function Values (doc), Notes: Finding Function Values KEY, Worksheet: Finding Function Values CW (doc), Worksheet: Finding Function Values HW (doc)
Essential Vocabulary	

Marking Period: 2
Days: 10
Reporting Category/Strand: EQUATIONS AND INEQUALITIES & FUNCTIONS

SOL A.7d **A.6a**	**A.7** The student will investigate and analyze function (linear and quadratic) families and their characteristics both algebraically and graphically, including: d) x- and y-intercepts. **A.6** The student will graph linear equations and linear inequalities in two variables, including: a) determining the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined.

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Essential Knowledge/Skills/Understandings	**A.7 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. • For each x in the domain of f, find f(x). **A.7 ESSENTIAL UNDERSTANDINGS** • The values of f(x) are the ordinates of the points of the graph of f. • The object f(x) is the unique object in the range of the function f that is associated with the object x in the domain of f. • 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. • An object x in the domain of f is an x-intercept or a zero of a function f if and only if f(x) = 0. **A.6 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Find the slope of the line, given the equation of a linear function. • Find the slope of a line, given the coordinates of two points on the line. • Find the slope of a line, given the graph of a line. • Recognize and describe a line with a slope that is positive, negative, zero, or undefined. **A.6 ESSENTIAL UNDERSTANDINGS** • Changes in slope may be described by dilations or reflections or both. • 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.
Essential Questions	● How does the slope of a line relate to real-world situations? ● What is meant by the term rate of change? ● How does slope relate to graphs, equations, and points on a line? ● What are positive, negative, zero, and undefined slopes and why are they important? ● How does changing the coefficient of the independent variable of an equation affect the slope of a line? ● What is the standard form of a linear equation? ● What does the slope intercept form of a linear equation mean?

	• What is the parent function of a linear equation? • What is the role of transformations in graphing linear equations?
Primary Resources	Functions 2 ESS A.7bcdef, Slope 2 Slope ESS A.6ab, Slippery Slope ESS A.6a, The Submarine ESS A.6a, Equations of Lines ESS A.6ab Notes: Graphing and Transforming Linear Equations (doc), Notes: Graphing and Transforming Linear Equations KEY, Worksheet: Graphing and Transforming Linear Equations CW (doc), Worksheet: Graphing and Transforming Linear Equations HW (doc)
Essential Vocabulary	

Marking Period: 2
Days: 5
Reporting Category/Strand: EQUATIONS AND INEQUALITIES

SOL A.6a	The student will graph linear equations and linear inequalities in two variables, including: a) determining the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Find the slope of the line, given the equation of a linear function. • Find the slope of a line, given the coordinates of two points on the line. • Find the slope of a line, given the graph of a line. • Recognize and describe a line with a slope that is positive, negative, zero, or undefined. **ESSENTIAL UNDERSTANDINGS** • Changes in slope may be described by dilations or reflections or both. • 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.
Essential Questions	● How does the slope of a line relate to real-world situations? ● What is meant by the term rate of change? ● How does slope relate to graphs, equations, and points on a line? ● What are positive, negative, zero, and undefined slopes and why are they important? ● How does changing the coefficient of the independent variable of an equation affect the slope of a line?
Primary Resources	Slope 2 Slope ESS A.6ab, Slippery Slope ESS A.6a, The Submarine ESS A.6a, Equations of Lines ESS A.6ab Notes: Slope (doc), Notes: Slope KEY, VDOE ESS: Silent Bingo Game (pdf), VDOE ESS: Slope-2-Slope Puzzle (pdf) , VDOE ESS: Slope-2-Slope Puzzle KEY, VDOE ESS: Slope-Intercept Cards (pdf), Worksheet: Slope CW (doc), Worksheet: Slope HW (doc)
Essential Vocabulary	

Marking Period: 2
Days: 5
Reporting Category/Strand: EQUATIONS AND INEQUALITIES

SOL A.6b	The student will graph linear equations and linear inequalities in two variables, including: b) writing the equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Graph linear equations and inequalities in two variables, including those that arise from a variety of real-world situations.

