MAGOFFIN COUNTY SCHOOLS' CURRICULUM RESOURCES

"Building a Better Future for Every Child - Every Day!"

Summer 2011

Subject Content: Algebra 1 Grade : Freshman

Indicates the Curriculum Map

THESE CONCEPTS WILL NO LONGER BE TAUGHT IN ALGEBRA 1. THEY HAVE BEEN MOVED TO THE INDICATED GRADE BELOW.	
KY.9-12.N.SC.2 Number Sense: Students will locate the position of a real number on the number line, find its distance from the origin (absolute value/magnitude) and find the distance between two numbers on the number line (the absolute value of their difference)	6
KY.9-12.N.EU.4 Students will understand that problem solving and connections with other content areas require a strong sense of number, including applications of absolute value (magnitude) and the ordering of numbers.	6
KY.9-12.N.SC.12 Number Operations: Students will apply absolute value, integer exponents, roots and factorials to solve problems	6
KY.9-12.N.EU.4 Students will understand that problem solving and connections with other content areas require a strong sense of number, including applications of absolute value (magnitude) and the ordering of numbers.	6
KY.9-12.N.SC.2 Number Sense: Students will locate the position of a real number on the number line, find its distance from the origin (absolute value/magnitude) and find the distance between two numbers on the number line (the absolute value of their difference)	6
KY.9-12.A.SC.21 Variables, Expressions and Operations: Students write expressions, equations, inequalities and relations in equivalent forms	6
KY.9-12.A.SC.35 Equations and Inequalities: Students will solve one-variable equations and inequalities using manipulatives, symbols, procedures and graphing, including graphing the solution set on a number line	6
KY.9-12.A.SC.25 Variables, Expressions and Operations: Students will understand the properties of integer exponents and roots and apply these properties to simplify algebraic expressions	7
KY.9-12.N.SC.11 Number Operations: Students will multiply and divide numbers expressed in scientific notation	7
KY.9-12.A.SC.35 Equations and Inequalities: Students will solve one-variable equations and inequalities using manipulatives, symbols, procedures and graphing, including graphing the solution set on a number line	8
KY.9-12.A.SC.38 Equations and Inequalities: Students will solve systems of two linear equations in two variables	8
KY.9-12.A.SC.44 Equations and Inequalities: Students will relate a solution of a system of two linear equations in two variables and the graphs of the corresponding lines	8
KY.9-12.A.SC.38 Equations and Inequalities: Students will solve systems of two linear equations in two variables	8
KY.9-12.G.SC.17 Coordinate Geometry: Students will describe a line by a linear equation	8
KY.9-12.A.SC.49 Equations and Inequalities: Students will write and solve linear sentences, describing real-world situations by using and relating formulas, tables, graphs and equations	8
KY.9-12.A.SC.50 Equations and Inequalities: Students will recognize and solve problems that can be modeled using a linear equation in one variable, a quadratic equation or a system of linear equations.	8
KY.9-12.D.SC.4 Data Representations: Students will display a scatter plot and describe its shape for bivariate data.	8
KY.9-12.D.SC.12 Characteristics of Data Sets: Students will apply line-of-best fit equations for a set of two-variable data to make predictions	8
KY.9-12.D.SC.12 Characteristics of Data Sets: Students will apply line-of-best fit equations for a set of two-variable data to make predictions	8

(TO BE USED THROUGHOUT ENTIRE COURSE)

B. EXPLORING THE SKILLS AND STRATEGIES UNDERLYING MATHEMATICS

1. MATHEMATICAL PROCESSES LEARNED IN THE CONTEXT OF INCREASINGLY COMPLEX MATHEMATICAL AND REAL-WORLD PROBLEMS

a. APPLY PROBLEM-SOLVING SKILLS (E.G., IDENTIFYING IRRELEVANT OR MISSING INFORMATION, MAKING CONJECTURES, EXTRACTING MATHEMATICAL MEANING, RECOGNIZING AND PERFORMING MULTIPLE STEPS WHEN NEEDED, VERIFYING RESULTS IN THE CONTEXT OF THE PROBLEM) TO THE SOLUTION OF REAL-WORLD PROBLEMS
b. USE A VARIETY OF STRATEGIES TO SET UP AND SOLVE INCREASINGLY COMPLEX PROBLEMS
c. REPRESENT DATA, REAL-WORLD SITUATIONS, AND SOLUTIONS IN INCREASINGLY COMPLEX CONTEXTS (E.G., EXPRESSIONS, FORMULAS, TABLES, CHARTS, GRAPHS, RELATIONS, FUNCTIONS) AND UNDERSTAND THE RELATIONSHIPS
d. USE THE LANGUAGE OF MATHEMATICS TO COMMUNICATE INCREASINGLY COMPLEX IDEAS ORALLY AND IN WRITING, USING SYMBOLS AND NOTATIONS CORRECTLY
e. MAKE APPROPRIATE USE OF ESTIMATION AND MENTAL MATHEMATICS IN COMPUTATIONS AND TO DETERMINE THE REASONABLENESS OF SOLUTIONS TO INCREASINGLY COMPLEX PROBLEMS
f. MAKE MATHEMATICAL CONNECTIONS AMONG CONCEPTS, ACROSS DISCIPLINES, AND IN EVERYDAY EXPERIENCES
g. DEMONSTRATE THE APPROPRIATE ROLE OF TECHNOLOGY (E.G., CALCULATORS, SOFTWARE PROGRAMS) IN MATHEMATICS (E.G., ORGANIZE DATA, DEVELOP CONCEPTS, EXPLORE RELATIONSHIPS, DECREASE TIME SPENT ON COMPUTATIONS AFTER A SKILL HAS BEEN ESTABLISHED)
h. APPLY PREVIOUSLY LEARNED ALGEBRAIC AND GEOMETRIC CONCEPTS TO MORE ADVANCES PROBLEMS

1-3 weeks	4-6 weeks	7-9 weeks
• **Introduction to Algebra I-The value of a Variable (15)**	• **Introduction to Algebra I-The value of a Variable (5)** • **You've Got Problems – Algebra's Got Solutions (10)**	• **You've Got Problems – Algebra's Got Solutions (conclusion) (15)**
10-12 weeks	13-15 weeks	16-18 weeks
• **Modeling Algebra with Graphs (15)**	• **The Three R's: Rise, Run, and Regression (15)**	• **Systems of Linear Equations (10)** • **Matrices (5)**
19-21 weeks	22-24 weeks	25-27 weeks
• **Systems of Linear Equations (conclusion) (15)**	• **Beyond the First Degree – Exponents and Polynomials (15)**	• **Factoring and Quadratics (15)**
28-30 weeks	31-33 weeks	34-36 weeks
• **Radical Expressions and Equations (15)**	• **Rational Expressions and Equations (15)**	• **Review (15)**

