NEW MILFORD PUBLIC SCHOOL
New Milford, Connecticut

ALGEBRA 1 COLLEGE PREP

June 2015

Approved by BOE April 2015

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New Milford’s Mission Statement

The mission of the New Milford Public Schools, a collaborative partnership of students, educators, family and community, is to prepare each and every student to compete and excel in an ever-changing world, embrace challenges with vigor, respect and appreciate the worth of every human being, and contribute to society by providing effective instruction and dynamic curriculum, offering a wide range of valuable experiences, and inspiring students to pursue their dreams and aspirations.

Algebra 1 College Prep

Algebra 1 College Prep is a full year course designed for students who have successfully completed pre-algebra. Students enrolled in this course are primarily freshmen. This is a college preparatory course that requires students to be disciplined and conscientious learners.

Algebra 1 provides students with a solid foundation in pattern recognition, mathematical modeling, functional relationships, data analysis, statistics, and manipulation of algebraic expressions and equations. Integrated throughout the course are real-world application problems which ask students to use the mathematics they have learned in the context of an authentic application.

Students who successfully complete Algebra 1College Prep are prepared to take both Geometry College Prep and Algebra 2 College Prep.

Pacing Guide
(based on a block schedule)

Unit #	Title	Weeks	Pages
1	Equations & Inequalities	6	7 – 11
2	Patterns	4	12 – 15
3	Functions	3	16 – 20
4	Linear Functions	8	21 – 25
5	Scatter Plots & Trend Lines	2	26 – 30
6	Systems of Equations	5	31 – 34
7	Intro to Exponential Functions	4	35 – 40
8	Intro to Quadratic Functions	5	41 – 45

Common Core State Standards for Mathematics
Mathematics Standards for High School

Key for the Standards

Number and Quantity

N-RN	The Real Number System
N-Q	Quantities
N-CN	The Complex Number System
N-VM	Vector and Matrix Quantities

Algebra

A-SSE	Seeing Structure in Expressions
A-APR	Arithmetic with Polynomials and Rational Expressions
A-CED	Creating Equations
A-REI	Reasoning with Equations and Inequalities

Functions

F-IF	Interpreting Functions
F-BF	Building Functions
F-LE	Linear, Quadratic, and Exponential Models
F-TF	Trigonometric Functions

Geometry

G-CO	Congruence
G-SRT	Similarity, Right Triangles, and Trigonometry
G-C	Circles
G-GPE	Expressing Geometric Properties with Equations
G-GMD	Geometric Measurement and Dimension
G-MG	Modeling with Geometry

Statistics and Probability

S-ID	Interpreting Categorical and Quantitative Data
S-IC	Making Inferences and Justifying Conclusions
S-CP	Conditional Probability and the Rules of Probability
S-MD	Using Probability to Make Decisions

New Milford Public Schools
Curriculum Template

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 1 - Equations & Inequalities	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 6 weeks

Identify Desired Results

Common Core Standards

8EE 7. Solve linear equations in one variable.
a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).
b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

A-SSE 1. Interpret expressions that represent a quantity in terms of its context.
a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity...

A-SSE 3. (part) Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

A-CED 1. (part) Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear ... functions*

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.*

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-Q 1 Use units as a way to understand problems and to guise the solution of multi-step problems; choose and interpret units consistently in formulas….

N-Q 2 Define appropriate quantities for the purpose of descriptive modeling.

N-Q 3 Choose a level of accuracy appropriate to limitations on measurements when reporting quantities.

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that …)	**Essential Questions** Inquiry used to explore generalizations
• To obtain a solution to an equation, no matter how complex, always involves the process of undoing the operations.	• What is an equation? • What is an expression? • What does equality mean? • What is an inequality? • How can we use linear equations and linear inequalities to solve real world problems? • What is a solution set for a linear equation or linear inequality? • How can models and technology aid in the solving of linear equations and linear inequalities?

Expected Performances
What students should know and be able to do

Students will know the following:

- Difference between an expression and an equation
- Associative, commutative, and distributive properties
- Steps to solve a linear equation
- Checking a solution
- Combining like terms
- Modeling a situation with a linear equation

Students will be able to do the following:

- Simplify an expression by combining like terms
- Evaluate an expression according to the order of operations
- Solve multi-step linear equations
- Solve equations which require the use of the distributive property
- Solve equations involving fractions
- Solve a literal equation for a variable

Character Attributes

- Respect
- Responsibility
- Honesty
- Perseverance
- Integrity
- Courage
- Cooperation