	• Use the parent function y = x and describe transformations defined by changes in the slope or y-intercept. • Use transformational graphing to investigate effects of changes in equation parameters on the graph of the equation. • Write an equation of a line when given the graph of a line. • Write an equation of a line when given two points on the line whose coordinates are integers. • Write an equation of a line when given the slope and a point on the line whose coordinates are integers. • Write an equation of a vertical line as x = a. • Write the equation of a horizontal line as y = c. **ESSENTIAL UNDERSTANDINGS** • 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 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. • 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 it is a strict inequality.
Essential Questions	● What are the appropriate techniques to graph a linear equation in two variables? ● How can a graph of a linear equation be used to represent a real-world situation? ● What are the appropriate techniques to graph a linear inequality in two variables? ● How does the slope of a line relate to real-world situations? ● How does slope relate to graphs, equations, and points on a line? ● How does changing the coefficient of the independent variable of an equation affect the slope of a line? ● What is the standard form of a linear equation? ● What does the slope intercept form of a linear equation mean? ● What is the parent function of a linear equation? ● What is the role of transformations in graphing linear equations?
Primary Resources	Equations of Lines ESS A.6ab, Slope 2 Slope ESS A.6ab, Transformationally Speaking ESS

	A.6b, Transformation Investigation ESS A.6b Notes: Writing Equations of Lines Given a Graph (doc), Notes: Writing Equations of Lines Given a Graph KEY, VDOE ESS: Silent Bingo Game (pdf), VDOE ESS: Slope-2-Slope Puzzle (pdf) , VDOE ESS: Slope-2-Slope Puzzle KEY, VDOE ESS: Slope-Intercept Cards (pdf),Worksheet: Writing Equations of Lines Given a Graph CW (doc), Worksheet: Writing Equations of Lines Given a Graph HW (doc) Notes: Writing Equations of Lines Using Point-Slope Formula (doc) , Notes: Writing Equations of Lines Using Point-Slope Formula KEY, Worksheet: Writing Equations of Lines Using Point-Slope Formula CW (doc), Worksheet: Writing Equations of Lines Using Point-Slope Formula HW (doc)
Essential Vocabulary	

Marking Period: 2
Days: 10
Reporting Category/Strand: EXPRESSIONS AND OPERATIONS

SOL A.2a	The student will perform operations on polynomials, including: a) applying the laws of exponents to perform operations on expressions
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Simplify monomial expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents. **ESSENTIAL UNDERSTANDINGS** • The laws of exponents can be investigated using inductive reasoning. • A relationship exists between the laws of exponents and scientific notation.
Essential Questions	● What is inductive reasoning? ● What are the laws of exponents? ● How are numbers written in scientific notation computed? ● When is it beneficial to use scientific notation?

	• What is the difference between a monomial and a polynomial?
Primary Resources	Exponents ESS A.2a, Scientifically Speaking ESS A.2a Notes: Multiplying Monomials (ppt), Multiplying Monomials Worksheet (doc), Puzzle Worksheets (doc), Monomial Magic (doc), Warm-up: Multiplying Monomials (ppt), Notes: Dividing Monomials (ppt), Activity: Project Graduation Exponents Puzzle (doc), Dividing Monomials Worksheet (pdf), Project Graduation Quotable Puzzle (doc)
Essential Vocabulary	

Marking Period: 3
Days: 15
Reporting Category/Strand: EXPRESSIONS AND OPERATIONS

SOL A.2b	The student will perform operations on polynomials, including: b) adding, subtracting, multiplying, and dividing polynomials
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Model sums, differences, products, and quotients of polynomials with concrete objects and their related pictorial representations. • Relate concrete and pictorial manipulations that model polynomial operations to their corresponding symbolic representations. • Find sums and differences of polynomials. • Find products of polynomials. The factors will have no more than five total terms (i.e. (4x+2)(3x+5) represents four terms and (x+1)(2x2 +x+3) represents five terms). • Find the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor. **ESSENTIAL UNDERSTANDINGS**

	• Operations with polynomials can be represented concretely, pictorially, and symbolically. • Polynomial expressions can be used to model real-world situations. • The distributive property is the unifying concept for polynomial operations. • Polynomial expressions can be used to define functions and these functions can be represented graphically.
Essential Questions	● What is the difference between a monomial and a polynomial? ● How are polynomials added, subtracted, multiplied, and divided? ● How are manipulatives used to model operations of polynomials?
Primary Resources	Dividing Polynomials Using Algebra Tiles ESS A.2b, Multiplying Polynomials Using Algebra Tiles ESS A.2b
Essential Vocabulary	