1-3 weeks	
Introduction to Algebra I-The value of a Variable (15)	
CURRICULUM	
ACT Quality Core	**Common Core Standards**
A. Prerequisites **1. SKILLS ACQUIRED BY STUDENTS IN A PREVIOUS COURSE AND REFINED IN THIS COURSE** a. Set up and solve problems following the correct order of operations (including proportions, percent, and absolute value) with rational numbers (integers, fractions, decimals) c. Use rational numbers to demonstrate knowledge of additive and multiplicative inverses d. Simplify ratios f. Add, subtract, multiply, and divide rational numbers, including integers, fractions, and decimals, without calculators **C. Establishing Number Sense and Operation Skills** **1. Foundations** a. Evaluate and simplify expressions requiring addition, subtraction, multiplication, and division with and without grouping symbols b. Translate real-world problems into expression using variables to represent values. c. Apply algebraic properties (e.g., commutative, associative, distributive, identity, inverse, substitution) to simplify algebraic expressions **D. Exploring Expressions, Equations, and functions in the First Degree** 2. Graphs, relations, and functions f. Use the terminology associated with the Cartesian plane in describing points and lines **G. Organizing and Analyzing Data And Applying Probability** **1. Data Relations, Probability, and Statistics** b. Interpret data from line, bar, and circle graphs, histograms, scatter plots, box-and- whisker plots, stem-and-leaf plots, and frequency tables to draw	N.RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. F.BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*(*Modeling standard) F.LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). (Statistics and Probability is a Modeling Conceptual Category.) S.ID.3 Interpret differences in shape, center and spread in the context of data sets, accounting for possible effects of extreme data points (outliers). (Statistics and Probability is a Modeling Conceptual Category.) S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data. (Statistics and Probability is a Modeling Conceptual Category.) S.ID.6a Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.* (Statistics and Probability is a Modeling Conceptual Category.) S.ID.6b Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. b. Informally assess the fit of a function by plotting and analyzing residuals. (Statistics and Probability is a Modeling Conceptual Category.) S.ID.6c Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

inferences and make predictions c. Identify arithmetic sequences and patterns in a set of data h. Identity the most efficient way to display data	c. Fit a linear function for a scatter plot that suggests a linear association. (Statistics and Probability is a Modeling Conceptual Category.) S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. (Statistics and Probability is a Modeling Conceptual Category.) S.ID.9 Distinguish between correlation and causation. (Statistics and Probability is a Modeling Conceptual Category.)

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
N.RN.1	• Define radical notation as a convention used to represent rational exponents.	• Explain the properties of operations of rational exponents as an extension of the properties of integer exponents. • Explain how radical notation, rational exponents, and properties of integer exponents relate to one another. • Note from Appendix A: In implementing the standards in curriculum, these standards should occur before discussing exponential functions with continuous domains.		
N.RN.2	• Using the properties of exponents, rewrite a radical expression as an expression with a rational exponent. • Using the properties of exponents, rewrite an expression with a rational exponent as a radical expression. • Notes from Appendix A: In implementing the standards in curriculum, these standards should occur before discussing exponential functions with continuous domains.			
N.RN.3	• Find the sums and products of rational and irrational numbers. • Recognize that the sum of a rational number and an irrational number is irrational. • Recognize that the product of a nonzero rational number and an irrational number is irrational.	• Explain why rational numbers are closed under addition or multiplication. • Note from Appendix A: Connect N.RN.3 to physical situations, e.g., finding the perimeter of a square of area 2.		
N.Q.1	• Calculate unit conversions. • Recognize units given or needed to solve problem.	• Use given units and the context of a problem as a way to determine if the solution to a multi-step problem is reasonable (e.g. length problems dictate different units than problems dealing with a measure such as slope) • Choose appropriate units to represent a problem when using formulas or graphing. • Interpret units or scales used in formulas or represented in graphs. • Use units as a way to understand problems and to guide the solution of multi-step problems.		
N.Q.2	• Define descriptive modeling.	• Determine appropriate quantities for the purpose of descriptive modeling.		

N.Q.3	• Identify appropriate units of measurement to report quantities. • Determine the limitations of different measurement tools.	• Choose and justify a level of accuracy and/or precision appropriate to limitations on measurement when reporting quantities. • Identify important quantities in a problem or real-world context.		
F.BF.2	• Identify arithmetic and geometric patterns in given sequences. • Generate arithmetic and geometric sequences from recursive and explicit formulas. • Given an arithmetic or geometric sequence in recursive form, translate into the explicit formula. • Given an arithmetic or geometric sequence as an explicit formula, translate into the recursive form. • Notes from Appendix A: Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.	• Use given and constructed arithmetic and geometric sequences, expressed both recursively and with explicit formulas, to model real-life situations. • Determine the recursive rule given arithmetic and geometric sequences. • Determine the explicit formula given arithmetic and geometric sequences. • Justify the translation between the recursive form & explicit formula for arithmetic and geometric sequences. • Notes from Appendix A: Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.		
F.LE.2	• Recognize arithmetic sequences can be expressed as linear functions. • Recognize geometric sequences can be expressed as exponential functions. • Construct linear functions, including arithmetic sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). • Construct exponential functions, including geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.	• Determine when a graph, a description of a relationship, or two input-output pairs (include reading these from a table) represents a linear or exponential function in order to solve problems.		
S.ID.1	• Represent data with plots on the real number line using various display types by creating dot plots, histograms and box plots.			
S.ID.3	• Define “the context of data sets” as meaning the specific nature of the attributes under investigation.	• Interpret differences in shape, center and spread in the context of data sets. • Describe the possible effects the presence of outliers in a set of data can have on shape, center, and spread in the context of the data sets.		

S.ID.5	• Recognize the differences between joint, marginal and conditional relative frequencies. • Calculate relative frequencies including joint, marginal and conditional relative frequencies. • Summarize categorical data for two categories in two-way frequency tables.	• Interpret relative frequencies in the context of the data. • Recognize possible associations and trends in the data.		
S.ID.6a	• Represent data on a scatter plot (2 quantitative variables). • Fit a given function class (e.g. linear, exponential) to data.	• Using given scatter plot data represented on the coordinate plane, informally describe how the two quantitative variables are related. • Determine which function best models scatter plot data represented on the coordinate plane, and describe how the two quantitative variables are related. • Use functions fitted to data to solve problems in the context of the data. • From Appendix A: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.		
S.ID.6b	• Represent the residuals from a function and the data set it models numerically and graphically.	• Informally assess the fit of a function by analyzing residuals from the residual plot. • From Appendix A: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals. Focus on linear models, however, this standard could also preview quadratic functions in Unit 5 of Algebra I.		
S.ID.6c	• From Appendix A: By the end of Middle School, students were creating scatter plots and recognizing linear trends in data. This unit builds upon that prior experience, providing students with more formal means of assessing how a model fits data.	• Fit a linear function for a scatter plot that suggests a linear association.		
S.ID.8	• Compute (using technology) the correlation coefficient of a linear fit. • Define the correlation coefficient.	• Interpret the correlation coefficient of a linear fit as a measure of how well the data fit the relationship. • From Appendix A: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9.		
S.ID.9	• Define positive, negative, and no correlation and explain why correlation does not imply causation. • Define causation.	• Distinguish between correlation and causation. • From Appendix A: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9.		

