8th Grade ALGEBRA 1 OUTLINE 2018-2019

All mathematical practices and literacy skills will be used throughout each unit.

STANDARDS FOR MATHEMATICAL PRACTICES
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

LITERACY SKILLS FOR MATHEMATICAL PROFICIENCY
1. Use multiple reading strategies.
2. Understand and use correct mathematical vocabulary.
3. Discuss and articulate mathematical ideas.
4. Write mathematical arguments.

QUARTER 1 OUTLINE

UNIT 1: EXPRESSIONS, EQUATIONS, AND INEQUALITIES

Lesson	Standards	TSW	Resources
1. Variables & Expressions Properties Justifying Equations	**A1.A.SSE.A.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. **A1.A.REI.A.1** Explain each step in solving an 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.	TSW translate between words in algebra. TSW solve and justify each step in equations using properties.	**Holt McDougal:** 1-1 **Vocabulary** Variable Constant Numerical Expression Algebraic Expression
2. Create Equations, Multi – Step Equations/ No Solution/Infinite	**8.EE.C.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 successfully 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 who solutions require expanding expressions using the distributive property and collecting like terms.	TSW be able to create and solve linear equations. TSW be able to analyze the give information to determine a viable solution. TSW determine how many solutions an equation has.	**Curriculum Associates:** Lessons 13 and 14 **Holt McDougal:** 2-3 **Carnegie Learning Student Skills Practice:** 3.4, 14.2 **Vocabulary** No Solution Infinite Solution Inverse Operation

	A1.A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. **A1.A.CED.A.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.		
3. Solving Inequalities in One Variable	**A1.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems. **A1.A.CED.A.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.	TSW be able to create, solve, and graph linear inequalities.	**Holt McDougal:** 3-2, 3-3 **Carnegie Learning Volume 1:** 2.3 **Vocabulary** Inequality Less Than Less Than or Equal To Greater Than Greater Than or Equal To Number Line
4. Multi – Step Inequalities, Compound Inequalities	**A1.REI.B.2** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	TSW be able to create, solve, and graph multi – step and compound inequalities.	**Holt McDougal:** 3-4, 3-6 **Carnegie Learning Volume 1:** 2.4 **Vocabulary** Compound Intersection Union
5. Literal Equations	**A1.A.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. **A1.A.REI.B.2** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	TSW be able to solve a formula for a given variable.	**Holt McDougal:** 2-5 **Carnegie Learning Volume 1:** 3.2 **Carnegie Learning Student Skills Practice:** 3.3 pgs. 341, 342, 344, 345

			Vocabulary Literal Equation Formula
6. Proportions and Rates	**A1.N.Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **A1.N.Q.A.2** Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling. **A1.N.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	TSW analyze the given information to determine viable solutions.	**Holt McDougal:** 2-7, 2-8 **Carnegie Learning Student Skills Practice:** 2.2 **Khan Academy:** Speed translation | Ratios, proportions, units, and rates **Vocabulary** Ratio Proportion Rate Similar Scale Factor Scale model Corresponding Sides
7. Dimensional Analysis	**A1.N.Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **A1.N.Q.A.2** Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling. **A1.N.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	TSW determine appropriate units in contextual situations. TSW be able to convert to appropriate units using dimensional analysis.	**Holt McDougal:** 2-8 **Khan Academy:** Unit measurement word problem: running laps **Vocabulary** Dimensional Analysis Conversion Factor

UNIT 2: FUNCTIONS AND RELATIONS			
Lesson	**Standards**	**TSW**	**Resources**
1. Functions and Relations	**8.F.A.1** Understand that a function is a rule that assigns to each input exactly one output. **A1.F.IF.A.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*).	TSW determine functions and relations based upon the input and output. TSW determine if a relation is a function.	**Curriculum Associates** Lesson 6 **Holt McDougal:** 4-2 **Carnegie Learning Volume 1:** 1.2 **Vocabulary** Function Relation Input Output Vertical Line Test
2. Domain and Range, Reasonable Domain and Range	**A1.F.IF.A.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*). **A1.F.IF.B.4** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	TSW be able to find the domain and range of functions.	**Holt McDougal:** 4-4 **Carnegie Learning Volume 1:** 1.2 **Vocabulary** Domain Range
3. Function Notation, Discrete and Continuous Graphs, Qualitative Graphs	**A1.F.IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. **A1.F.IF.B.4** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	TSW evaluate a function for given input values. TSW determine a reasonable domain for the given function.	**Curriculum Associates** Lesson 10 **Holt McDougal:** 4-3 **Carnegie Learning Volume 1:** 1.1, 1.3, 1.4 **Vocabulary** Function Notation Independent Variable Dependent Variable Function Rule