Marking Period: 3
Days: 10
Reporting Category/Strand: EXPRESSIONS AND OPERATIONS

SOL A.2c	The student will perform operations on polynomials, including: c) factoring completely first- and second-degree binomials and trinomials in one or two variables. Graphing calculators will be used as a tool for factoring and for confirming algebraic factorizations.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Factor completely first- and second-degree polynomials with integral coefficients. • Identify prime polynomials. • Use the x-intercepts from the graphical representation of the polynomial to determine and confirm its factors. **ESSENTIAL UNDERSTANDINGS** • Factoring reverses polynomial multiplication.

	• Some polynomials are prime polynomials and cannot be factored over the set of real numbers. • Polynomial expressions can be used to define functions and these functions can be represented graphically. • There is a relationship between the factors of any polynomial and the x-intercepts of the graph of its related function.
Essential Questions	● What methods are used to factor polynomials? ● What is the relationship between factoring polynomials and multiplying polynomials? ● What is the relationship between the factors of a polynomial and the x-intercepts of the related function?
Primary Resources	Factoring ESS A.2c Notes: Factoring Using GCF (doc), Notes: Factoring Using GCF KEY, Worksheet: Factoring Using GCF Classwork (doc), Worksheet: Factoring Using GCF Homework (doc), Factoring Polynomials Using Algebra Tiles Notes: Factoring Using Difference of Squares (doc), Notes: Factoring Using Difference of Squares KEY, Worksheet: Factoring Using Difference of Squares Classwork (doc), Worksheet: Factoring Using Difference of Squares Homework (doc) Notes: Factoring Trinomials (doc), Notes: Factoring Trinomials KEY, Worksheet: Factoring Trinomials Classwork (doc), Worksheet: Factoring Trinomials Homework (doc), Squares Factoring Puzzle,
Essential Vocabulary	

Marking Period: 3
Days: 10
Reporting Category/Strand: EQUATIONS AND INEQUALITIES

SOL A.4c	The student will solve multistep linear and quadratic equations in two variables, including:

	c) solving quadratic equations algebraically and graphically.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Solve quadratic equations. • Identify the roots or zeros of a quadratic function over the real number system as the solution(s) to the quadratic equation that is formed by setting the given quadratic expression equal to zero. • Confirm algebraic solutions to linear and quadratic equations, using a graphing calculator. **ESSENTIAL UNDERSTANDINGS** • Real-world problems can be interpreted, represented, and solved using linear and quadratic equations. • The process of solving linear and quadratic equations can be modeled in a variety of ways, using concrete, pictorial, and symbolic representations. • The zeros or the x-intercepts of the quadratic function are the real root(s) or solution(s) of the quadratic equation that is formed by setting the given quadratic expression equal to zero. • Equations and systems of equations can be used as mathematical models for real-world situations. • Set builder notation may be used to represent solution sets of equations.
Essential Questions	● What is a quadratic equation? ● What is the standard form of a quadratic equation? ● What methods are used to solve quadratic equations? ● What is the relationship between the solutions of quadratic equations and the roots of a function? ● How are solutions written in set builder notation? ● How can symmetry be helpful in graphing a quadratic function? ● What is the zero of a function?
Primary Resources	Factoring for Zeros ESS A.4c, A.7c, VDOE ESS: Factoring for Zeros Worksheet (pdf)
Essential Vocabulary	

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Days: 10
Reporting Category/Strand: EQUATIONS AND INEQUALITIES