CRITICAL VOCABULARY

Absolute value	Commutative	Frequency tables	Line graph	Real numbers
Additive inverse	Data	Functions	Lines	Relations
Associative	Decimals	Graphs	Multiplicative inverse	Scatter plots
Bar graph	Distributive	Histograms	Percent	Set
Box-and-whisker plots	Evaluate	Identity	Points	Simplify
Cartesian plane	Expressions	Inferences	Predictions	Stem-and-leaf plots
Charts	Formulas	Integers	Proportions	Substitution
Circle graph	Fractions	Inverse	Rational	Symbols
		Irrational numbers order of operations	Ratios	Tables
				variable

Suggested Strategies/Activities

Comparing Prices of Real Life Situations
Comparing Temperatures in different forms
What's my Value?
Support/Refute values

Balanced Assessment:

Formative	Summative
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

Prentice Hall Algebra 1 textbook, student companion
Prentice Hall Algebra 1 Transition Packet for CCS
ACT Quality Core Algebra 1

http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

4-6 weeks	
• Introduction to Algebra I -The value of a Variable (Conclusion) (5) • *You've Got Problems? Algebra's Got solutions!(10)	
CURRICULUM	
ACT Quality Core A. Prerequisites 1. SKILLS ACQUIRED BY STUDENTS IN A PREVIOUS COURSE AND REFINED IN THIS COURSE a. Set up and solve problems following the correct order of operations (including proportions, percent, and absolute value) with rational numbers (integers, fractions, decimals) c. Use rational numbers to demonstrate knowledge of additive and multiplicative inverses d. Simplify ratios f. Add, subtract, multiply, and divide rational numbers, including integers, fractions, and decimals, without calculators C. Establishing Number Sense and Operation Skills 1. Foundations a. Evaluate and simplify expressions requiring addition, subtraction, multiplication, and division with and without grouping symbols b. Translate real-world problems into expression using variables to represent values. c. Apply algebraic properties (e.g., commutative, associative, distributive, identity, inverse, substitution) to simplify algebraic expressions D. Exploring Expressions, Equations, and functions in the First Degree 1. *Expressions, Equations, and Inequalities a. Solve single-step and multistep equations and inequalities in one variable b. Solve equations that contain absolute value c. Solve formulas for a specified variable d. Write and graph linear equations and inequalities from real-world situations (e.g., A constant-rate distance/line problem) 2. Graphs, relations, and functions a. *Graph linear inequalities in one variable on the real number line to solve problems f. Use the terminology associated with the Cartesian plane in describing points and lines G. Organizing and Analyzing Data And Applying Probability 1. Data Relations, Probability, and Statistics a. *Identify the effect on mean, median, mode, and range when a set of data is changed b. Interpret data from line, bar, and circle graphs, histograms, scatter plots, box-and-whisker plots, stem-and-leaf plots, and frequency tables to draw inferences and make predictions c. Identify arithmetic sequences and patterns in a set of data h. Identity the most efficient way to display data	**Common Core Standards** A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. (Statistics and Probability is a Modeling Conceptual Category.)

Learning Targets I can…				
	Knowledge	**Reasoning**	**Performance**	**Product**
A.REI.1	• Know that solving an equation means that the equation remains balanced during each step. • Recall the properties of equality. • Explain why, when solving equations, it is assumed that the original equation is equal. • From Appendix A: Students should focus on and master A.REI.1 for linear equations and be able to extend and apply their reasoning to other types of equations in future courses.	• Determine if an equation has a solution. • Choose an appropriate method for solving the equation. • Justify solution(s) to equations by explaining each step in solving a simple equation using the properties of equality, beginning with the assumption that the original equation is equal. • Construct a mathematically viable argument justifying a given, or self-generated, solution method.		
A.REI.3	• Recall properties of equality • Solve multi-step equations in one variable • Solve multi-step inequalities in one variable	• Determine the effect that rational coefficients have on the inequality symbol and use this to find the solution set. • Solve equations and inequalities with coefficients represented by letters.		
S.ID.2	• From Appendix A: In grades 6-8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution such as the shape of the distribution or the existence of extreme data points.	• Choose the appropriate measure for center (mean, median) and spread (interquartile range, standard deviation) based on the shape of a data distribution. • Use appropriate statistics for center and spread to compare two or more data sets.		

CRITICAL VOCABULARY

Equations Inequalities Mean Median Mode

Suggested Strategies/Activities

Comparing Prices of Real Life Situations
Comparing Temperatures in different forms
What's my Value?
Support/Refute values

Balanced Assessment:

Formative Examples

Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning

Summative

Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

Prentice Hall Algebra 1 textbook, student companion
Prentice Hall Algebra 1 Transition Packet for CCS
ACT Quality Core Algebra 1

http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

7-9 weeks

- You've got Problems-algebra's got solutions (conclusion) (15)

CURRICULUM

ACT Quality Core	Common Core Standards
D. Exploring Expressions, Equations, and Functions in the First Degree **1. Expressions, Equations, and Inequalities** a. Solve single-step and multistep equations and inequalities in one variable b. Solve equations that contain absolute value c. Solve formulas for a specified variable d. Write and graph linear equations and inequalities from real-world situations (e.g., a constant-rate distance/line problem) 2. Graphs, Relations, and functions a. Graph linear inequalities in one variable on the real number line to solve problems **G. Organizing and Analyzing Data And Applying Probability** **1. Data Relations, Probability, and Statistics** a. Identify the effect on mean, median, mode, and range when a set of data is changed	A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
A.REI.1	• Know that solving an equation means that the equation remains balanced during each step. • Recall the properties of equality. • Explain why, when solving equations, it is assumed that the original equation is equal. • From Appendix A: Students should focus on and master A.REI.1 for linear equations and be able to extend and apply their reasoning to other types of equations in future courses.	• Determine if an equation has a solution. • Choose an appropriate method for solving the equation. • Justify solution(s) to equations by explaining each step in solving a simple equation using the properties of equality, beginning with the assumption that the original equation is equal. • Construct a mathematically viable argument justifying a given, or self-generated, solution method.		
A.REI.3	• Recall properties of equality • Solve multi-step equations in one variable • Solve multi-step inequalities in one variable	• Determine the effect that rational coefficients have on the inequality symbol and use this to find the solution set. • Solve equations and inequalities with coefficients represented by letters.		