Technology Competencies

- Calculator
- Using personal devices for research

Develop Teaching and Learning Plan

Teaching Strategies:	Learning Activities:
• Teacher will use an analogy or demonstration to show students how performing operations on a number and then undoing the operations in a particular order will result in the original number. (ex. Magic tricks, putting on/taking off shoes). • Teacher will highlight for students that solving an equation involves undoing the operations that have been done to the variable. • Teacher will model how to solve equations using algebra tiles and balance pans. • Teacher will demonstrate how to combine like terms using algebra tiles. • Teacher will model for students how they can use a flow chart to solve equations that require distribution by first simplifying the equation. • Teacher will present students a strategy for solving multistep equations that contain variables on both sides. • Teacher will demonstrate multiple ways of solving the same equation and stress that both ways are correct. • Teacher will encourage students to write equations with parenthesis so they can apply the distributive property when writing models. • Teacher checks for prior knowledge using common formative assessment (pre-test). • Teacher checks for pre-requisite knowledge through the nit using	• Students will practice/apply skills and concepts for solving equations and inequalities in a variety of groupings including whole class, individual, and small groups. Students will have the opportunity to practice skills and concepts in each grouping situation during class. • Students will verbally and in writing justify steps used to simplify expressions and solve equations and inequalities. • Students will use white boards to practice evaluating expressions, simplifying expressions, and solving equations and inequalities. • Students will use algebra tiles and pan balances to understand how to solve equations and inequalities. • Students use flow charts, algebra arrows, and verbal descriptions to represent expressions and equations and inequalities. • Students write equations and inequalities that can be used model and solve real world problems. • Students write and solve inequalities to solve a variety of contextual problems. • Students represent solutions to inequalities using number lines. • Students complete number puzzles to improve understanding of algebraic expressions and how to work backwards to find a solution. • Students utilize a variety of methods, including algebra tiles and pan balances, to model situations that require the distributive property and combining like terms.

warm-up problems, questioning activities, and spiral review problems. • Teacher encourages higher order thinking skills through the use of math journals and discussion. Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to draw connections between a current topic and prior/prerequisite knowledge and/or a real world situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via exit ticket). Prompts may include asking students what they found easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills and deeper understanding of	

concepts.	

Assessments	
Performance Task(s) Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	**Other Evidence** Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: Use math as tool to help make a decision about the purchase of iPods and downloads. Role: Consumer Audience: Self/Classmates Situation: Student wants to purchase an iPod and must investigate file storage size and cost for various models of iPods. Product or Performance: Complete activity packet Standards for Success: See rubric	• Exit slips • Class work • Quizzes • Homework assignments • Math journals • Mid-unit assessments • End-of-Unit test
Suggested Resources	
• Pearson Algebra 1 Common Core 2012 • ctcorestandards.org • National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)	

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 2 - Patterns	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 4 weeks

Identify Desired Results

Common Core Standards

F-IF 3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

F-BF 1. Write a function that describes a relationship between two quantities.*

a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

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.*

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that …)	**Essential Questions** Inquiry used to explore generalizations
• Analyzing patterns and writing recursive and explicit algebraic rules provides a powerful way to extend patterns and make predictions.	• What is a sequence? • How can patterns be represented? • What are the advantages and disadvantages of a recursive rule compared to an explicit rule?

Expected Performances

What students should know and be able to do

Students will know the following:

- Recursive rule
- Explicit rule
- Arithmetic Sequence
- Geometric Sequence
- Fractal
- Order of Operations

Students will be able to do the following:

- Determine the recursive and explicit rules for patterns represented in words, images, tables, and graphs.
- Determine if a numerical pattern is arithmetic sequence or a geometric sequence.
- Evaluate expressions.
- Create fractal designs.

Character Attributes

- Respect

- Responsibility
- Honesty
- Perseverance
- Integrity
- Courage
- Cooperation

Technology Competencies

- Calculator

Develop Teaching and Learning Plan

Teaching Strategies:

- When working with algebra tiles teacher will emphasize that the same number of positive and negative tiles cancel out to be zero.
- Teacher will emphasize that observing patterns can be useful in problem solving and patterns can be used to write equations.
- Teacher will help students understand subtraction as the difference between two items by using a contextual example such as temperature change.
- Teacher will stress that patterns are an important part of nature.
- Teacher checks for prior knowledge using common formative assessment (pre-test).
- Teacher checks for pre-requisite knowledge through the nit using warm-up problems, questioning activities, and spiral review problems.
- Teacher encourages higher order thinking skills through the use of math journals and discussion. Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to draw connections between a current topic and prior/prerequisite knowledge and/or a real world

Learning Activities:

- Students will build models and create and analyze different representations of patterns – tables, graphs, and symbolic rules.
- Students will write recursive and explicit rules for arithmetic sequences.
- Students will review integers and order of operations by working with algebra tiles.
- Students will solve problems from a variety of contexts to explore the difference between geometric and arithmetic sequences.
- Students will explore using calculators and spread sheets for recursive rules.
- Students will explore patterns through fractals and will analyze stages of fractals to understand that not all patterns are arithmetic.

situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via exit ticket). Prompts may include asking students what they found easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills and deeper understanding of concepts.	

