NEW MILFORD PUBLIC SCHOOLS

New Milford, Connecticut

ALGEBRA 1 HONORS

April 2021

BOE Approved August 2021

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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 Honors

Algebra 1 Honors is a full year course designed for students who have excelled in pre-algebra. Topics in this course include algebraic notation and terminology, evaluating expressions, operations with real numbers, linear equations, operations with polynomials, factoring, systems of equations, relations, functions, graphs, radicals, quadratic equations, and appropriate word problems. Calculators and/or computers will be used. A scientific calculator is required of all students in this course. At the honors level, this course is more rigorous, and moves at a faster pace. Additional homework may be required.

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

Pacing Guide

(based on a block schedule)

Unit #	Title	Weeks
1	Equations & Inequalities	6
2	Patterns	2
3	Functions	3
4	Linear Functions	5
5	Scatter Plots & Trend Lines	2
6	Systems of Equations	5
7	Intro to Exponents and Exponential Functions	4
8	Intro to Polynomials and Quadratics	5

Unit 1 – Equations, Inequalities, Rates, Ratios & Proportions

Course/Subject: Algebra 1 Honors

# of Weeks: 6

Stage 1 Desired Results	
ESTABLISHED GOALS 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	*Transfer*

Students will be able to independently use their learning to…
• CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. • CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. • CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. • CCSS.Math.Practice.MP4 Model with mathematics. • CCSS.Math.Practice.MP5 Use appropriate tools strategically. • CCSS.Math.Practice.MP6 Attend to precision. • CCSS.Math.Practice.MP7 Look for and make use of structure.

Meaning	
UNDERSTANDINGS *Students will understand that…* • To obtain a solution to an equation, no matter how complex, always involves the process of undoing the operations • There are multiple ways to solve a multi-step equation correctly • There are multiple solutions to an inequality • Equations and inequalities can be	**ESSENTIAL QUESTIONS** *Students will keep considering…* • 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

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	used to model real world problems	equation or linear inequality? ● How models and technology can aid in the solving of linear equations and linear inequalities?

Acquisition	
Students will know… ● The difference between an expression and an equation ● How to follow the order of operations to evaluate an expression ● How to apply the associative, commutative, and distributive properties ● The steps to solve a linear equation ● How to check a solution ● How to combining like terms ● There are multiple solutions to an inequality ● How to model a situation with a linear equation or inequality	*Students will be skilled at…* ● Simplifying an expression by combining like terms ● Evaluating an expression according to the order of operations ● Solving multi-step linear equations ● Solving equations which require the use of the distributive property ● Solving equations involving fractions ● Solving a literal equation for a variable ● Interpreting solutions in the context of a real world application

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 guide 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		

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	. Scoring Rubric used to evaluate successful understanding of the criteria comparing costs and product features in purchasing an electronic device	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Use math as a tool to help make a decision about the purchase of a cell phone. Role: Consumer Audience: Self/Classmates Situation: Student wants to purchase a new cell phone and must investigate file storage size and cost for various models of cell phones. Product or Performance: Students will create a presentation (Google Doc, Poster, Video, Google Slides) justifying their decision. Standards & Criteria for Success: Presentation contains: - accurate cost analysis of various cell phones - a chart/diagram that highlights features and costs - visually neat, organized - comparison of cost and monthly fees

M, A	● Thorough understanding of associative, commutative and distributive properties	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…*
M, A	● Thorough understanding of steps needed to solve multi-step linear equations and how to check the answer	● Monitoring class work through board work, group work, questioning, and walk-arounds ● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals
M, A	● Thorough understanding of steps needed to solve multi-step linear inequalities and how to check the answer	● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives
T, M, A	● Thorough understanding of how to model real world problems using linear equations and inequalities and how to interpret the solution in the context of the application.	● Alternative assessment projects such as posters, drawings, pictures and real world applications ● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams ● Quizzes ● Unit Test - to include a variety of DOK level problems and may include SAT style problems.

Stage 3 – Learning Plan	

Code	Pre-Assessment
M T, M, A	● Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as basic problems on order of operations, solving one and two step equations and the associative, commutative and distributive properties. ● Prerequisite knowledge will be reviewed as it is incorporated into multi-step problems both in class and on review assignments

Code	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring
M M, A M, A M, A M	● Teacher will review the difference between expressions and equations/inequalities and review the concept of simplifying/evaluating expressions ● Teacher will review concepts of associative, commutative and distributive properties, as well as rules for order of operations and combining like terms ● Students will practice/apply skills and concepts involving evaluating with order of operations and simplifying using distributive property and combining like terms. ● Teacher introduces solving equations by using 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 and taking off shoes) ● Teacher will highlight for students that solving an equation/inequality involves undoing the operations that	● Warm up questions ● Class worksheets with direct teacher observation or self assessment ● Practice on whiteboard/chalkboard with direct teacher observation ● Kahoot quiz or pear deck slideshow with review questions and direct teacher observation ● Reflective journals or exit tickets at the end of the lesson ● Edulastic or google form review assignments ● Homework assignments with direct teacher observation or self assessment ● Projects/performance tasks modeling real world problems involving equations and inequalities ● Summative assessments