CRITICAL VOCABULARY

Absolute value	Mean
Charts	Median
Data	Mode
Expressions	Range
Formulas	Relations
Functions	Symbols
Graphs	tables
Inequalities	

Suggested Strategies/Activities

Comparing Prices of Real Life Situations
Comparing Temperatures in different forms
Solving Equations Dealing with Real Life Situations

Balanced Assessment:

Formative	Summative
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

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http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

10-12 weeks	
• Modeling Algebra with Graphs (15)	
CURRICULUM	
ACT Quality Core **D. Exploring Expressions, Equations, and Functions in the First Degree** **1. Expressions, Equations, and Inequalities** d. Write and graph linear equations and inequalities from real-world situations (e.g., a constant-rate distance/line problem) e. Write linear equation in standard form and slope-intercept form when given two points, a point and the slope, or the graph of the equation **2. Graphs, Relations, and Functions** a. Graph linear inequalities In one variable on the real number line to solve problems b. Give the domain and range of relations and functions c. Evaluate functions at given values d. Identify graphs of relations and functions and analyze them to determine whether a relation is a function (e.g., vertical line test) e. Graph linear inequalities with two variables on the standard (x,y) coordinate plane f. Use the terminology associated with the Cartesian plane in describing points and lines g. Recognize the concept of slope as a rule of change and determine the slope when given the equations of a line in standard form or slope-intercept form, the graph of a line, two points, or a verbal description h. Graph a linear equation using a table of values, x- and y-intercepts, slope-intercept form, and technology i. Translate between different representations of relations and functions: graphs, equations, sets of ordered pairs, verbal descriptions, and tables	**Common Core Standards** F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.**(*Modeling standard) F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.**(*Modeling standard) F.IF.7a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*(Modeling standard) a. Graph linear and quadratic functions and show intercepts, maxima, and minima. F.IF.7b Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*(Modeling standard) b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. F.IF.7e Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*(Modeling standard) e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* F.BF.1a Write a function that describes a relationship between two quantities.*(Modeling standard) a. Determine an explicit expression, a recursive process, or steps for calculation from a context. F.BF.1b Write a function that describes a relationship between two quantities.*(Modeling standard) b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* F.BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* F.LE.1a Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals. F.LE.1b Distinguish between situations that can be modeled with linear functions and with exponential functions. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

	F.LE.1c Distinguish between situations that can be modeled with linear functions and with exponential functions. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
F.IF.4	• Define and recognize the key features in tables and graphs of linear, exponential, and quadratic functions: intercepts; intervals where the function is increasing, decreasing, positive, or negative, relative maximums and minimums, symmetries, and end behavior. • Identify whether the function is linear, exponential, or quadratic, given its table or graph.	• Interpret key features of graphs and tables of functions in the terms of the contextual quantities the function represents. • Sketch graphs showing key features of a function that models a relationship between two quantities from a given verbal description of the relationship. • Notes from Appendix A: Focus on quadratic functions; compare with linear and exponential functions studied in unit 2.		
F.IF.5	• Given the graph or a verbal/written description of a function, identify and describe the domain of the function. • Identify an appropriate domain based on the unit, quantity, and type of function it describes. • Note from Appendix A: Focus on quadratic functions; compare with linear and exponential functions studied in Unit 2.	• Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. • Explain why a domain is appropriate for a given real-world situation.		
F.IF.7a	• Graph linear and quadratic functions, by hand in simple cases or using technology for more complicated cases, and show/label intercepts, maxima, and minima of the graph.	• Determine the differences between simple and complicated linear, exponential and quadratic functions and know when the use of technology is appropriate.		
F.IF.7b	• Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions, by hand in simple cases or using technology for more complicated cases, and show/label key features of the graph. • Notes from Appendix A: Compare and contrast absolute value, step and piece-wise defined functions with linear, quadratic, and exponential functions. Highlight issues of domain, range, and usefulness when examining piece-wise defined functions.	• Determine the difference between simple and complicated linear, quadratic, square root, cube root, and piecewise-defined functions, including step functions and absolute value functions and know when the use of technology is appropriate. • Compare and contrast the domain and range of absolute value, step and piece-wise defined functions with linear, quadratic, and exponential.		
F.IF.7e	• Graph exponential functions, by hand in simple cases or using technology for more complicated cases, and show intercepts and end behavior. • Note from Appendix A: Focus on linear and exponentials functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as $y=3_n$ and $y=100_2$.	• Determine the differences between simple and complicated linear and exponential functions and know when the use of technology is appropriate.		

F.IF.9	• Identify types of functions based on verbal , numerical, algebraic, and graphical descriptions and state key properties (e.g. intercepts, growth rates, average rates of change, and end behaviors) • Differentiate between exponential and linear functions using a variety of descriptors (graphically, verbally, numerically, and algebraically) • Note from Appendix A: Focus on linear and exponential functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as y=3n and y=1002.	• Use a variety of function representations (algebraically, graphically, numerically in tables, or by verbal descriptions) to compare and contrast properties of two functions		
F.BF.1b	• Combine two functions using the operations of addition, subtraction, multiplication, and division • Evaluate the domain of the combined function. • Note from Appendix A: Limit to linear and exponential functions.	• Given a real-world situation or mathematical problem: • build standard functions to represent relevant relationships/ quantities, • determine which arithmetic operation should be performed to build the appropriate combined function, and • relate the combined function to the context of the problem • Note from Appendix A: Limit to linear and exponential functions.		
F.BF.3	• Given a single transformation on a function (symbolic or graphic) identify the effect on the graph. • Using technology, identify effects of single transformations on graphs of functions. • Graph a given function by replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative).	• Describe the differences and similarities between a parent function and the transformed function. • Find the value of k, given the graphs of a parent function, f(x), and the transformed function: f(x) + k, k f(x), f(kx), or f(x + k). • Recognize even and odd functions from their graphs and from their equations. • Experiment with cases and illustrate an explanation of the effects on the graph using technology. • Notes from Appendix A: Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard.		
F.LE.1a	• Recognize that linear functions grow by equal differences over equal intervals. • Recognize that exponential functions grow by equal factors over equal intervals.	• Distinguish between situations that can be modeled with linear functions and with exponential functions to solve mathematical and real-world problems. • Prove that linear functions grow by equal differences over equal intervals. • Prove that exponential functions grow by equal factors over equal intervals.		
F.LE.1b	• Recognize situations in which one quantity changes at a constant rate per unit (equal differences) interval relative to another to solve mathematical and real-world problems.	•		
F.LE.1c	• Recognize situations in which a quantity grows or decays by a constant percent rate per unit (equal factors) interval relative to another to solve mathematical and real-world problems.	•		

F.LE.3	• Informally define the concept of "end behavior".	• Compare tables and graphs of linear and exponential functions to observe that a quantity increasing exponentially exceeds all others to solve mathematical and real-world problems. • Note from Appendix A: Limit to comparisons between linear and exponential models.		
F.LE.5	• Recognize the parameters in a linear or exponential function including: vertical and horizontal shifts, vertical and horizontal dilations. • Recognize rates of change and intercepts as "parameters" in linear or exponential functions.	• Interpret the parameters in a linear or exponential function in terms of a context.		