Assessments	
Performance Task(s) Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	**Other Evidence** Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: Design round banquet tables with honeycomb cores. Role: Engineer Audience: Employer	• Exit slips • Class work • Quizzes • Homework assignments • Math journals

Situation: You are an engineer for Plasticore, a manufacturer of honeycomb products. The team has been asked to design round banquet tables with honeycomb cores, so they need to learn more about honeycombs. Product or Performance: Completed activity packet Standards for Success: See rubric	• Mid-unit assessments • End-of-Unit test

Suggested Resources

- Pearson Algebra 1 Common Core 2012
- ctcorestandards.org
- National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 3 - Functions	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 3 weeks

Identify Desired Results

Common Core Standards

8F 1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.1

8F 2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

8F 5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

A-CED 2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A-CED 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).

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 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....

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 factory, then the positive integers would be an appropriate domain for the function.**

F-IF 7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions

F-IF 9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Enduring Understandings Generalizations of desired understanding via	**Essential Questions** Inquiry used to explore generalizations

<table>
<tr><td>essential questions
(Students will understand that …)</td><td></td></tr>
<tr><td>Functions are a mathematical way to describe relationships between two quantities that vary.</td><td>What is a function?
What are the different ways in which functions may be represented?
How can functions be used to model real world situations, make predictions, and solve problems?</td></tr>
<tr><td colspan="2">Expected Performances
What students should know and be able to do</td></tr>
<tr><td colspan="2">Students will know the following:
Relation
Function
Domain and Range
Independent and Dependent Variables
Multiple Representations of Functions
Students will be able to do the following:
Determine whether a relation is a function
Identify the domain and range of a function
Represent a function using an equation, table, and graph
Evaluate linear and non-linear functions
Evaluate functions using function notation
Recognize functions in contextual situations
Use functions to solve problems in real world contexts</td></tr>
<tr><td colspan="2">Character Attributes</td></tr>
<tr><td colspan="2">Respect
Responsibility
Honesty
Perseverance
Integrity
Courage</td></tr>
<tr><td colspan="2">Technology Competencies</td></tr>
<tr><td colspan="2">Calculator</td></tr>
<tr><td colspan="2">Develop Teaching and Learning Plan</td></tr>
<tr><td>Teaching Strategies:
Teacher leads discussion with students about how relationships such as “friends” is used to describe the relationship among one set of people, where as the relation “is the mother of” describes the relationship between another group</td><td>Learning Activities:
Students identify relationships that are and are not functions using a variety of methods.
Students visually display relations in a variety of formats (ex. Mapping diagrams, ordered pairs, graphs, and tables)</td></tr>
</table>

of people (mothers and their children). • Teacher will explain that relations can be expressed in at least five different ways; mapping diagrams, tables, graphs, ordered pairs, and equations. • Teacher will explain that not all relations lend themselves to being expressed using all five methods. • Teacher will use an analogy to help students understand the features of each representation of a relation. For example, how a mapping diagram can be used to map teachers in a school with their students. • Teacher will have students find data for a relationship that they are interested in. Teacher will then ask students to identify the domain and range. (ex. Pounds of fish eaten by individual sea lions at Mystic Aquarium) • Teacher will stress that a relation is a connection between an input value and an output value. • Teacher will stress that in a function each input value is paired with exactly one output value. • Teacher checks for prior knowledge using common formative assessment (pre-test). • Teacher checks for pre-requisite knowledge through the nit using warm-up problems, questioning activities, and spiral review problems. • Teacher encourages higher order thinking skills through the use of math journals and discussion. Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to	• Students define domain and range and can state the domain and range of a relation given a table, function, graph, or other model. • Students organize and analyze data in tables and graphs and use the information to describe relationships. • Students distinguish between linear and non-linear functions. • Students will be able to identify independent and dependent variables. • Students will be able to describe how machines and functions are related. • Students will evaluate functions using functions and graphs. • Students will explore piecewise functions as models for real world situations

draw connections between a current topic and prior/prerequisite knowledge and/or a real world situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via exit ticket). Prompts may include asking students what they found easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills and deeper understanding of concepts.	

Assessments	
Performance Task(s) Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	**Other Evidence** Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: Collect data and use it to find a model that can be used to make	• Exit slips • Class work • Quizzes

conjectures. Role: Student Audience: Classmates/Teacher Situation: Students will collect data, create a graph and use it to make predictions about how the length of a string affects the time for one full swing. Product or Performance: Completed activity Standards for Success: See rubric	• Homework assignments • Math journals • Mid-unit assessments • End-of-Unit test
Suggested Resources	
• Pearson Algebra 1 Common Core 2012 • ctcorestandards.org • National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)	

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 4 - Linear Functions	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 8 weeks

Identify Desired Results

Common Core Standards

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.*

F-IF 7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*

a. Graph linear ...functions and show intercepts..