	have been done to the variable.	Quizzes Unit test
M, A	● Teacher will model how to solve equations and inequalities. This will include modeling proper techniques and a variety of techniques for solving problems	
M, A	● Students will practice/apply skills and concepts for solving equations and inequalities in a variety of groupings during class including whole class, individual and small groups.	
M, A	● Students will verbally and in writing justify steps used to simplify expressions and solve equations and inequalities.	
M, A	● Students will use white boards to practice evaluating/simplifying expressions and solving equations/inequalities	
M, A	● Teacher will model how to solve equations that require use of the distributive property and combining like terms.	
M, A	● Teacher will present students with a strategy for solving multi-step equations that contain variables on both sides.	
T, M, A	● Teacher will demonstrate multiple ways of solving the same equation and stress that both ways are correct. Teacher will also demonstrate how to check an answer for accuracy either by hand or by using technology.	
T, M, A	● Students will practice solving multi-step equations and inequalities with a focus on showing complete work, formalizing the answer and checking the solution.	

T, M, A	• Students will represent solutions to inequalities using a number line.
T, M, A	• Teacher will demonstrate how to write equations/inequalities that model and solve real world problems.
T, M, A	• Students will use mathematical and verbal descriptions to represent expressions and equations/inequalities that can be used to model and solve real world problems.
T, M, A	• Students will utilize a variety of methods to model situations that require the distributive property and combining like terms.

Unit 2 – Patterns

Course/Subject: Algebra 1 Honors

# of Weeks: 2

Stage 1 Desired Results

ESTABLISHED GOALS	*Transfer*	
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.*	*Students will be able to independently use their learning to…* ● CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. ● CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. ● CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. ● CCSS.Math.Practice.MP4 Model with mathematics. ● CCSS.Math.Practice.MP5 Use appropriate tools strategically. ● CCSS.Math.Practice.MP6 Attend to precision. ● CCSS.Math.Practice.MP7 Look for and make use of structure.	
	Meaning	
	UNDERSTANDINGS *Students will understand that…* ● Analyzing patterns and writing recursive and explicit algebraic rules provides a powerful way to extend patterns and make predictions. ● Many real world situations have patterns that can be modeled by recursive and exponential rules. ● Some patterns increase by a specific value each time that makes them algebraic or geometric.	ESSENTIAL QUESTIONS *Students will keep considering…* ● What is a sequence? ● How can patterns be represented? ● What are the advantages and disadvantages of a recursive rule compared to an explicit rule?

	Acquisition	
	Students will know…	*Students will be skilled at…*
	- How to identify the characteristics of and to make a recursive rule - How to identify the characteristics of and to make an explicit rule - The difference between an arithmetic sequence, a geometric sequence, and how to identify, apply, and write each.	- Analyzing sequences and their characteristics. - Determining the recursive and explicit rules for patterns represented in words, images, tables, and graphs. - Determining if a numerical pattern is arithmetic sequence or a geometric sequence.

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	Scoring Rubric used to evaluate successful understanding of the skills and concepts required to determine the amount of string needed for different necklace lengths	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Determine the amount of string needed to make knotted necklaces. Role: Jewelry Designer Audience: Employer Situation: You are making knotted necklaces and need to determine the amount of string is needed for different necklace lengths. Product or Performance: You will create a presentation which displays the amount of string for necklaces with 5 different lengths. Standards and Criteria for Success: Presentation contains: - The mathematical process shown for calculating the length of string needed for each necklace - A chart displaying the data comparing length of necklace and string needed - Accurate calculations - A neat, organized, and well written presentation of the information

T, M, A	● Recognizing patterns and extending patterns to finding the "next terms".	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…* ● Monitoring class work through board work, group work, questioning, and walk-arounds
T, M, A	● Thorough understanding of the recursive and explicit rules.	● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals
T, M, A	● Thorough understanding of geometric and arithmetic sequences	● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives
		● Alternative assessment projects such as posters, drawings, pictures and real world applications
		● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams
		● Quizzes
		● Unit Test - to include a variety of DOK level problems and may include SAT style problems.

Stage 3 – Learning Plan

Code	Pre-Assessment	
M T, M, A	● Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as basic problems on recognizing patterns, sequences, and finding the "next term" in a sequence. ● Prerequisite knowledge will be reviewed as it is incorporated into writing and solving various sequences both in class and on review assignments	

	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring

M
 	
T, M
 	
T, M
 	
A
 	
M
 	
T, M, A
 	
A
	● Teacher will emphasize that observing patterns can be useful in problem solving and patterns can be used to write equations.
	
	● Students will build models and create and analyze different representations of patterns – tables, graphs, and symbolic rules.
	
	● Teacher will stress that patterns are an important part of nature, and will use examples to model recursive and explicit rules.
	
	● Students will write recursive and explicit rules for arithmetic sequences.
	
	● Teacher will lead students to discover the difference between geometric and arithmetic sequences.
	
	● Students will solve problems from a variety of contexts to explore the difference between geometric and arithmetic sequences.
	