CRITICAL VOCABULARY

Cartesian plane	Range
Domain	Relations
Equations	slope
Inequalities	Slope-intercept form
Functions	Standard form
Graph	variables

Suggested Strategies/Activities

Relationships of Graphs and Tables	What's my domain?
Relationships of Graphs and Equations	What's my range?

Balanced Assessment:

Formative	**Summative**
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

Prentice Hall Algebra 1 textbook, student companion	http://www.mathopenref.com/
Prentice Hall Algebra 1 Transition Packet for CCS	http://www.geogebra.org/cms/en/download
ACT Quality Core Algebra 1	http://www.studyisland.com

13-15 weeks	
• The 3 R's: Rise, Run, Regression (15)	
CURRICULUM	
ACT Quality Core	**Common Core Standards**
D. Exploring Expressions, Equations, and Functions in the First Degree **1. Expressions, Equations, and Inequalities** d. Write and graph linear equations and inequalities from real-world situations (e.g., a constant-rate distance/line problem) f. Write linear equation in standard form and slope-intercept form when given two points, a point and the slope, or the graph of the equation g. Identify, formulate, and obtain solutions to problems involving direct and inverse variation **2. Graphs, Relations, and Functions** b. Give the domain and range of relations and functions c. Evaluate functions at given values d. Identify graphs of relations and functions and analyze them to determine whether a relation is a function (e.g., vertical line test) e. Graph linear inequalities with two variables on the standard (x,y) coordinate plane f. Use the terminology associated with the Cartesian plane in describing points and lines g. Recognize the concept of slope as a rule of change and determine the slope when given the equations of a line in standard form or slope-intercept form, the graph of a line, two points, or a verbal description h. Graph a linear equation using a table of values, x- and y-intercepts, slope-intercept form, and technology i. Translate between different representations of relations and functions: graphs, equations, sets of ordered pairs, verbal descriptions, and tables **G. Organizing and Analyzing Data and Applying Probability** **1. Data Relation, Probability, and Statistics** c. Identify arithmetic sequences and patterns in a set of data g. Identify an approximate line of best fit to model data and make predictions h. Identify the most efficient way to display data	**A.CED.1 Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*** **A.CED.2 Create equations in two or more variables to represent relationships between quantities, graph equations on a coordinate axes with labels and scales.** **A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*** **F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*).** **F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.** **F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.** **F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*(Modeling standard)** **S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.** **(Statistics and Probability is a Modeling Conceptual Category.)**

Learning Targets I can…				
	Knowledge	**Reasoning**	**Performance**	**Product**
A.CED.1	• Solve linear and exponential equations in one variable. • Solve inequalities in one variable. • Describe the relationships between the quantities in the problem (for example, how the quantities are changing or growing with respect to each other); express these relationships using mathematical operations to create an appropriate equation or inequality to solve. • Note from Appendix A: Limit to linear and exponential equations, and, in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs.	• Create equations (linear and exponential) and inequalities in one variable and use them to solve problems. • Create equations and inequalities in one variable to model real-world situations. • Compare and contrast problems that can be solved by different types of equations (linear & exponential).		
A.CED.2	• Identify the quantities in a mathematical problem or real-world situation that should be represented by distinct variables and describe what quantities the variables represent. • Graph one or more created equation on a coordinate axes with appropriate labels and scales. • Appendix A: the targets extend work on linear and exponential equation in Unit 1 to quadratic equations.	• Create at least two equations in two or more variables to represent relationships between quantities • Justify which quantities in a mathematical problem or real-world situation are dependent and independent of one another and which operations represent those relationships. • Determine appropriate units for the labels and scale of a graph depicting the relationship between equations created in two or more variables.		
A.CED.4	• Define a “quantity of interest” to mean any numerical or algebraic quantity (e.g., in which 2 is the quantity of interest showing that d must be even; and showing that) • From Appendix A: Extend A.CED.4 to formulas involving squared variables.	• Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (e.g. • π * r2 can be re-written as (π *r)*r which makes the form of this expression resemble b*h.)		
F.IF.1	• Identify the domain and range of a function. • Determine if a relation is a function. • Determine the value of the function with proper notation (i.e. f(x)=y, the y value is the value of the function at a particular value of x) • Evaluate functions for given values of x. • Note from Appendix A: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses.	•		
F.IF.2	• Identify mathematical relationships and express them using function notation. • Define a reasonable domain, which depends on the context and/or mathematical situation, for a function focusing on linear and exponential functions. • Evaluate functions at a given input in the domain, focusing on linear and exponential functions.	• Interpret statements that use functions in terms of real world situations, focusing on linear and exponential functions. • Note from Appendix A: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses.		

F.IF.3	• Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n + 1) = f(n) + f(n - 1) for n ≥ 1.* • Notes from Appendix A: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear and exponential functions. In F.IF.3, draw connection to F.BF.2, which requires students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions.	•		
F.IF.6	• Recognize slope as an average rate of change. • Calculate the average rate of change of a function (presented symbolically or as a table) over a specified interval. • Estimate the rate of change from a linear or exponential graph. • Notes from Appendix A: Focus on linear functions and exponential functions whose domain is a subset of the integers. Unit 5 of the Traditional Algebra 1 Pathway and the Traditional Algebra II Pathway address other types of functions.	• Interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.		
S.ID.7	• From Appendix A: Build on students' work with linear relationships in eighth grade.	• Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.		

CRITICAL VOCABULARY

Direct variation Inverse variation

Suggested Strategies/Activities

Rate of Change
Discover my pattern
What's my Rise?