	8.F.B.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.	TSW describe the relationship between two quantities by analyzing a graph. TSW sketch a graph of a function that has been described verbally.	Discrete Continuous Increasing Decreasing Qualitative Graphs Constant
4. Naming the Function, Graphing Functions, Comparing Functions	**8.F.A.3** Know and interpret the equation y=mx+b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A=s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4), and (3,9), which are not on a straight line. **A1.F.IF.B.3** 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. **8.F.A.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 another linear function represented by an algebraic expression, determine which function has the greater rate of change.	TSW determine what type of function (linear, quadratic, cubic, etc.) by the equation, graph, and table. TSW 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. TSW compare properties of two functions each represented in a different way.	**Curriculum Associates** Lesson 8, 7 **Holt McDougal:** 4-4 **Carnegie Learning Volume 1:** 1.2 **Vocabulary** Linear Function Quadratic Function Cubic Function Exponential Function Absolute Value Function Initial Value Rate of Change

5. Arithmetic Sequence, Common Difference	**A1.F.LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input-output pairs.	TSW write an equation given different representations of arithmetic sequences.	**Holt McDougal:** 4-6 **Carnegie Learning Volume 1:** Chapter 4: Sequences **Vocabulary** Arithmetic Sequence Common Difference Sequence Term
6. Explicit and Recursive Rule	**A1.F.BF.A.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.	TSW write a function using the explicit and recursive rule involving arithmetic sequences.	**Holt McDougal:** Pg. AT10 (Section A-4) **Carnegie Learning Volume 1:** Chapter 4: Sequences **Vocabulary** Explicit Recursive

UNIT 3: LINEAR FUNCTIONS			
Lesson	**Standards**	**TSW**	**Resources**
1. Graphing Using a Table of Points	**A1.A.REI.D.5** 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).	TSW graph functions by creating a table of values.	**Holt McDougal:** 5-3 Find the Change Task Relationship among Quantities **Vocabulary** Table of Points
2. Horizontal and Vertical Lines	**A1.A.REI.D.5** 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).	TSW graph an equation and determine if it is horizontal or vertical.	**Vocabulary** Horizontal Vertical
3. Intercepts	**A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	TSW graph functions by hand and with a calculator identifying x and y intercepts.	**Holt McDougal:** 5-2 Downhill Task Intercepts Activity **Vocabulary** X and y intercepts
4. Slope Formula	**8.EE.B.6** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; know and derive the equation y=mx for a line through the origin and the equation y=mx+b for a line intercepting the vertical axis at b. **A1.F.LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Recognize that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval	TSW calculate slope from a formula, graph, and a table of values. TSW use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane. TSW know and derive the equation y=mx and y=mx+b.	**Curriculum Associates** Lesson 12 **Holt McDougal:** 5-4 The Slope Game Graph and Write Lines Instruction **Vocabulary** Slope Slope Formula Rise Run Similar Triangles

	relative to another. c. Recognize situations in which a quantity grows or decays by a constant factor per unit interval relative to another. **A1.S.ID.C.5** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.		
5. Rate of Change	**A1.S.ID.C.5** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **A1.F.IF.B.5** 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. **8.EE.B.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	TSW use rate of change to interpret contextual problems. TSW interpret unit rate as the slope of the graph in proportional relationships. TSW graph proportional relationships and compare proportional relationships.	**Curriculum Associates:** Lesson 11 **Holt McDougal:** Pg. AT14 (Section A-5) Mathemafish Population Task Graphs of Simple Nonlinear Functions Lesson **Vocabulary** Rate of Change Proportional Relationships Unit Rate
6. Slope – Intercept Form	**8.F.B.4** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or form two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values. **A1.A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales.	TSW create and graph linear functions in slope – intercept form.	**Curriculum Associates** Lesson 9 **Holt McDougal:** 5-7 **Vocabulary** Slope – Intercept Form