	● Teacher will demonstrate recursive rules and how to write them.
		● Warm up questions
		
		● Class worksheets with direct teacher observation or self assessment
		
		● Practice on whiteboard/chalkboard with direct teacher observation
		
		● Kahoot quiz or pear deck slideshow with review questions and direct teacher observation
		
		● Edulastic or google form review assignments
		
		● Homework assignments with direct teacher observation or self assessment
		
		● Projects/performance tasks modeling real world problems involving sequences and patterns
		
		● Summative assessments
		
		    Quizzes
		    Unit test

T, M, A	● Students will explore recursive rules using calculators and spreadsheets.	

Unit 3 – Functions

Course/Subject: Algebra 1 Honors

# of Weeks: 3

Stage 1 Desired Results

ESTABLISHED GOALS	Transfer
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. 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.*	*Students will be able to independently use their learning to…* ● CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. ● CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. ● CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. ● CCSS.Math.Practice.MP4 Model with mathematics. ● CCSS.Math.Practice.MP5 Use appropriate tools strategically. ● CCSS.Math.Practice.MP6 Attend to precision. ● CCSS.Math.Practice.MP7 Look for and make use of structure.

Meaning	
UNDERSTANDINGS *Students will understand that…* ● Functions are a mathematical way to describe relationships between two quantities that vary.	ESSENTIAL QUESTIONS *Students will keep considering…* ● 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?

Acquisition	
Students will know… ● A relation is a set of ordered pairs with independent (input) and dependent	*Students will be skilled at…* ● Identifying the independent and dependent variables of a relation

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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	(output) variables that may be represented in a variety of ways ● What makes a relation a function ● Functions can be represented in a variety of ways, including using an equation, table and graph ● Functions can model linear and non-linear data ● Domain and Range of a function ● How to evaluate functions using function notation ● How to apply functions to solve real world problems ● A piecewise function is a function that combines pieces of 2 different functions	● Determining if a relation is a function ● Representing a function using an equation, table, and graph ● Identifying the domain and range of a function ● Evaluating linear and nonlinear functions ● Evaluating functions using function notation ● Recognizing functions in contextual situations ● Using functions to solve problems in real world contexts ● Evaluating piecewise functions

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).		

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	Scoring Rubric used to evaluate successful understanding of the skills and concepts required to analyze the price per shopping bag based on the quantity purchased.	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Find the cost to purchase shopping bags. Role: Store manager Audience: Purchasing agent Situation: Students will collect data, create a piecewise graph and use it to make predictions about the price per bag based on the number of bags purchased. Product or Performance: A poster, google doc, google slide or other such presentation containing the data, graph, and predictions. Standards and Criteria for Success: Finished product should contain: - The data collected - Correct equations for each piecewise equation - A piecewise graph with labels - Correct predictions about the price per bag based on the number of bags purchased - A neat and well written presentation

M, A	● Thorough understanding of the independent and dependent variable of a relation	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…* ● Monitoring class work through board work, group work, questioning, and walk-arounds
M, A	● Thorough understanding of what makes a relation a function	● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals
M, A	● Thorough understanding of the different representations of functions	● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives
M, A	● Thorough understanding of the domain and range of a function	
M, A	● Thorough understanding of evaluating functions and using function notation	● Alternative assessment projects such as posters, drawings, pictures and real world applications
T, M, A	● Thorough understanding of how linear and nonlinear functions represent real-world data	● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams ● Quizzes
T, M, A	● Thorough understanding of piecewise functions and their graphs	● Unit Test - to include a variety of DOK level problems and may include SAT style problems.

	Stage 3 – Learning Plan

Code	*Pre-Assessment*
M	• Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as basic problems on representing relations in a variety of ways and identifying the independent and dependent variables
T, M, A	• Prerequisite knowledge will be reviewed as it is incorporated into evaluating, writing, and graphing functions.

	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring • Warm up questions
M	• Teacher introduces relations as sets of ordered pairs, that have an independent (input) variable and a dependent (output) variable.	• Class worksheets with direct teacher observation or self assessment
M	• Teacher will explain that relations can be expressed in at least five different ways; mapping diagrams, tables, graphs, ordered pairs, and equations.	• Practice on whiteboard/chalkboard with direct teacher observation • Kahoot quiz or pear deck slideshow with review questions and direct teacher observation
M, A	• Students identify and display relations in a variety of formats (ie: Mapping diagrams, ordered pairs, graphs, and tables), and identifies the independent and dependent variables	• Edulastic or google form review assignments
M	• Teacher will explain that not all relations lend themselves to being expressed using all five methods.	• Homework assignments with direct teacher observation or self assessment
M, A	• Teacher will use analogy and real world scenarios 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.	• Projects/performance tasks modeling real world problems involving data that can be modeled with functions • Summative assessments
T, M, A	• Teacher will have students find data for a relationship that they are interested in. Teacher will then ask	Quizzes Unit test

	students to identify the domain and range. (ex. Pounds of fish eaten by individual sea lions at Mystic Aquarium)
M, A	● Teacher will explain the domain and range of a relation and offer examples using the different representations of relations.
M, A	● Students will define domain and range and can state the domain and range of a relation given a table, function, graph, or other model.
T, M, A	● Students will organize and analyze data in tables and graphs and use the information to describe relationships.
M, A	● Students distinguish between linear and nonlinear functions.
M, A	● Teacher will define a function and stress that in a function each input value is paired with exactly one output value.
T, M, A	● Students will identify relations given in different forms that are and are not functions .
M, A	● Teacher will introduce function notation and will model how to evaluate functions when given an equation or a graph.
M, A	● Students will evaluate functions using function notation and graphs
M, A	● Teacher will introduce piecewise functions as pieces of different functions put together.