F-IF 8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

F-LE 1. 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...

b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another....

F-LE 2. 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).

F-LE 5. Interpret the parameters in a linear ... function in terms of a context.

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that …)	**Essential Questions** Inquiry used to explore generalizations
Linear functions are characterized by a constant average rate of change (or constant additive change).	• What is a linear function? • What are the different ways that linear functions may be represented? • What is the significance of a linear function's slope and *y*-intercept? • How may linear functions model real world situations? • How may linear functions help us analyze real world situations and solve practical problems?

Expected Performances

What students should know and be able to do

Students will know the following:

- Constant rate of change
- Slope
- *X* and *y* intercepts
- Slope-intercept form
- Standard form
- Point-slope form

Students will be able to do the following:

- Determine if a function is linear from words, tables, equations, and graphs.
- Determine the slope of linear functions represented in words, equations, tables, and graphs.
- Given a linear equation in any of four representations write it in any of the other three.
- Transform equations of lines to either slope intercept or standard form.
- Use linear functions to model and analyze real world situations and solve practical problems.

Character Attributes

- Respect
- Responsibility
- Honesty
- Perseverance
- Integrity
- Courage

Technology Competencies

- Calculator

Develop Teaching and Learning Plan

Teaching Strategies:

- Teacher will have students collect linear data, organize the data in a table, and create a graph.
- Teacher will lead a discussion about the properties of a linear function.
- Teacher will challenge students to think about how they can determine if a function is linear given only a table of values.
- Teacher will build upon student understanding of average rate of change and draw connections to constant rate of change/slope.
- Teacher will lead students to draw connections between the direction

Learning Activities:

- Students identify the characteristics of a linear function.
- Students investigate the role of slopes and *y*-intercepts in the graphs of functions and relate this information to the context of various problems.
- Students create graphs by hand and with a graphing calculator.
- Students engage in activities that highlight the capability of linear functions to model a wide range of real world relationships.
- Students will calculate the slope from the data in tables and graphs.
- Students will identify and interpret the slope from real world linear situations

of a graph and the sign of the slope. • Teacher will demonstrate positive, negative, zero, and undefined slope using their arms as a modeling tool. • Teacher will lead students to discover the slope is the coefficient of x and the y-intercept is the constant term when given an equation in the form $y = mx + b$. • Teacher will help students define "parameter" and help them distinguish between a parameter and a variable. • Teacher guides students to develop understanding of how changing the parameter *m*, the slope of a line, causes changes in the steepness of the graph, and changing the sign of *m* changes the direction of the graph. • Teacher guides students through activities to discover that direct variable occurs when a linear function has a *y*-intercept of 0 and that the direct variation equation $y = kx$ is a special case of the slope-intercept form. • When introducing the point-slope form of a linear function the teacher will key idea that the slope between any point and a fixed point on a line will be constant. • Teacher will guide students to discover the point-slope form of a line and help them recognize that the slope formula can be derived from this form. • Teacher checks for prior knowledge using common formative assessment (pre-test). • Teacher checks for pre-requisite knowledge through the nit using warm-up problems, questioning activities, and spiral review problems. • Teacher encourages higher order thinking skills through the use of math journals and discussion.	as the constant rate of change in the dependent variable compared to the change in the independent variable. • Students will investigate the slope intercept form and use this form to model a variety of real world situations and to define patterns in data. • Students explore the results of how changing the slope and *y*-intercept changes the graph of a linear function. • Students will be able to graph a function given in slope-intercept form using a table of values and also by first plotting the *y*-intercept and then using one or more additional points using the slope. • Students will be able to find the slope-intercept equation of a line from a graph, table, or real world scenario. • Students will discover the relationships of the slopes of parallel and perpendicular lines. • Students will be able to graph equations given in standard form by finding the intercepts and transforming the standard equation to slope-intercept form. • Students will investigate direct variation problems. • Students will identify the point and the slope from an equation given in slope-intercept form. • Students will write equations in point-slope form given a point and a slope. • Students will transform equations from point-slope to slope-intercept form. • Students will be able to determine which form of a linear equation is most advantageous for solving a problem.

Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to draw connections between a current topic and prior/prerequisite knowledge and/or a real world situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via exit ticket). Prompts may include asking students what they found easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills and deeper understanding of concepts.	