	A1.A.REI.D.5 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).		
7. Transforming Linear Functions	**A1.F.BF.B.2** Identify the effect on the graph of replacing *f(x)* by *f(x) + k*, *k f(x)*, *f(kx)*, and *f(x + k)* for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. **A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	TSW be able to describe how altering parts of a linear function can transform the parent function.	**Holt McDougal:** 5-10 **Carnegie Learning Volume 1:** 5.1, 5.3, 5.4 **Vocabulary** Family of Functions Parent Function Transformation Translation Rotation Reflection

QUARTER 2 OUTLINE

UNIT 4: DATA ANALYSIS

Lesson	Standards	TSW	Resources
1. Data Representations, Center and Spread	**A1.S.ID.A.1** Represent single or multiple data sets with dot plots, histograms, and stem plots (stem and leaf) and box plots **A1.S.ID.A.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. **A1.S.ID.A.3** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	TSW be able to create and interpret box and whisker plots, dot plots, histograms, and stem plots. TSW compare the center and spread of two or more different data sets. TSW interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points.	**Vocabulary:** Frequency Histogram Dot Plot Outlier Mean Median Mode First Quartile Third Quartile Interquartile Range Box and Whiskers Plot Correlation Coefficient Skewed Data Discrete Data Continuous Data Plot Measure of Central Tendency Interpolation Extrapolation Causation Correlation **Carnegie Learning** **Algebra I – Volume 2:** Chapter 8 – Analyzing Data Sets Chapter 9 – Correlation and Residual (9.2 and 9.5) Chapter 10 – Analyzing Data Sets for Two Categorical Variables
3. Scatterplots and Trend lines	**8.SP.A.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.A.2** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informal fit a straight line and informally assess the model fit by judging the closeness of the data points to the line. **A1.S.ID.B.4** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	TSW be able to summarize data and describe the shape of the data. TSW be able to create and interpret scatterplots and line of best fit. TSW be able to use technology to determine the line of best fit. TSW use the line of best fit to solve problems in the context of the data.	

	a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. b. Fit a linear function for a scatter plot that suggests a linear association. **8.SP.A.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. **A1.S.ID.C.6** Use technology to compute and interpret the correlation coefficient of a linear fit.	TSW interpret the slope and intercepts of the line of best fit in the context of the problem.	**Curriculum Associates:** Lesson 28,29, and 30 **Holt McDougal**: 10-1, 10-2, 4-5, 4-5 Tech lab, pg. AT30, 10-3, CC30 Pg. AT38, Pg. AT40, HMH p.441 MetaMetrics – Quantiles Marbles Plop It Histogram **Online Resources:** Quartile-Box-Whiskers Activity Virtual Nerd Histograms Khan Academy - Mean, Median, and Mode Better Lessons - Causation and Correlation Better Lessons - Outliers
7. Transformation of Data	**A1.S.ID.C.6** Use technology to compute and interpret the correlation coefficient of a linear fit. **A1.S.ID.C.7** Distinguish between correlation and causation	TSW be able to use technology to determine the line of best fit. TSW be able to distinguish between correlation and causation.	

UNIT 5: SYSTEMS OF LINEAR FUNCTIONS			
1. Solving Systems of Equations by Graphing Special Cases	**A1.A.CED.A.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. **A1.A.REI.D.5** 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 (but could be a line) **8.EE.C. 8** Analyze and solve systems of two linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.	TSW be able to analyze the given information to determine viable solutions. TSW be able to evaluate a solution from a table of values or a graph to determine a solution using an appropriate domain.	**Vocabulary:** System of Linear Equations Solution of a System Substitution Consistent Systems Inconsistent Systems Dependent Independent Linear Inequality System of Linear Inequalities **Curriculum Associates:** Lesson 15,16,17 **Carnegie Learning** **Algebra I – Volume 1:** Chapter 6 – Systems of Equations Chapter 7 – Systems of Inequalities **Holt McDougal:** 6-1 thru 6-6 **Online Resources:** Schmoop - Systems of Equations Math Games Watch Your Step!! TI Math Inspired Virtual Nerd - Inequalities Solving Systems of Inequalities Activity
2. Solving Systems of Equations by Substitution Special Cases	**8.EE.C. 8** Analyze and solve systems of two linear equations. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x_2y=5 and 3x+2y=6 have no solution because 3x+2y cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the lien through the first pair of points intersects the line through the second pair.	TSW be able to analyze the given information to determine viable solutions. TSW be able to solve a system of equations both algebraically and graphically.	