T, M, A	• Students will evaluate piecewise functions and explore models for real world situations	

Unit 4 - Linear Functions

Course/Subject: Algebra 1 Honors

# of Weeks: 5 weeks

Stage 1 Desired Results

ESTABLISHED GOALS	*Transfer*	
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].	Students will be able to independently use their learning to… • CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. • CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. • CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. • CCSS.Math.Practice.MP4 Model with mathematics. • CCSS.Math.Practice.MP5 Use appropriate tools strategically. • CCSS.Math.Practice.MP6 Attend to precision. • CCSS.Math.Practice.MP7 Look for and make use of structure.	
	Meaning	
	UNDERSTANDINGS *Students will understand that…* • Linear functions are characterized by a constant average rate of change (or constant additive change). • Linear functions can be used to model and analyze real world situations • The y-intercept represents the initial value in real world problems and the slope represents the rate of change • The form of a linear equation that is most advantageous for solving a problem	ESSENTIAL QUESTIONS *Students will keep considering…* • 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?

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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.	● There is a difference between inverse and direct variations	● How can direct and inverse variations be used to model real world situations?

Acquisition	
Students will know…	*Students will be skilled at…*
● that linear functions have a constant rate of change ● that the slope of a linear function represents the rate of change ● what the x and y intercepts are in the context of the problem ● how to write equations in slope-intercept form, standard form and point-slope form ● how to use linear functions to model and analyze real world situations ● the difference between direct variation and Inverse variation and how to use them to model real world data ● the meaning of the constant of variation	● Determining if a function is linear from words, tables, equations, and graphs. ● Determining the slope of linear functions represented in words, equations, tables, and graphs. ● Writing a linear equation in any of the 3 forms. ● Transforming equations of lines to either slope intercept or standard form. ● Using linear functions to model and analyze real world situations and solve practical problems. ● Applying direct and inverse variation to model and analyze real world data.

Stage 2 – Evidence

Code	Evaluative Criteria	Assessment Evidence
T, M, A	Scoring Rubric used to evaluate successful understanding of the criteria for using a linear model to determine the height of an object	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Students will determine the height of a hot air balloon at any given point in time. Role: Balloon Engineer Audience: Balloon Enthusiast Situation: Students are asked to use data given in a table to create and evaluate a linear model. Product or Performance: A poster displaying the analysis, linear model and graph of the data Standards and Criteria 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.

T, M, A	● Thorough understanding of the meaning of the slope and x and y intercepts for a linear function, including in the context of a real world problem	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…* ● Monitoring class work through board work, group work, questioning, and walk-arounds ● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals
M, A	● Thorough understanding of the slope intercept, point slope and standard form of linear equations and how to transform an equation from one form to another	● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives
T, M, A	● Thorough understanding of how to use a linear function to model and analyze a real world problem.	● Alternative assessment projects such as posters, drawings, pictures and real world applications ● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams
T, M, A	● Thorough understanding of the difference between direct and inverse variation and how to use them to model real world problems.	● Quizzes ● Unit Test - to include a variety of DOK level problems and may include SAT style problems.

Stage 3 – Learning Plan	
Code M T, M, A	***Pre-Assessment*** ● Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as basic problems on solving and writing equations and evaluating in an equation ● Prerequisite knowledge will be reviewed as it is incorporated into application problems both in class and on review assignments

	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring
T, M, A	● Teacher will have students collect linear data, organize the data in a table, and create a graph.	● Warm up questions
M, A	● Teacher will lead a discussion about the properties of a linear function.	● Class worksheets with direct teacher observation or self assessment
M, A	● Teacher will challenge students to think about how they can determine if a function is linear given only a table of values.	● Practice on whiteboard/chalkboard with direct teacher observation ● Kahoot quiz or pear deck slideshow with review questions and direct teacher observation
M	● Students will identify the characteristics of a linear function.	● Reflective journals or exit tickets at the end of the lesson
T, M, A	● Teacher will build upon student understanding of average rate of change and draw connections to constant rate of change/slope.	● Edulastic or google form review assignments
M, A	● Teacher will lead students to draw connections between the direction of a graph and the sign of the slope.	● Homework assignments with direct teacher observation or self assessment ● Projects/performance tasks modeling real world problems involving data that can be represented through functions
T, M, A	● Students will identify and interpret the slope from real world linear situations as the constant rate of change in	● Summative assessments

	the dependent variable compared to the change in the independent variable	Quizzes Unit test
M	● Teacher will demonstrate positive, negative, zero, and undefined slope using his or her arms as a modeling tool.	
T, M, A	● Students will calculate the slope from the data in tables and graphs.	
T, M, A	● Students investigate the role of slopes and y-intercepts in the graphs of functions and relate this information to the context of various problems.	
M, A	● 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 $y = mx + b$.	
T, M, A	● 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.	
T, M, A	● Students create graphs by hand and with a graphing calculator.	
M, A	● Students explore the results of how changing the slope and y-intercept changes the graph of a linear function.	
M, A	● 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.	
T, M, A	● Students will be able to find the slope-intercept equation of a line from a graph, table, or real world scenario.	