SOL A.4e **A.5d**	**A.4** The student will solve multistep linear and quadratic equations in two variables, including: e) solving systems of two linear equations in two variables algebraically and graphically. **A.5** The student will solve multistep linear inequalities in two variables, including: d) solving systems of inequalities.
Essential Knowledge/Skills/Understandings	**A.4 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Given a system of two linear equations in two variables that has a unique solution, solve the system by substitution or elimination to find the ordered pair which satisfies both equations. • Given a system of two linear equations in two variables that has a unique solution, solve the system graphically by identifying the point of intersection. • Determine whether a system of two linear equations has one solution, no solution, or infinite solutions. • Write a system of two linear equations that models a real-world situation. • Interpret and determine the reasonableness of the algebraic or graphical solution of a system of two linear equations that models a real-world situation. **ESSENTIAL UNDERSTANDINGS** • 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 lines that are parallel. • A system of two linear equations having infinite solutions is characterized by two graphs that coincide (the graphs will appear to be the graph of one line), and the coordinates of all points on the line satisfy both equations. • Systems of two linear equations can be used to model two real world conditions that must be satisfied simultaneously.

	• Equations and systems of equations can be used as mathematical models for real-world situations. • Set builder notation may be used to represent solution sets of equations. **A.5 The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Solve systems of linear inequalities algebraically and graphically. • A solution to an inequality is the value or set of values that can be substituted to make the inequality true. • Real-world problems can be modeled and solved using linear inequalities. • Set builder notation may be used to represent solution sets of inequalities.
Essential Questions	● What is a system of equations? ● In what instances will there be one solution, no solutions, or an infinite number of solutions for a system of equations? ● What methods are used to solve a system of linear equations? ● How are solutions written in set builder notation? ● How are the properties of real numbers used to solve inequalities? ● What is the same about solving equations and solving inequalities and what is different? ● How are the solutions of systems of linear inequalities the same or different from the solutions of systems of equations? ● How are solutions written in set builder notation?
Primary Resources	Spring Fling Carnival ESS A.4ef, The Exercise Fields ESS A.4ef, How Much Is That Tune? ESS A.4ef A.11, Road Trip ESS A.4ef, VDOE ESS: Road Trip Worksheet (pdf) VDOE ESS: Salaries Worksheet (pdf), VDOE ESS: Saving Money Worksheet (pdf) Graphing Systems of Inequalities ESS A.5d, VDOE ESS: Graphing Systems of Inequalities Worksheet (pdf), VDOE ESS: Graphing Systems of Inequalities Worksheet KEY
Essential Vocabulary	

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Marking Period: 4
Days: 5
Reporting Category/Strand: STATISTICS

SOL A.9	The student, given a set of data, will interpret variation in real-world contexts and calculate and interpret mean absolute deviation, standard deviation, and z-scores.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Analyze descriptive statistics to determine the implications for the real-world situations from which the data derive. • Given data, including data in a real-world context, calculate and interpret the mean absolute deviation of a data set. • Given data, including data in a real-world context, calculate variance and standard deviation of a data set and interpret the standard deviation. • Given data, including data in a real-world context, calculate and interpret z-scores for a data set. • Explain ways in which standard deviation addresses dispersion by examining the formula for standard deviation. • Compare and contrast mean absolute deviation and standard deviation in a real-world context. **ESSENTIAL UNDERSTANDINGS** • Descriptive statistics may include measures of center and dispersion. • Variance, standard deviation, and mean absolute deviation measure the dispersion of the data. • The sum of the deviations of data points from the mean of a data set is 0. • Standard deviation is expressed in the original units of measurement of the data. • Standard deviation addresses the dispersion of data about the mean. • Standard deviation is calculated by taking the square root of the variance. • The greater the value of the standard deviation, the further the data tend to be dispersed from the mean. • For a data distribution with outliers, the mean absolute deviation may be a better measure of dispersion than the standard deviation or variance. • A z-score (standard score) is a measure of position derived from the mean and standard deviation of data.

	• A z-score derived from a particular data value tells how many standard deviations that data value is above or below the mean of the data set. It is positive if the data value lies above the mean and negative if the data value lies below the mean.
Essential Questions	• What is the importance of statistics? • What is the mean absolute deviation for a set of data? • What is the variance and standard deviation for a set of data? • What is the z-score?
Primary Resources	Analyzing and Interpreting Statistics ESS A.9, Calculating Measures of Dispersion ESS A.9, Exploring Statistics ESS A.9, z-Scores ESS A.9 Notes: Standard Deviation and Mean Absolute Deviation (doc), Notes: Standard Deviation and Mean Absolute Deviation KEY, Notes: Statistics (ppt), Statistics : Student Notes (doc), Guided Notes: Statistics (doc), Guided Notes: Statistics: Excel Worksheet, Guided Notes: Statistics KEY VDOE ESS: Interpreting Descriptive Statistics Worksheet (pdf), VDOE ESS: Data Collection and Exploring Statistics (pdf), VDOE ESS: Heights of Basketball Players (pdf), Worksheet: Standard Deviation and Z-Scores (doc)
Essential Vocabulary	