Assessments	
Performance Task(s)	**Other Evidence**
Authentic application to evaluate student	Application that is functional in a

achievement of desired results designed according to GRASPS (one per marking period)	classroom context to evaluate student achievement of desired results
Goal: Students will be able to distinguish between linear and non-linear relationships and make predictions using linear functions. Role: Audience: Situation: Students are asked to use data given in a table to create models and use these models to predict rates of growth in the population. Product or Performance: Completed Activity Standards for Success: Students will have provided correct answers with proper work or justification to support them. Students will also be able to determine whether or not their model is a good fit for the data and explain why.	• Exit slips • Class work • Quizzes • Homework assignments • Math journals • Mid-unit assessments • End-of-Unit test
Suggested Resources	
• Pearson Algebra 1 Common Core 2012 • ctcorestandards.org • National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)	

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 5 - Scatter Plots & Trend Lines	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 2 weeks

Identify Desired Results

Common Core Standards

8-SP 1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

8-SP 2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

8-SP 3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

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.

S-ID 3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S-ID 6. 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.

c. Fit a linear function for a scatter plot that suggests a linear association.

S-ID 7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S-ID 8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

S-ID 9. Distinguish between correlation and causation.

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that …)	**Essential Questions** Inquiry used to explore generalizations
• Although scatter plots and trend lines may reveal a pattern, the relationship of the variables may indicate a correlation, but not causation**.**	• How do we make predictions and informed decisions based on current numerical information? • What are the advantages and disadvantages of analyzing data by hand versus by using technology? • What is the potential impact of

	making a decision from data that contains one or more outliers?

Expected Performances

What students should know and be able to do

Students will know the following:

- Scatter plots, trend lines
- Correlation coefficient
- Outliers

Students will be able to do the following:

- Create a scatter plot by hand and draw the trend line
- Use a graphing calculator to graph a scatter plot, using an appropriate window, and to find a linear regression line.
- Interpret the correlation coefficient for a linear model.
- Understand the effects of outliers.

Character Attributes

- Respect
- Responsibility
- Honesty
- Perseverance
- Integrity
- Courage

Technology Competencies

- Graphing calculators

Develop Teaching and Learning Plan

Teaching Strategies:	Learning Activities:
• Teacher introduces need for scatter plots and trend lines using an application about rising sea levels. • Teacher stresses the importance of using data as a tool in the decision making process. • Teacher will guide students to discover how an outlier can effect a data set. • Teacher checks for prior knowledge using common formative assessment (pre-test). • Teacher checks for pre-requisite	• Students will create scatter plots and fit trend lines to the data by hand and using a graphing calculator. • Students will find the equation for a trend line and use it to make predictions by interpolation or extrapolating. • Students will interpret the meaning of the correlation coefficient.

knowledge through the nit using warm-up problems, questioning activities, and spiral review problems. • Teacher encourages higher order thinking skills through the use of math journals and discussion. Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to draw connections between a current topic and prior/prerequisite knowledge and/or a real world situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via exit ticket). Prompts may include asking students what they found easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills	

and deeper understanding of concepts.	

Assessments	
Performance Task(s) Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	**Other Evidence** Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: Students will collect data or do research on two variables that they find interesting. Role: Researcher/Student Audience: Classmates & Teacher Situation: Students will collect data or do research on two variables that they find interesting. Product or Performance: To be determined by student Standards for Success: Students will produce a product that clearly outlines the variables they chose, the process of examining the two variables. The product will also include appropriate graphs and equations.	• Exit slips • Class work • Quizzes • Homework assignments • Math journals • Mid-unit assessments • End-of-Unit test

Suggested Resources
• Pearson Algebra 1 Common Core 2012 • ctcorestandards.org • National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 6 - Systems of Equations	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 5 weeks

Identify Desired Results

Common Core Standards

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 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 functions.*

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that …)	**Essential Questions** Inquiry used to explore generalizations
• A system of linear equations is an algebraic way to compare two equations that model a situation and find the breakeven point or choose the most efficient or economical plan.	• What does the number of solutions (none, one or infinite) of a system of linear equations represent? • What are the advantages and disadvantages of solving a system of linear equations graphically versus algebraically?