T, M, A	● Students engage in activities that highlight the capability of linear functions to model a wide range of real world relationships.
M, A	● Students will be able to graph equations given in standard form by finding the intercepts and transforming the standard equation to slope-intercept form
M	● Teacher will help students define "parameter" and help them distinguish between a parameter and a variable.
M, A	● 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.
M, A	● Teacher guides students through activities to discover that direct variation 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.
M, A	● Students will investigate direct variation problems.
M, A	● Teacher guides students through activities the discover that inverse variation occurs as a nonlinear function in the form $y = \frac{k}{x}$.
M, A	● Students will investigate inverse variation problems.
M, A	● When introducing the point-slope form of a linear function the teacher will stress the idea that the slope

	between any point and a fixed point on a line will be constant.
M, A	● Students will identify the point and the slope from an equation given in slope-intercept form
T, M, A	● 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.
M, A	● Students will write equations in point-slope form given a point and a slope.
M, A	● Students will transform equations from point-slope to slope-intercept form.
T, M, A	● Students will be able to determine which form of a linear equation is most advantageous for solving a problem

Unit 5 – Scatter Plots & Trend Lines

Course/Subject: Algebra 1 Honors

 # of Weeks: 2

Stage 1 Desired Results	

ESTABLISHED GOALS	Transfer	
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.	Students will be able to independently use their learning to… ● CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. ● CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. ● CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. ● CCSS.Math.Practice.MP4 Model with mathematics. ● CCSS.Math.Practice.MP5 Use appropriate tools strategically. ● CCSS.Math.Practice.MP6 Attend to precision. ● CCSS.Math.Practice.MP7 Look for and make use of structure.	
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	Meaning	
	UNDERSTANDINGS Students will understand that… ● Although scatter plots and trend lines may reveal a pattern, the relationship of the variables may indicate a correlation, but not causation.	ESSENTIAL QUESTIONS Students will keep considering… ● 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?
	Acquisition	
	Students will know…	Students will be skilled at…

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	● that scatter plots and trend lines are different visual representations of data ● the correlation coefficient tells how well an equation accurately models a data set ● that outliers are data points that don't quite fit with the rest of the data, and can have a major effect on the analysis of the data.	● Creating a scatter plot by hand and drawing the trend line ● Using a graphing calculator to graph a scatter plot, using an appropriate window, and to find a linear regression line. ● Interpreting the correlation coefficient for a linear model. ● Understanding the effects of outliers.

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.		

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	Scoring Rubric used to evaluate successful understanding of the criteria for creating and analyzing a scatter plot to make a prediction.	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Students will predict the male and female population of the United States in the year 2035 Role: Census Taker Audience: General Population Situation: Students are asked to use data given in a table to create a scatter plot of data pairs and use the models to predict the rate of growth in the population. Product or Performance: A display (poster, google slides, etc) showing their data, scatter plot, model and prediction. Standards and Criteria 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.

T, M, A	● Thorough understanding of scatter plots and trend lines, and the correlation between data points.	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…* ● Monitoring class work through board work, group work, questioning, and walk-arounds
T, M, A	● Thorough understanding of the correlation coefficient as a measure of how accurate a trend line models data.	● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals
T, M, A	● Thorough understanding of outliers and how they can affect data analysis.	● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives ● Alternative assessment projects such as posters, drawings, pictures and real world applications ● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams ● Quizzes ● Unit Test - to include a variety of DOK level problems and may include SAT style problems.

Stage 3 – Learning Plan		
Code M T, M, A	*Pre-Assessment* ● Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as graphing data points to make a scatter plot, and finding equations of lines. ● Prerequisite knowledge will be reviewed as it is incorporated into application problems both in class and on review assignments	
	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring
M, A	● Teacher introduces the need for scatter plots and trend lines using an application.	● Warm up questions ● Class worksheets with direct teacher observation or self assessment
T, M, A	● Teacher stresses the importance of using data as a tool in the decision making process.	● Practice on whiteboard/chalkboard with direct teacher observation
T, M, A	● Students will create scatter plots and fit trend lines to the data by hand and using a graphing calculator.	● Kahoot quiz or pear deck slideshow with review questions and direct teacher observation
T, M, A	● Students will find the equation for a trend line and use it to make predictions by interpolation or extrapolation.	● Reflective journals or exit tickets at the end of the lesson ● Edulastic or google form review assignments
M, A	● Teacher will guide students to discover how an outlier can affect a data set.	● Homework assignments with direct teacher observation or self assessment
T, M, A	● Students will discover how an outlier affects a data set .	● Projects/performance tasks modeling real world problems involving data that graphs as a scatterplot

T, M, A	● Students will interpret the meaning of the correlation coefficient.	● Summative assessments
		
		    Quizzes
		    Unit test

Unit 6 – Systems of Equations

Course/Subject: Algebra 1 Honors

# of Weeks: 5

Stage 1 Desired Results

ESTABLISHED GOALS	*Transfer*
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.	*Students will be able to independently use their learning to…* ● CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. ● CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. ● CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. ● CCSS.Math.Practice.MP4 Model with mathematics. ● CCSS.Math.Practice.MP5 Use appropriate tools strategically. ● CCSS.Math.Practice.MP6 Attend to precision. ● CCSS.Math.Practice.MP7 Look for and make use of structure.