Balanced Assessment:

Formative	**Summative**
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

Prentice Hall Algebra 1 textbook, student companion
Prentice Hall Algebra 1 Transition Packet for CCS
ACT Quality Core Algebra 1

http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

16-18 weeks

- Systems of linear equations(15)

CURRICULUM

ACT Quality Core	Common Core Standards
D. Exploring Expressions, Equations, and Functions in the First Degree **1. Expressions, Equations, and Inequalities** g. Solve systems of two equations using various methods, including elimination, substitution, and graphing with and without technology **2. Graphs, Relations, and functions** e. Graph linear inequalities with two variables on the standard (x,y) coordinate plane g. Recognize the concept of slope as a rate of change and determine the slope when given the equation of a line in standard form or slope-intercept form, the graph of a line, two points, or a verbal description i. Translate between different representations of relations and functions: graphs, Equations, sets of ordered pairs, verbal descriptions, and tables.	A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A.REI.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line y = –3x and the circle x2 + y2 = 3.* A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.11 Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* (Modeling standard) A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
A.CED.3	• Recognize when a modeling context involves constraints. • From Appendix A: Limit targets to linear equations and inequalities.	• Interpret solutions as viable or nonviable options in a modeling context. • Determine when a problem should be represented by equations, inequalities, systems of equations and/ or inequalities. • Represent constraints by equations or inequalities, and by systems of equations and/or inequalities. • From Appendix A: Limit targets to linear equations and inequalities.		
A.REI.5	• Recognize and use properties of equality to maintain equivalent systems of equations.	• Justify that replacing one equation in a two-equation system with the sum of that equation and a multiple of the other will yield the same solutions as the original system.		

A.REI.6	• Solve systems of linear equations by any method.	• Justify the method used to solve systems of linear equations exactly and approximately focusing on pairs of linear equations in two variables. • Notes from Appendix A: Build on student experiences graphing and solving systems of linear equations from middle school to focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to GPE.5 when it is taught in Geometry, which requires students to prove the slope criteria for parallel lines.		
A.REI.7	• Transform a simple system consisting of a linear equation and a quadratic equation in 2 variables so that a solution can be found algebraically and graphically. • Notes from Appendix A: Include systems consisting of one linear and one quadratic equation.	• Explain the correspondence between the algebraic & graphical solutions to a simple system consisting of a linear equation and a quadratic equation in 2 variables.		
A.REI.10	• Recognize that the graphical representation of an equation in two variables is a curve, which may be a straight line. • Explain why each point on a curve is a solution to its equation. • Notes from Appendix A: For A.REI.10, focus on linear and exponential equations and be able to adapt and apply that learning to other types of equations in future courses.	•		
A.REI.11	• Recognize and use function notation to represent linear and exponential equations • Recognize that if (x1, y1) and (x2, y2) share the same location in the coordinate plane that x1 = x2 and y1 = y2. • Recognize that f(x) = g(x) means that there may be particular inputs of f and g for which the outputs of f and g are equal. • Notes from Appendix A: For A.REI.11, focus on cases where f(x) and g(x) are linear or exponential.	• Explain why the x-coordinates of the points where the graph of the equations y=f(x) and y=g(x) intersect are the solutions of the equations f(x) = g(x) . (Include cases where f(x) and/or g(x) are linear and exponential equations) • Approximate/find the solution(s) using an appropriate method for example, using technology to graph the functions, make tables of values or find successive approximations (Include cases where f(x) and/or g(x) are linear and exponential equations).		
A.REI.12	• Identify characteristics of a linear inequality and system of linear inequalities, such as: • boundary line (where appropriate), • shading, and determining appropriate test points to perform tests to find a solution set.	• Explain the meaning of the intersection of the shaded regions in a system of linear inequalities.	•	• Graph a line, or boundary line, and shade the appropriate region for a two variable linear inequality. • Graph a system of linear inequalities and shade the appropriate overlapping region for a system of linear inequalities.

CRITICAL VOCABULARY

Elimination method | Solution of a system of linear equations | Substitution method | System of linear equations | matrices

Suggested Strategies/Activities

Balanced Assessment:	
Formative Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	**Summative** Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed	
Prentice Hall Algebra 1 textbook, student companion	http://www.mathopenref.com/
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ACT Quality Core Algebra 1	http://www.studyisland.com

19-21 weeks	
• Systems of Linear Equations (conclusion) (15)	
CURRICULUM	
ACT Quality Core **D. Exploring Expressions, Equations, and Functions in the First Degree** **1. Expressions, Equations, and Inequalities** g. Solve systems of two equations using various methods, including elimination, substitution, and graphing with and without technology **2. Graphs, Relations, and functions** e. Graph linear inequalities with two variables on the standard (x,y) coordinate plane g. Recognize the concept of slope as a rate of change and determine the slope when given the equation of a line in standard form or slope-intercept form, the graph of a line, two points, or a verbal description a. Translate between different representations of relations and functions: graphs, Equations, sets of ordered pairs, verbal descriptions, and tables	**Common Core Standards** **A.REI.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.** **A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.** **A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.*** **A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).** **A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* (Modeling standard)** **A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.**

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
A.REI.5	• Recognize and use properties of equality to maintain equivalent systems of equations.	• Justify that replacing one equation in a two-equation system with the sum of that equation and a multiple of the other will yield the same solutions as the original system.		
A.REI.6	• Solve systems of linear equations by any method.	• Justify the method used to solve systems of linear equations exactly and approximately focusing on pairs of linear equations in two variables. • Notes from Appendix A: Build on student experiences graphing and solving systems of linear equations from middle school to focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to GPE.5 when it is taught in Geometry, which requires students to prove the slope criteria for parallel lines.		

A.REI.7	• Transform a simple system consisting of a linear equation and a quadratic equation in 2 variables so that a solution can be found algebraically and graphically. • Notes from Appendix A: Include systems consisting of one linear and one quadratic equation. Include systems that lead to work with fractions.	• Explain the correspondence between the algebraic & graphical solutions to a simple system consisting of a linear equation and a quadratic equation in 2 variables.		
A.REI.10	• Recognize that the graphical representation of an equation in two variables is a curve, which may be a straight line. • Explain why each point on a curve is a solution to its equation. • Notes from Appendix A: For A.REI.10, focus on linear and exponential equations and be able to adapt and apply that learning to other types of equations in future courses.			
A.REI.11	• Recognize and use function notation to represent linear and exponential equations • Recognize that if (x1, y1) and (x2, y2) share the same location in the coordinate plane that x1 = x2 and y1 = y2. • Recognize that f(x) = g(x) means that there may be particular inputs of f and g for which the outputs of f and g are equal. • Notes from Appendix A: For A.REI.11, focus on cases where f(x) and g(x) are linear or exponential.	• Explain why the x-coordinates of the points where the graph of the equations y=f(x) and y=g(x) intersect are the solutions of the equations f(x) = g(x) . (Include cases where f(x) and/or g(x) are linear and exponential equations) • Approximate/find the solution(s) using an appropriate method for example, using technology to graph the functions, make tables of values or find successive approximations (Include cases where f(x) and/or g(x) are linear and exponential equations).		
A.REI.12	• Identify characteristics of a linear inequality and system of linear inequalities, such as: • boundary line (where appropriate), • shading, and determining appropriate test points to perform tests to find a solution set.	• Explain the meaning of the intersection of the shaded regions in a system of linear inequalities.		