	A1.A.CED.A.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. **A1.A.REI.C.4** Write and solve a system of linear equations in context.		
3. Graphing Linear Inequalities	**A1.A.REI.D.7** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	TSW be able to solve systems of linear inequalities by graphing solutions sets.	
4. Solving Systems of Inequalities by Graphing	**A1.A.REI.D.7** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	TSW be able to solve systems of linear inequalities by graphing solutions sets.	

UNIT 6: ABSOLUTE VALUE			
1. Absolute Value Equations	**A1.A.REI.A.1** Explain each step in solving an 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.	TSW be able to list and explain using mathematical terms his/her solution to the equation.	**Vocabulary:** Opposites Absolute Value Linear Absolute Value Equation Linear Absolute Value Inequality Step Function Piecewise **Carnegie Learning Algebra I – Volume I:** Chapter 2 (2.5) **Carnegie Learning Algebra I – Volume II:** Chapter 15 (15.1 and 15.2) Chapter 16 (16.5) **Holt McDougal:** pg. 378-381, pg. AT5 **Online Resources:** Khan Academy - Absolute Value and Piecewise Functions Khan Academy - Step Functions Graphing Transformations Piecewise Functions
2. Absolute Value Inequalities	**A1.A.REI.B.2** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	TSW be able to create and solve equations.	
3. Graphing Absolute Values	**A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value-functions.	TSW be able to graph functions by hand and with a calculator identifying x and y intercepts.	
4. Graphing Absolute Value Functions and Piecewise and Step Functions	**A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value-functions	TSW be able to graph functions by hand and with a calculator identifying x and y intercepts.	
5. Domain and Range of Absolute Value Equations	**A1.F.IF.B.4** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	TSW be able to determine the domain of the graph of a quadratic function in real world situations.	

6. Transformation of Absolute Value Functions	**A1.F.BF.B.2** Identify the effect on the graph of replacing f(x)by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.	TSW transform graphs of absolute value and exponential functions.	
MID-TERM REVIEW AND EXAM			

QUARTER 3 OUTLINE

UNIT 7: EXPONENTIAL FUNCTIONS

Lesson	Standards	TSW	Resources
8. Identify Geometric Sequence	**A1.F.LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Recognize that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant factor per unit interval relative to another. **A1.F.LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input-output pairs.	TSW identify a sequence as being geometric. TSW identify the common ratio of a geometric sequence. TSW differentiate between an arithmetic and geometric sequence, based on if the sequence has a common difference or common ratio between successive terms.	**Vocabulary** Geometric sequence Common ratio Successive terms **Holt McDougal** 11-1 p.790 http://www.coolmath.com/algebra/17-exponentials-logarithms **Carnegie Learning** vol. 1 Ch.5
9. Recursive Rule	**A1.F.BF.A.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. **A1.F.LE.A.2** Construct linear and exponential functions, including arithmetic and geometric	TSW write the recursive rule for a geometric sequence, given either the sequence, a graph of the sequence, a table of values, or two consecutive terms in the sequence.	$a_n=a_{n-1} * r$ **Vocabulary** Recursive/recursion **Carnegie Learning** vol. 1 4.3