Meaning	
UNDERSTANDINGS *Students will understand that…* ● A system of linear equations can have none, one or an infinite number of solutions ● A system of equations can be solved algebraically or graphically ● 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.	ESSENTIAL QUESTIONS *Students will keep considering…* ● 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?

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.*		
	Acquisition	
	Students will know…	*Students will be skilled at…*
	- How to create a system of linear equations - How to solve a system of equations using the substitution method - How to solve a system of equations using the elimination method - What the solution to a system of equations represents	- Creating equations that describe numbers or relationships - Solving systems of equations using the substitution and elimination methods - Representing and solving systems of equations graphically

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	Scoring Rubric used to evaluate successful understanding of the criteria for creating and solving a system of equations as well as analyzing the solution	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Use systems of equations as a tool when determining distances in a race. Role: Athlete Audience: Other competitors Situation:Two people begin walking in the same direction at different speeds. Find the time and distance when the walkers will be even. Product or Performance: A completed poster with the data, correct equations, and analysis of the direction and speed of each person Standards and Criteria for Success: Finished product should contain: - Data clearly showing the rate of motion for each walker - The correct equation that models the distance as a function of time for each walker - The correct analysis of when the walkers will be even - A neat, organized presentation

T, M, A	● Thorough understanding of the meaning of the solution to a system of equations	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…* ● Monitoring class work through board work, group work, questioning, and walk-arounds
M, A	● Thorough understanding of how to solve a system of linear equations algebraically using the substitution and elimination methods	● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals
M, A	● Thorough understanding of how to solve a system of linear equations graphically.	● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives
T, M, A	● Thorough understanding of how to represent real world information using a system of equations and then to solve and analyze the solution	● Alternative assessment projects such as posters, drawings, pictures and real world applications ● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams ● Quizzes ● Unit Test - to include a variety of DOK level problems and may include SAT style problems.

Stage 3 – Learning Plan	
Code M T, M, A	***Pre-Assessment*** ● Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as basic problems on solving and writing equations and graphing linear equations ● Prerequisite knowledge will be reviewed as it is incorporated into application problems both in class and on review assignments

Code	Summary of Key Learning Events and Instruction	Progress Monitoring
M M M, A T, M, A M, A T, M, A	*Student success at transfer meaning and acquisition depends on…* ● 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. ● Students will determine whether two linear functions will have a point of intersection. ● 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 scaffolds 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.	● Warm up questions ● Class worksheets with direct teacher observation or self assessment ● Practice on whiteboard/chalkboard with direct teacher observation ● Kahoot quiz or pear deck slideshow with review questions and direct teacher observation ● Reflective journals or exit tickets at the end of the lesson ● Edulastic or google form review assignments ● Homework assignments with direct teacher observation or self assessment ● Projects/performance tasks modeling real world problems involving system of equations ● Summative assessments

M, A	● Students will calculate the point of intersection for two linear functions using both graphical and algebraic methods.	Quizzes Unit test
T, M, A	● Teacher will show students how graphing technology can be used to generate more accurate solutions for real world application problems.	
M, A	● Teacher will stress the limitations of solving using the graphing method.	
T, M, A	● When working with real world models, the teacher will highlight connections to the work done in the previous unit with scatter plots and trend lines.	
T, M, A	● Students will write models and use these models as a tool to solve real world problems and make decisions	
T, M, A	● 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.	
T, M, A	● Students will recognize when one method of solving a system of linear equations is more advantageous than another.	
T, M, A	● When working with application problems, the teacher will model for students how to highlight/identify key information in a problem and then translate this information into a mathematical sentence.	
T, M, A	● Students will explain what the point of intersection means in the context of a real world problem.	

T, M, A	● Teacher will lead students to discover how they can tell that there is no solution to a system of linear equations.	

Unit 7 – Intro to Exponents and Exponential Functions
Course/Subject: Algebra 1 Honors

# of Weeks: 4

Stage 1 Desired Results

ESTABLISHED GOALS	*Transfer*	
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.*	Students will be able to independently use their learning to… ● CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. ● CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. ● CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. ● CCSS.Math.Practice.MP4 Model with mathematics. ● CCSS.Math.Practice.MP5 Use appropriate tools strategically. ● CCSS.Math.Practice.MP6 Attend to precision. ● CCSS.Math.Practice.MP7 Look for and make use of structure.	
N-RN 2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. 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%.	*Meaning*	
	UNDERSTANDINGS *Students will understand that…* ● A single quantity may be represented by many different expressions. The facts about a quantity may be expressed by many different equations ● The idea of exponents can be extended to include zero and negative exponents ● All of the facts of arithmetic and algebra follow from certain properties. ● Properties of exponents make it easier to simplify products or quotients of powers with the same base or powers	ESSENTIAL QUESTIONS *Students will keep considering…* ● How can numbers less than 1 be represented with exponents? ● How can expressions involving exponents be simplified? ● What are the characteristics of exponential functions? ● How are exponential growth and decay applied to the real world?