CRITICAL VOCABULARY

Elimination method | Solution of a system of linear equations | Substitution method | System of linear equations | matrices

Suggested Strategies/Activities

Balanced Assessment:

Formative	**Summative**
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

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ACT Quality Core Algebra 1

http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

22-24 weeks

- Beyond the first degree-Exponents & Polynomials(15)

CURRICULUM

ACT Quality Core

A. Prerequisites
1. SKILLS ACQUIRED BY STUDENTS IN A PREVIOUS COURSE AND REFINED IN THIS COURSE
e. Use scientific notation when working with very large or very small quantities
C. Establishing Number Sense and Operation Skills
1. Foundations
d. Add and subtract polynomials
e. Factor a monomial from a polynomial
f. Multiply monomials, trinomials, and polynomials
F. Exploring Advanced Functions
1. Rational and Radical Expressions
a. Use properties of exponents (including zero and negative exponents) to evaluate and simplify expressions
G. Organizing and Analyzing Data and Applying Probability
1. Data Relations, Probability, and Statistics
d. Identify patterns of growth (e.g., patterns of exponential growth) in a set of data

Common Core Standards

A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

F.IF.8b Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function:
b. Use the properties of exponents to interpret expressions for exponential functions. *For example: identify percent rate of change in functions such as y= (1.02)t, y=(.97)t, y=(1.01)12t, y=(1.2)t/10, and classify them as representing exponential growth or decay.*

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
A.APR.1	• Identify that the sum, difference, or product of two polynomials will always be a polynomial, which means that polynomials are closed under the operations of addition, subtraction, and multiplication. • Define "closure". • Apply arithmetic operations of addition, subtraction, and multiplication to polynomials. • Note from Appendix A: Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of x.	•		
F.IF.8b	• Classify the exponential function as exponential growth or decay by examining the base.	• Use the properties of exponents to interpret expressions for exponential functions in a real-world context. • Note from Appendix A: Note this unit extends the work begun in Unit 2 on exponential functions with integer exponents.		

CRITICAL VOCABULARY					
Binomials monomials	polynomials trinomials	Exponents Exponential function	Growth factor Scientific notation	Exponential growth Exponential decay	Compound interest Decay factor

Suggested Strategies/Activities

Balanced Assessment:

Formative	Summative
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

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ACT Quality Core Algebra 1

http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

25-27 weeks

Factoring & Quadratics (15)

CURRICULUM

ACT Quality Core	Common Core Standards
C. Establishing Number Sense and Operation Skills **1. Foundations** b. Translate real-world problems into expression using variables to represent values. c. Apply algebraic properties (e.g., commutative, associative, distributive, identity, inverse, substitution) to simplify algebraic expressions **D. Exploring Expressions, Equations, and Functions in the First Degree** **2. Graphs, Relations, and Functions** **c**. Evaluate functions at given values f. Use the terminology associated with the Cartesian plane in describing points and lines i. Translate between different representations of relations and functions: graphs, equations, sets of ordered pairs, verbal descriptions, and tables **E. Exploring Quadratic Equations and Functions** 1. Equations and Inequalities a. Factor perfect square trinomials and the differences of two squares b. Factor trinomials in the form $ax^2+ bx + c$ c. Solve quadratic equations using multiple methods, including graphing, factoring, and the square root principle 2. Graphs, relations, and functions a. Identify graphs of quadratic functions b. Relate factors, solutions (roots), zeros of related functions, and x-intercepts in equations that arise from quadratic functions	**A.SSE.1a Interpret expressions that represent a quantity in terms of its context.*(*Modeling standard)** **a. Interpret parts of an expression, such as terms, factors, and coefficients.** **A.SSE.1b Interpret expressions that represent a quantity in terms of its context.* (Modeling standard)** **b. Interpret complicated expressions by viewing one or more of their parts as a single entity.** **A.SSE.2 Use the structure of an expression to identify ways to rewrite it.** **A.SSE.3a Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*(Modeling standard)** **a. Factor a quadratic expression to reveal the zeros of the function it defines.** **A.SSE.3b Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* (Modeling standard)** **b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.** **A.SSE.3c Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* (*Modeling standard)** **c. Use the properties of exponents to transform expressions for exponential functions.** **A.REI.4a Solve quadratic equations in one variable.** **a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)2=q that has the same solutions. Derive the quadratic formula from this form.** **A.REI.4b Solve quadratic equations in one variable.** **b. Solve quadratic equations by inspection (e.g., for *x2* = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as *a* ± *bi* for real numbers *a* and *b*.** **F.IF.8a Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.** **a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.**

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
A.SSE.1a	• For expressions that represent a contextual quantity, define and recognize parts of an expression, such as terms, factors, and coefficients. • Notes from Appendix A: limit to linear expressions and to exponential expressions with integer exponents.	• For expressions that represent a contextual quantity, interpret parts of an expression, such as terms, factors, and coefficients in terms of the context. • Notes from Appendix A: limit to linear expressions and to exponential expressions with integer exponents.		

A.SSE.1b	• The underpinning knowledge for this standard is addressed in For expressions that represent a contextual quantity, define and recognize parts of an expression, such as terms, factors, and coefficients. • Notes from Appendix A: Limit to linear expressions with integer exponents	• For expressions that represent a contextual quantity, interpret complicated expressions, in terms of the context, by viewing one or more of their parts as a single entity. • Notes from Appendix A: Limit to linear expressions with integer exponents		
A.SSE.2	• Identify ways to rewrite expressions, such as difference of squares, factoring out a common monomial, regrouping, etc. • Identify various structures of expressions (e.g. an exponential monomial multiplied by a scalar of the same base, difference of squares in terms other than just x) • Notes from Appendix A: Focus on quadratics and exponential expressions	• Use the structure of an expression to identify ways to rewrite it. • Classify expressions by structure and develop strategies to assist in classification. • Notes from Appendix A: Focus on quadratics and exponential expressions		
A.SSE.3a	• Factor a quadratic expression to produce an equivalent form of the original expression • Explain the connection between the factored form of a quadratic expression and the zeros of the function it defines. • Explain the properties of the quantity represented by the quadratic expression.	• Choose and produce an equivalent form of a quadratic expression to reveal and explain properties of the quantity represented by the original expression. • Notes from Appendix A: It is important to balance conceptual understanding and procedural fluency in work with equivalent expressions. For example, development of skill in factoring and completing the square goes hand-in-hand with understanding what different forms of a quadratic expression reveal.		
A.SSE.3b	• Complete the square on a quadratic expression to produce an equivalent form of an expression. • Explain the connection between the completed square form of a quadratic expression and the maximum or minimum value of the function it defines. • Explain the properties of the quantity represented by the expression.	• Choose and produce an equivalent form of a quadratic expression to reveal and explain properties of the quantity represented by the original expression. • Notes from Appendix A: It is important to balance conceptual understanding and procedural fluency in work with equivalent expressions. For example, development of skill in factoring and completing the square goes hand-in-hand with understanding what different forms of a quadratic expression reveal.		
A.SSE.3c	• Use the properties of exponents to transform simple expressions for exponential functions. • Use the properties of exponents to transform expressions for exponential functions.	• Choose and produce an equivalent form of an exponential expression to reveal and explain properties of the quantity represented by the original expression. • Explain the properties of the quantity or quantities represented by the transformed exponential expression.		
A.REI.4a	• Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)2 = q that has the same solutions. • Solve quadratic equations in one variable. • Notes from Appendix A: Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II.	• Derive the quadratic formula by completing the square on a quadratic equation in x.		