	sequences, given a graph, a table, a description of a relationship, or input-output pairs. **A1.F.LE.B.4** Interpret the parameters in a linear or exponential function in terms of a context.		**Holt McDougal** 11-1 p.790 CoolMath Virtual Nerd
10. Explicit Rule	**A1.F.BF.A.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. **A1.F.LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input-output pairs. **A1.F.LE.B.4** Interpret the parameters in a linear or exponential function in terms of a context.	TSW write the explicit rule for a geometric sequence, given either the sequence, a graph of the sequence, a table of values, or two consecutive terms in the sequence.	$a_n=a_1r^{n-1}$ **Vocabulary** nth term explicit **Holt McDougal** 11-1 p.791 CoolMath **Carnegie Learning** vol. 1 4.3
11. Define an Exponential Function	**A1.A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. c. Use the properties of exponents to rewrite exponential expressions.	TSW define an exponential function as $f(x)=ab^x$. TSW evaluate exponential functions. TSW identify and graph exponential functions. TSW rewrite exponential functions using the properties of exponents.	**Vocabulary** Exponential function **Holt McDougal** 11-2 p.796 Clarification: For example, the growth of bacteria can be modeled by either $f(t) = 3^{(t+2)}$ or $g(t) = 9(3^t)$ because the expression $3^{(t+2)}$ can be rewritten as $(3^t)(3^2) = 9(3^t)$.
12. Exponential Functions	**A1.F.IF.B.3** 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. ★	TSW graph exponential functions and identify its key features.	**Holt McDougal** 11-2 p.796
13. Exponential Growth and Decay	**A1.F.LE.A.1** Distinguish between situations that can be modeled with linear functions and with	TSW write exponential functions to represent growth and decay.	**Vocabulary** Exponential growth Exponential decay

	exponential functions. a. Recognize that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant factor per unit interval relative to another. **A1.F.IF.B.4** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Clarification: For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.	TSW use properties of exponents, including rational exponents (such as power of a power, product of powers, power of a product, and rational exponents, etc…) to write an equivalent form of an exponential function to reveal and explain specific information about its approximate rate of growth or decay (including negative and zero exponents).	Half-life Compound interest **Holt McDougal** 11-3 p.805 Virtual Nerd

UNIT 8: POLYNOMIALS AND FACTORING			
Lesson	**Standards**	**TSW**	**Resources**
1. Determine Linear, Exponential, Cubic, Quadratic functions graphs	**A1.F.LE.A.1** ★Distinguish between situations that can be modeled with linear functions and with exponential functions. a) Recognize that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b) Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c) Recognize situations in which a quantity grow **A1.F.LE.A.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. **A1.F.IF.C.8** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	TSW compare linear, quadratic, cubic, and exponential models.	**Vocabulary** Cubic Quadratic Differences Constant change Constant ratio **Holt McDougal** blending of: 5-1 p.300 linear 9-1 p.610 quadratic 11-2 p.796 exponential A-4 p.AT10 patterns and recursion Ch.9 extension p.680 cubic **Holt McDougal** Common Core Curriculum Companion CC34 Comparing Functions *Can be moved to start of Unit 9
2. Exponents and Scientific Notation (Scientific Notation is not in Algebra 1, but is on the ACT so EE.A.3 and EE.A.4 can be moved to after testing)	**8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. **8.EE.A.3** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other. For example, estimate the	TSW know and apply the properties of integer exponents to generate equivalent expressions. TSW use numbers in Scientific Notation to estimate quantities and express how many times as much one is than the other.	**Vocabulary:** Exponent Base Power Product Rule Quotient Rule Power to Power Negative Exponent Zero Exponent

	population of the United States as 3 x 10^8 and the population of the world as 7 x 10^9, and determine that the world population is more than 20 times larger. **8.EE.A.4** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	TSW Perform operations with numbers expressed in scientific notation. TSW choose units of appropriate size for measurements. TSW interpret scientific notation that has been generated by technology.	Scientific Notation **Curriculum Associates** Lesson 1,4,5
3. Identifying parts of polynomials Standard form of polynomials	**A1.A.SSE.A.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.	TSW decompose polynomial expressions and make sense of multiple factors and terms by explaining the meaning of the individual parts focusing on quadratic and exponential expressions. TSW classify a polynomial based on its number of terms, as well as identify the degree, the leading coefficient, and the constant term.	**Vocabulary** Monomial Binomial Trinomial Polynomial Degree of a monomial Standard form of a polynomial Leading coefficient Quadratic Cubic **Holt McDougal** 7-6
4. Add and Subtract Polynomials	**A1.A.APR.A.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	TSW rewrite algebraic expressions in different equivalent forms using combining like terms and the distributive property to add and subtract polynomials.	**Vocabulary** Like terms **Holt McDougal** 7-7 **Carnegie Learning** vol. 2 12.1
5. Multiply Polynomials	**A1.A.APR.A.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations	TSW multiply polynomials.	**Vocabulary** FOIL Box method