Expected Performances

What students should know and be able to do

Students will know the following:

- System of linear equations
- Substitution method
- Elimination method
- Solution

Students will be able to do the following:

- Create equations that describe numbers or relationships
- Solve systems of equations
- Represent and solve systems of equations graphically

Character Attributes
• Respect • Responsibility • Honesty • Perseverance • Integrity • Courage
Technology Competencies
• Calculators • Graphing calculators
Develop Teaching and Learning Plan

Teaching Strategies:	Learning Activities:
• Teacher will emphasize that the solution to a system of equations is an ordered pair. • Teacher will emphasize that the solution to a system of equations must be checked in both of the original equations. • Teacher will use different colors and a real world analogy to help students understand how the substitution method works. • Teacher will emphasize that the elimination method utilizes the addition and multiplication properties of equality. • Teacher scaffold instruction by introducing the concept of solving systems of equations by graphing by using two equations that are easy to plot before moving into an example that arises from a real world situation. • Teacher will show students how graphing technology can be used to generate more accurate solutions for real world application problems. • Teacher will stress the limitations of solving using the graphing method. • When working with real world models teacher will highlight connections to the work done in the previous unit with scatter plots and	• Students will determine whether two linear functions will have a point of intersection. • Students will calculate the point of intersection for two linear functions using both graphical and algebraic methods. • Students will explain what the point of intersection means in the context of a real world problem. • Students will write models and use these models as a tool to solve real world problems and make decisions. • Students will recognize when one method of solving a system of linear equations is more advantageous than another.

trend lines. • Teacher will acknowledge and affirm that there are multiple ways of solving many real world application problems, including methods that use one and two variable equations. • When working with application problems teacher will model for students how to highlight/identify key information in a problem and then translate this information into a mathematical sentence. • Teacher will lead students to discover how they can tell that there is no solution to a system of linear equations. • Teacher checks for prior knowledge using common formative assessment (pre-test). • Teacher checks for pre-requisite knowledge through the nit using warm-up problems, questioning activities, and spiral review problems. • Teacher encourages higher order thinking skills through the use of math journals and discussion. Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to draw connections between a current topic and prior/prerequisite knowledge and/or a real world situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via exit ticket). Prompts may include asking students what they found	

easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills and deeper understanding of concepts.	

Assessments	
Performance Task(s) Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	**Other Evidence** Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: Use systems of equations as a tool when designing a park. Role: Engineer/Architect Audience: Town Personnel Situation: The town is building a new community park and students must create a graph that construction workers and landscapers can use as a guide. The graph must meet certain requirements as specified in the activity. Product or Performance: Completed graph	• Exit slips • Class work • Quizzes • Homework assignments • Math journals • Mid-unit assessments • End-of-Unit test

and written explanation. Standards for Success: See rubric	

Suggested Resources

- Pearson Algebra 1 Common Core 2012
- ctcorestandards.org
- National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 7 - Intro to Exponential Functions	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 4 weeks

Identify Desired Results

Common Core Standards

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. *For example, we define* $5^{1/3}$ *to be the cube root of 5 because we want* $(5^{1/3})^3 = 5^{(1/3)3}$ *to hold, so* $(5^{1/3})^3$ *must equal 5.*

N-RN 2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

A-SSE 1b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*

A-SSE 3c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $[1.15^{(1/12)}]^{(12t)} \approx 1.012^{(12t)}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

F-IF 7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
e. Graph exponential ... functions, showing intercepts and end behavior... F-IF 8b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{(t/10)}$, and classify them as representing exponential functions.

F-BF 2. Write ... geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

F-LE 1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Prove ... that exponential functions grow by equal factors over equal intervals....
c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

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).

F-LE 3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly...

F-LE 5. Interpret the parameters in a ... exponential function in terms of a context.	
Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that …)	**Essential Questions** Inquiry used to explore generalizations
• When comparing an exponential model with a linear model, the question is not *if* the exponential model will generate very large or very small inputs, but rather *when*. • With real data, sometimes deciding whether data is linear or non-linear is more complex than just looking at a graph, differences ($y_n - y_{n-1}$), or an r-value; it is important to examine differences that are approximately the same more carefully to see if there is a pattern of increasing or decreasing values that, because the pattern is exponential, soon begins to produce outputs of remarkable values.	• What characterizes exponential growth and decay? • What are real world models of exponential growth and decay? • What are the limitations of exponential growth models? • How can one differentiate an exponential model from a linear model given a real world data set?

Expected Performances
What students should know and be able to do

Students will know the following:

- Laws of Exponents
- Properties of exponents extend to rational exponents.
- Repeated multiplication can be represented with a function in the form $y = ab^x$.
- The factor *a* in $y = ab^x$ can be used to stretch or compress, and possibly reflect, the graph of the parent function $y = b^x$.
- A function can be used to model the relationship between two quantities.
- A quantity that changes regularly over time by the same percentage can be modeled using an exponential function.

Students will be able to do the following:

- Determine whether real-world data best models linear or exponential growth (or decay).
- Recognize exponential models in various forms and express them in other forms.
- Identify and explain the meaning of the parameters of an exponential function.
- Identify similarities and differences between linear models and exponential models.
- Explain the limitations of exponential growth and decay models.
- Understand and work with exponential algebraic expressions.