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F-LE 5. Interpret the parameters in a ... exponential function in terms of a context. e. Graph exponential ... functions, showing intercepts and end behavior F-LE 1. Distinguish between situations that can be modeled with linear functions and with exponential functions.	raised to a power or products raised to a power. ● Rational exponents can be used to represent radicals. ● The parent of the family of exponential functions is $y = ab^x$. The independent variable is an exponent. This family of functions can model growth or decay of an initial amount.	
	Acquisition	
	Students will know… ● how to simplify expressions with zero and negative exponents ● the properties of exponents and how to apply them to simplify expressions ● how to simplify expressions with rational exponents. ● how to graph exponential functions ● what makes an exponential function exponential growth or decay and real world applications	*Students will be skilled at…* ● evaluating and simplifying expressions with zero and negative exponents ● applying the properties of exponents to simplify expressions ● simplifying expressions with rational exponents ● graphing rational functions ● identifying exponential growth and decay ● applying exponential growth and decay to real world situations

Stage 2 – Evidence

Code	Evaluative Criteria	Assessment Evidence
T, M, A	Scoring rubric evaluating successful understanding of the application of exponents to correctly solve the problem	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Students will calculate the amount of computer memory, bits, in a computer. Role: Student Audience: Classmates Situation: Students will use exponential expressions to convert computer bits to megabytes and gigabytes, as well as megabytes to gigabytes Product or Performance: Students will produce a chart that displays the appropriate conversions for at least 5 bits Standards for Success: Students will have provided correct answers with proper work or justification to support them. Chart will be neat, easy to read, and understandable.

T, M, A	● Thorough understanding of simplifying expressions with zero and negative exponents	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…*
T, M, A	● Thorough understanding of the properties of exponents and how they apply to simplifying and evaluating expressions	● Monitoring class work through board work, group work, questioning, and walk-arounds ● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals
T, M, A	● Thorough understanding of rational exponents	● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives
T, A	● Thorough understanding of graphing exponential functions	● Alternative assessment projects such as posters, drawings, pictures and real world applications
T, M	● Thorough understanding of exponential growth and decay, and applications to real world situations	● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams ● Quizzes ● Unit Test - to include a variety of DOK level problems and may include SAT style problems.

Stage 3 – Learning Plan	

Code	Pre-Assessment
M T, M, A	● Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as basic problems on evaluating with exponents and graphing basic functions. ● Prerequisite knowledge will be reviewed as it is incorporated into application problems both in class and on review assignments

	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring

M
 	
 T, M, A
 	
 M, A
 	
 T, M, A
 	
 M, A
 	
 T, M, A
 	
 M
 	
 T, M
	● Teacher introduces negative and zero exponents by showing patterns in different powers of the same base.
	
	 ● Students will recognize that zero exponent leads to a value of 1, and negative exponents result in the reciprocal value of the base.
	
	 ● Students will work independently to simplify expressions with zero and negative exponents
	
	 ● Teacher will model the properties of exponents and will relate them to multiplication and division rules
	
	 ● Students will work in pairs to apply the properties of exponents to simplifying and evaluating expressions
	
	 ● Teacher will use the properties of exponents and the definition of radicals to demonstrate rational exponents
	
	 ● Students develop meanings for rational exponents through group activities.
	
	 ● Teacher guides students through an activity that demonstrates the connection between the graph of an
		● Warm up questions
		
		 ● Class worksheets with direct teacher observation or self assessment
		
		 ● Practice on whiteboard/chalkboard with direct teacher observation
		
		 ● Kahoot quiz or pear deck slideshow with review questions and direct teacher observation
		
		 ● Reflective journals or exit tickets at the end of the lesson
		
		 ● Edulastic or google form review assignments
		
		 ● Homework assignments with direct teacher observation or self assessment
		
		 ● Projects/performance tasks modeling real world problems involving exponential data
		
		 ● Summative assessments
		    Quizzes
		    Unit test

M	exponential function and the meaning of negative and rational exponents. ● 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.
M, A	● Teacher will guide students through activities that compare the key features of data modeled by exponential functions.
M, A	● Teacher will present scenarios which involve growth, decay, 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 growth and decay.
T, M, A	● Students will solve real world problems involving exponential growth and decay. . .

Unit 8 – Intro to Polynomials and Quadratics
Course/Subject: Algebra 1 Honors
 # of Weeks: 5

Stage 1 Desired Results

ESTABLISHED GOALS	*Transfer*
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. 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,	*Students will be able to independently use their learning to…* ● CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them. ● CCSS.Math.Practice.MP2 Reason abstractly and quantitatively. ● CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. ● CCSS.Math.Practice.MP4 Model with mathematics. ● CCSS.Math.Practice.MP5 Use appropriate tools strategically. ● CCSS.Math.Practice.MP6 Attend to precision. ● CCSS.Math.Practice.MP7 Look for and make use of structure.