A.REI.4b	• Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring • Express complex solutions as a ± bi for real numbers solutions as a and b.	• Determine appropriate strategies (see first knowledge target listed) to solve problems involving quadratic equations, as appropriate to the initial form of the equation. • Recognize when the quadratic formula gives complex solutions. • Note from Appendix A: Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II.		
F.IF.8a	• Identify different forms of a quadratic expression. • Write functions in equivalent forms using the process of factoring • Identify zeros, extreme values, and symmetry of the graph of a quadratic function	• Interpret different but equivalent forms of a function defined by an expression in terms of a context • Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. • Note from Appendix A: Extend work with quadratics to include the relationship between coefficients and roots, and that once roots are known, a quadratic equation can be factored.		

CRITICAL VOCABULARY

Difference of two squares	graphing	Quadratic functions	Square root principle
factoring	Perfect square trinomials	Solutions (roots)	trinomials

Suggested Strategies/Activities

Balanced Assessment:

Formative	**Summative**
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

Prentice Hall Algebra 1 textbook, student companion
Prentice Hall Algebra 1 Transition Packet for CCS
ACT Quality Core Algebra 1

http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

28-30 weeks

- Radical Expressions & equations (15)

CURRICULUM

ACT Quality Core	Common Core Standards
C. Establishing Number Sense and Operation Skills **1. Foundations** b. Translate real-world problems into expression using variables to represent values. **D. Exploring Expressions, Equations, and Functions in the First Degree** **1. Expressions, Equations, and Inequalities** a. Solve single-step and multistep equations and inequalities in one variable c. Solve formulas for a specified variable 2. Graphs, relations, and functions b. Give the domain and range of relations and functions c. Evaluate functions at given value d. Identify graphs of relations and functions and analyze them to determine whether a relation is a function (e.g., vertical line test) **F. Exploring Advanced Functions** 1. Rational and Radical Expressions, Equations, and Functions d. Find rational number square roots (without calculators) and approximate irrational square roots (with and without calculators) e. Evaluate and simplify radical expressions f. Multiply radical expressions g. Simplify an algebraic quotient by rationalizing an irrational monomial denominator	A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters**.**

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product
A.REI.1	• Know that solving an equation means that the equation remains balanced during each step. • Recall the properties of equality. • Explain why, when solving equations, it is assumed that the original equation is equal. • From Appendix A: Students should focus on and master A.REI.1 for linear equations and be able to extend and apply their reasoning to other types of equations in future courses.	• Determine if an equation has a solution. • Choose an appropriate method for solving the equation. • Justify solution(s) to equations by explaining each step in solving a simple equation using the properties of equality, beginning with the assumption that the original equation is equal. • Construct a mathematically viable argument justifying a given, or self-generated, solution method.		
A.REI.3	• Recall properties of equality • Solve multi-step equations in one variable • Solve multi-step inequalities in one variable	• Determine the effect that rational coefficients have on the inequality symbol and use this to find the solution set. • Solve equations and inequalities with coefficients represented by letters.		

CRITICAL VOCABULARY

Radical expression rationalize Square roots

Suggested Strategies/Activities

Balanced Assessment:

Formative	**Summative**
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

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Prentice Hall Algebra 1 Transition Packet for CCS
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http://www.mathopenref.com/
http://www.geogebra.org/cms/en/download
http://www.studyisland.com

31-33 weeks

- Rational Expressions and Equations (15)

CURRICULUM

ACT Quality Core	Common Core Standards
A. Prerequisites **1. SKILLS ACQUIRED BY STUDENTS IN A PREVIOUS COURSE AND REFINED IN THIS COURSE** d. Simplify ratios f. Add, subtract, multiply, and divide rational numbers, including integers, fractions, and decimals, without calculators **D. Exploring Expressions, Equations, and Functions in the First Degree** **1. Expressions, Equations, and Inequalities** a. Solve single-step and multistep equations and inequalities in one variable c. Solve formulas for a specified variable f. Identify, formulate, and obtain solutions to problems involving direct and inverse variation **. Exploring Advanced Functions** 1. Rational and Radical Expressions, Equations, and Functions b. Evaluate and simplify rational expressions c. Add, subtract, multiply, and divide rational expressions g. Simplify an algebraic quotient by rationalizing and irrational monomial denominator **G. Organizing and Analyzing data and applying probability** 1. Data relations, probability, and statistics e. Find the probability of a simple event f. Distinguish between independent and dependent events g. Identify an approximate line of best fit to model data and make predictions	A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. N.RN.3 Explain why the sum or product of rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the products of a nonzero rational number and an irrational number is irrational

Learning Targets
I can…

	Knowledge	Reasoning	Performance	Product

A.REI.1	• Know that solving an equation means that the equation remains balanced during each step. • Recall the properties of equality. • Explain why, when solving equations, it is assumed that the original equation is equal. • From Appendix A: Students should focus on and master A.REI.1 for linear equations and be able to extend and apply their reasoning to other types of equations in future courses.	• Determine if an equation has a solution. • Choose an appropriate method for solving the equation. • Justify solution(s) to equations by explaining each step in solving a simple equation using the properties of equality, beginning with the assumption that the original equation is equal. • Construct a mathematically viable argument justifying a given, or self-generated, solution method.		
A.REI.3	• Recall properties of equality • Solve multi-step equations in one variable • Solve multi-step inequalities in one variable	• Determine the effect that rational coefficients have on the inequality symbol and use this to find the solution set. • Solve equations and inequalities with coefficients represented by letters.		
N.RN.3	• Find the sums and products of rational and irrational numbers. • Recognize that the sum of a rational number and an irrational number is irrational. • Recognize that the product of a nonzero rational number and an irrational number is irrational.	• Explain why rational numbers are closed under addition or multiplication. • Note from Appendix A: Connect N.RN.3 to physical situations, e.g., finding the perimeter of a square of area 2.		

CRITICAL VOCABULARY

Rational expression

Suggested Strategies/Activities

Balanced Assessment:

Formative	**Summative**
Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning, bell ringers	Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

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http://www.studyisland.com

34-36 weeks

• Review