Marking Period: 4
Days: 5
Reporting Category/Strand: STATISTICS

SOL A.11	The student will collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve real world problems, using mathematical models. Mathematical models will include linear and quadratic functions.
Essential	**The student will use problem solving, mathematical communication, mathematical**

Knowledge/Skills/Understandings	**reasoning, connections, and representations to:** • Write an equation for a curve of best fit, given a set of no more than twenty data points in a table, a graph, or real-world situation. • Make predictions about unknown outcomes, using the equation of the curve of best fit. • Design experiments and collect data to address specific, real world questions. • Evaluate the reasonableness of a mathematical model of a real world situation. **ESSENTIAL UNDERSTANDINGS** • The graphing calculator can be used to determine the equation of a curve of best fit for a set of data. • The curve of best fit for the relationship among a set of data points can be used to make predictions where appropriate. • Many problems can be solved by using a mathematical model as an interpretation of a real-world situation. The solution must then refer to the original real-world situation. • Considerations such as sample size, randomness, and bias should affect experimental design.
Essential Questions	● What is a curve of best fit? ● How is a curve of best fit used to make predictions in real-world situations? ● How do sample size, randomness, and bias affect the reasonableness of a mathematical model of a real-world situation?
Primary Resources	Linear Curve of Best Fit ESS A.11, Quadratic Curve of Best Fit ESS A.11, Line of Best Fit ESS A.11, How Much Is That Tune? ESS A.4ef A.11 Six Tasks for Quadratics (pdf)
Essential Vocabulary	

Marking Period: 4
Days: 5
Reporting Category/Strand: STATISTICS

SOL A.10	The student will compare and contrast multiple univariate data sets, using box-and-whisker

	plots.
Essential Knowledge/Skills/Understandings	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to:** • Compare, contrast, and analyze data, including data from real world situations displayed in box-and-whisker plots. **ESSENTIAL UNDERSTANDINGS** • Statistical techniques can be used to organize, display, and compare sets of data. • Box-and-whisker plots can be used to analyze data.
Essential Questions	● What is a box-and-whisker plot? ● How is a box-and-whisker plot constructed? ● How is a box-and-whisker plot used in a real-world situation?
Primary Resources	Box-and-Whisker Plots ESS A.10 VDOE ESS: Box-and-Whisker Plots #1 (pdf), VDOE ESS: Box-and-Whisker Plots #2 (pdf), VDOE ESS: Box-and-Whisker Plots #3 (pdf), Worksheet: Box and Whisker Plot (doc)
Essential Vocabulary	

Marking Period: 4
Days: 5
Reporting Category/Strand: EXPRESSIONS AND OPERATIONS

SOL A.3	The student will express the square roots and cube roots of whole numbers and the square root of a monomial algebraic expression in simplest radical form.
Essential	**The student will use problem solving, mathematical communication, mathematical**

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Knowledge/Skills/Understandings	**reasoning, connections, and representations to:** • Express square roots of a whole number in simplest form. • Express the cube root of a whole number in simplest form. • Express the principal square root of a monomial algebraic expression in simplest form where variables are assumed to have positive values. **ESSENTIAL UNDERSTANDINGS** • A square root in simplest form is one in which the radicand (argument) has no perfect square factors other than one. • A cube root in simplest form is one in which the argument 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. • In the real number system, the argument of a square root must be nonnegative while the argument of a cube root may be any real number.
Essential Questions	● What is a radical? ● How are radical expressions simplified? ● What are the restrictions on the radicands for both square roots and cube roots?
Primary Resources	Simplifying Square Roots ESS A.3, Simply Radical ESS A.3 Lesson Plan: Teaching Radicals in Less Than Five Minutes (pdf)
Essential Vocabulary	