	Meaning	
	UNDERSTANDINGS *Students will understand that…* ● Quadratic functions can be used to model real world relationships and the key points in quadratic functions have meaning in the real world context. ● Polynomials are closed under addition, subtraction, and multiplication. ● Many polynomials can be represented in factored form ● The Zero Product Property is used to solve polynomial equations ● The square root method can be used in to solve certain quadratic equations	ESSENTIAL QUESTIONS *Students will keep considering…* ● What can the zeros, intercepts, vertex, maximum, minimum and other features of a quadratic function tell you about real world relationships? ● How is the polynomial system analogous to the system of integers? ● What are different ways to represent the same polynomial expression? ● How can the Zero Product Property be applied to solve polynomial equations? ● When can the square root method be used to solve an equation?

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 ...* 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.		
	Acquisition	
	Students will know… ● the definitions of polynomial, monomial, binomial, and trinomial ● how to add, subtract, and multiply polynomials ● identify the factored form of a polynomial ● how to factor polynomials by using the greatest common factor ● to recognize and factor the difference of two squares ● to use methods of "reverse foil" or master product to factor trinomials, including those with a leading coefficient greater than 1. ● how to solve polynomial equations using the zero product property ● how to apply the square root method to solve equations	*Students will be skilled at…* ● classifying expressions a polynomials, and identifying polynomials as monomials, binomials, or trinomials ● performing the operations of adding, subtracting, and multiplying polynomials ● identifying the factored form of a polynomial ● factoring the greatest common factor from a polynomial ● identifying a binomial as the difference of two squares, and factoring it. ● applying the method of "reverse foil" or master product to factor trinomials ● applying the zero product property to solve polynomial equations ● using the square root method to solve equations

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	. Scoring Rubric used to evaluate successful understanding of the criteria for applying the methods of multiplying polynomials to solve the problem.	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Goal: Determine the dimensions of a new box at a packaging company Role: Engineer Audience: Factory workers Situation: The company is building a new box with the same volume as two present boxes combined. You must find dimensions of the new box that will meet this condition Product or Performance: A presentation (google doc, google slides, etc) which displays the dimensions and volumes of the original boxes, as well as the dimensions and volume of their newly designed box. Standards and Criteria for Success: Finished product will have: Students will have provided pictures, dimensions, and correct answers for the calculated volumes, with proper work or justification to support them. Product will be neat and easy to read.

M, A	● Thorough understanding of what makes an expression a polynomial, and how to classify polynomials as monomials, binomials, or trinomials	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…*

● Monitoring class work through board work, group work, questioning, and walk-arounds |
| M, A | ● Thorough understanding of adding, subtracting, and multiplying polynomials | ● Check for understanding via going over homework, whiteboard activities, and medium such as reflections, exit tickets, and journals |
| M, A | ● Thorough understanding of applying the methods of Greatest Common Factor, Difference of Two Squares, and "reverse FOIL" or master product to factor polynomials, including those with a leading coefficient greater than 1. | ● Differentiate through purposeful or flexible grouping, use of diagrams and explanations to demonstrate understanding and active lessons involving discovery, scaffolding, jigsaw activities and use of hands-on manipulatives

● Alternative assessment projects such as posters, drawings, pictures and real world applications |
| M, A | ● Thorough understanding of the Zero Product Property and how to apply it to solve polynomial equations | ● Review of standardized test questions to prep students for the challenge of the SAT and ACT exams

● Quizzes |
| M, A | ● Thorough understanding of when and how to use the square root method to solve equations | ● Unit Test - to include a variety of DOK level problems and may include SAT style problems. |

Stage 3 – Learning Plan	
Code M T, M, A	*Pre-Assessment* ● Teacher checks for prerequisite skills and prior knowledge via warm-up and questioning activities, such as order of operations and operations with polynomials ● Prerequisite knowledge will be reviewed as it is incorporated into new concepts and application problems both in class and on review assignments

	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring
M	● Teacher will introduce and define polynomial, and classifications of polynomials based on the number of terms (monomial, binomial, trinomial)	● Warm up questions ● Class worksheets with direct teacher observation or self assessment
M	● Teacher will model the processes of adding, subtracting, and multiplying polynomials	● Practice on whiteboard/chalkboard with direct teacher observation
M, A	● Students will identify polynomials and classify them according to the number of terms	● Kahoot quiz or pear deck slideshow with review questions and direct teacher observation
M, A	● Students will complete activities where they perform operations of adding, subtracting, and multiplying polynomials.	● Reflective journals or exit tickets at the end of the lesson
T, M, A	● Teacher will use to process of multiplying polynomials as a way to introduce factoring as the inverse operation of multiplication	● Edulastic or google form review assignments ● Homework assignments with direct teacher observation or self assessment
T, M, A	● Teacher will demonstrate and model the factoring methods of Greatest Common Factor, Difference of Squares, and "Reverse Foil" or Master Product to factor polynomials, including those with a leading coefficient greater than 1	● Projects/performance tasks modeling real world problems involving quadratic equations that can be solved by factoring
T, M, A	● Students will complete hands on and discovery	● Summative assessments 　　Quizzes

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	activities to recognize the methods needed to factor polynomials	Unit test
M, A	● Students will work collaboratively and independently to practice and master the methods of factoring	
M, A	● Teacher will introduce the Zero Product Property as a method to solving polynomial equations.	
M, A	● Students will complete an activity to practice solving polynomial equations.	
M, A	● Teacher will highlight for students the concept of square roots and the principal square root.	
M, A	● Students will explore how solving equations using the square root method can be used.	