Character Attributes	
• Respect • Responsibility • Honesty • Perseverance • Integrity • Courage	
Technology Competencies	
• Calculators • Computers/Personal devices for research	
Develop Teaching and Learning Plan	
Teaching Strategies: • Teacher will help students draw connections between exponential models and the unit on patterns. • Teacher will guide students to discover how an exponential model is used to represent patterns that are determined by repeated multiplication by a constant multiplier. • Teacher will stress that mathematical models are used to *approximate* real world data. • Teacher will guide students through activities that compare the key features of data modeled by linear and exponential models. • Teacher leads a discussion to help students compare and contrast linear and exponential growth. • Teacher will remind students that integer exponents represent repeated multiplication of the base and guide students to discover shortcuts for exponential expressions. • Teacher leads a discussion in which students share their conjectures about rational exponents and whether or not they believe that rational exponents satisfy the rules and meanings of integer exponents. • Teacher guides students through an activity that demonstrates the connection between the graph of an	Learning Activities: • Students will compare the growth rates of linear and exponential models. • Students will recognize that different types of functions are needed to model data that is non-linear. • Students will recognize that a model may only be appropriate for a limited amount of time – connections will be drawn to restricting the domain. • Students will study the laws of exponents and develop meanings for negative exponents and rational exponents. • Students will examine exponential growth and decay models to gain an understanding of the parameters of exponential functions. • Students will learn informal methods of fitting an exponential function to a set of data. • Students will participate in data collection and simulations for topics such as radioactive decay that can be modeled using exponential functions. • Students will investigate the relationship between percentage rate of change and exponential growth or decay. • Students will use doubling and half life applications to model compound interest and prescription drug decay.

exponential function and the meaning of negative and rational exponents. • Teacher presents scenarios which involve growth, decay, linear models, and exponential models and asks students to study each situation, make a graph, write an equation, and classify the function. Teacher points out critical differences between exponential and linear growth and exponential and linear decay. • Teacher will stress how the techniques used in the scatter plots and trend lines unit can be extended to data that is best modeled using an exponential function. • Teacher checks for prior knowledge using common formative assessment (pre-test). • Teacher checks for pre-requisite knowledge through the nit using warm-up problems, questioning activities, and spiral review problems. • Teacher encourages higher order thinking skills through the use of math journals and discussion. Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to draw connections between a current topic and prior/prerequisite knowledge and/or a real world situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via	

exit ticket). Prompts may include asking students what they found easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills and deeper understanding of concepts.	

Assessments	
Performance Task(s) Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	**Other Evidence** Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: Students will choose a research question and find related data. Students will then find a model for the data and use this model to extrapolate beyond the domain of the data set. Role: Scientist Audience: Classmates Situation: Global warming has been linked to climate change. Students will find data and develop models to explore how	• Exit slips • Class work • Quizzes • Homework assignments • Math journals • Mid-unit assessments • End-of-Unit test

increased levels of carbon dioxide and global warming are related. Product or Performance: To be determined by student. Examples may include presentations, story boards, essays, websites, or some other agreed upon format. Standards for Success: See rubric.	

Suggested Resources

- Pearson Algebra 1 Common Core 2012
- ctcorestandards.org
- National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)

Committee Member(s): Linda Cervone, Anna Desis, Kelly Monroe, Colleen Peterson, Linda Scoralick Unit Title: 8 - Intro to Quadratic Functions	Course/Subject: Algebra 1 College Prep Grade Level: 9 # of Weeks: 5 weeks

Identify Desired Results

Common Core Standards

8EE 2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

A-SSE 3. a Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

A-REI 4. 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. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.

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.

A-CED 1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from ...quadratic functions ...*

A-CED 2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

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... *

F-IF 7a. Graph ... quadratic functions and show intercepts, maxima, and minima.

F-IF 8a. 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.

F-BF 3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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...

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that …)	**Essential Questions** Inquiry used to explore generalizations
• Quadratic functions can be used to model real world relationships and the key points in quadratic functions	• What can the zeros, intercepts, vertex, maximum, minimum and other features of a quadratic

have meaning in the real world context. • Polynomials are closed under addition, subtraction, and multiplication. • Dynamic software, graphing calculators, and other technology can be used to explore and deepen our understanding of mathematics.	function tell you about real world relationships? • How is the polynomial system analogous to the system of integers? • How can technology support investigation and experimentation of the way that parameters effect functions?

Expected Performances

What students should know and be able to do

Students will know the following:

- Quadratic Function
- Quadratic Equation
- Quadratic Formula
- Parabola
- Factored form
- Vertex form
- Standard form
- Square root property
- Zero product property
- Completing the square
- Vertex
- Line of symmetry
- First and second differences
- Monomial
- Binomial
- Trinomial

Students will be able to do the following:

- Graph quadratic functions
- Find line of symmetry and vertex
- Solve quadratic equations
- Model with quadratic function
- Solve problems arising from quadratic models
- Expand product of two binomials
- Factor quadratic trinomials
- Use quadratic formula

Character Attributes

- Respect
- Responsibility
- Honesty
- Perseverance
- Integrity
- Courage

Technology Competencies	
• Calculator	
Develop Teaching and Learning Plan	
Teaching Strategies: • Teacher will define a quadratic function as one that can be written I the form $y = ax^2 + bx + c$ form. • Teacher will emphasize that the graph of every quadratic function is a parabola. • Teacher will help students brainstorm the key features of a quadratic function and show them how they are connected to the equation for a quadratic function presented in both vertex and standard form. • Teacher will challenge students to find the line of symmetry and vertex given the equation of a quadratic function. • Teacher will demonstrate how to transform quadratic functions from standard form to vertex form and draw connections to the process of solving by completing the square. • Teacher will highlight for students the concept of square roots and the principal square root. • Teacher will remind students that operations can be undone by performing inverse operations. • Teacher will have students use graphs and tables to observe that the x-intercepts of a quadratic function coincide with the x-intercepts of the linear factors, leading to a statement of the zero product property. • Teacher checks for prior knowledge using common formative assessment (pre-test). • Teacher checks for pre-requisite knowledge through the nit using warm-up problems, questioning activities, and spiral review problems.	Learning Activities: • Students will investigate what the features of quadratic functions can tell us about real world relationships (ex. Vertex, minima/maxima, intercepts). • Students will compare quadratic patterns with linear and exponential patterns using real world applications which may include depth of water in a parabolic bowl compared to the radius of the bowl, HIV statistics, and the distance an object falls over time. • Students will be able to distinguish between the non-linear patterns of exponential and quadratic growth when given a table of values. • Students will recognize graphs that could be modeled by quadratic functions. • Students will recognize that for non-linear growth the average rates of change will not be constant. • Students will match graphs of quadratic functions with the appropriate equation. • Students will discover the line of symmetry for a parabola given an equation in standard form. • Given an equation in vertex form, students will investigate the effects of the parameters *a*, *h*, and *k* on the graph of a parabola and determine whether the parabola opens up or down. • Students will write an equation in vertex form for a parabola given its vertex and one other point. • Students will learn to transform a quadratic function from standard form to vertex form. • Students will explore how solving equations using the square root property can be used to find *x*-intercepts of a quadratic function given in vertex form.

• Teacher encourages higher order thinking skills through the use of math journals and discussion. Journal prompts might include asking students to explain their approach to a problem, explain an alternate approach to a problem, how to check that their work was accurate, how to explain a concept to a student that was absent, or to draw connections between a current topic and prior/prerequisite knowledge and/or a real world situation. • Teacher uses exit tickets and common formative assessments at the end of each lesson to guide planning for future lessons. • Teacher encourages students to reflect on their own learning after each lesson (reflective journal via exit ticket). Prompts may include asking students what they found easy in a lesson, which parts of a lesson were the most challenging, and which skills and concepts they feel need more practice in order to be mastered. • Teacher models proper techniques and a variety of techniques for solving problems. • Teacher models for students how to show complete work, formalize answers, check solutions (by hand and using technology). • Teacher models and cues expected behaviors for appropriate classroom behavior including participation and note taking skills. • Teacher uses a variety of grouping strategies (including whole class, individual, and small groups) to allow students varied opportunities to build strong foundational skills and deeper understanding of concepts.	• Students will model real world situations using quadratic functions. Students will find and interpret the meaning of the vertex and *x*-intercepts. • Students will factor quadratic trinomials of various forms and convert quadratic functions in standard form to quadratic functions in factored form. • Students will explore how factoring polynomials is the inverse operation of multiplying polynomials. • Students will learn how to solve quadratic equations by completing the square and using the quadratic formula.

Assessments

Performance Task(s) Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	**Other Evidence** Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: Determine a safe driving speed to be traveling in order to avoid being hit by a train. Role: Concerned Citizen or Driver Audience: Situation: In the community there is a railroad crossing that is 200 feet from a sharp bend in the road. As the driver approaches, she cannot see the railroad tracks until she has rounded the bend. Product or Performance: Letter Standards for Success: Correctly determine safe driving speed based on reaction time and driving conditions. Write a persuasive letter with road conditions containing recommendations for signs to be posted on the highway before the bend in the road.	• Exit slips • Class work • Quizzes • Homework assignments • Math journals • Mid-unit assessments • End-of-Unit test

Suggested Resources

- Pearson Algebra 1 Common Core 2012
- ctcorestandards.org
- National Library of Virtual Manipulative (nlvm.usu.edu/en/nav/topic_t_2.html)