	of addition, subtraction, and multiplication; add, subtract, and multiply polynomials		Double distribution **Holt McDougal** 7-8--7-9 **Carnegie Learning** vol. 2 12.2
6. Greatest Common Factor	**A1.A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it.	TSW find the greatest common factor of monomials.	**Vocabulary** Greatest common factor **Holt McDougal** 8-1
7. Factor by GCF	**A1.A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it.	TSW factor polynomials by using the greatest common factor.	**Holt McDougal** 8-2
8. Factor D.O.T.S.	**A1.A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it.	TSW factor the difference of two squares	**Vocabulary** D.O.T.S. Perfect squares **Holt McDougal** 8-5 **Carnegie Learning** vol. 2 12.3
9. Factor quadratic trinomials when a=1	**A1.A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it.	TSW factor quadratic trinomials when a=1.	**Vocabulary** Lizzie's method AC table Divide and Slide **Holt McDougal** 8-3
10. Factor quadratic trinomials when a>1	**A1.A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it.	TSW factor quadratic trinomials when a>1.	**Holt McDougal** 8-4
10. Choose an appropriate factoring method	**A1.A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it.	TSW choose an appropriate method for factoring a polynomial. TSW combine methods for factoring a polynomial.	**Holt McDougal** 8-6
11 Find Zeros of polynomials after factored	**A1.A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	TSW solve quadratic equations by factoring.	**Vocabulary** Quadratic equation **Holt McDougal**

	a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression in the form Ax2 + Bx + C to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to rewrite exponential expressions. **A1.A.APR.B.2** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.		9-6 **<u>Carnegie Learning</u>** vol. 2 12.3

UNIT 9: QUADRATICS			
Lesson	**Standards**	**TSW**	**Resources**
1. Solve Quadratics by using Square Roots	**8.EE.A.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 positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. **8.NS.A.2** Use rational approximations of irrational numbers to compare the size of irrational numbers locating them approximately on a number line diagram. Estimate the value of irrational expressions such as π^2. For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. **A1.A.REI.B.3** Solve quadratic equations and inequalities in one variable. a. Use the method of completing the square to rewrite 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. b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.	TSW solve quadratic equations by using square roots. TSW approximate square roots of non perfect squares. TSW understand why taking the square root of both sides of an equation yields two solutions. TSW recognize that a quadratic will have non-real solutions when there is a negative under the radical. Bonus TSW solve cube root equations. TSW identify numbers as rational or irrational.	**Holt McDougal** 9-7 **Curriculum Associates** Lesson 2,3 **Vocabulary** Square Root Index Radical Radicand Solution Non Real Solution
2. Solving by Completing the Square	**A1.A.REI.B.3** Solve quadratic equations and inequalities in one variable.	TSW solve quadratic equations by completing the square.	**Vocabulary** Perfect square trinomial

	a. Use the method of completing the square to rewrite 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. b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions. **A1.A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression in the form Ax2 + Bx + C to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to rewrite exponential expressions.		Completing the square **Holt McDougal** 9-8
3. Characteristics and Properties of Quadratics	**A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. **A1.F.IF.B.3** 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.	TSW identify the axis of symmetry, vertex, maxima or minima, domain, range, direction of opening, and intercepts from the graph of the quadratic.	**Vocabulary** Quadratic function Parabola axis of symmetry Vertex Upward/downward Minimum/minima Maximum/maxima x- and y-intercepts zeros **Holt McDougal** 9-1, 9-2

4. Solving Quadratic Equations by Graphing	**A1.A.APR.B.2** Identify zeros of polynomials when suitable factorizations are available and use the zeros to construct a rough graph of the function defined by the polynomial. **A1.F.IF.B.3** 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 **A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	TSW find the zeros of a polynomial function when it is factored and use the zeros to help sketch the graph. TSW identify the parent function of a quadratic as $f(x)=x^2$. TSW algebraically find the axis of symmetry, vertex, and intercepts of a quadratic when given the equation in standard form.	**Holt McDougal** 9-3
5. Transforming of Quadratics	**A1.F.BF.B.2** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. **A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	TSW identify the transformations of a quadratic function when compared to the parent function. TSW use technology to experiment with the graphs of various functions when transforming the equations using different values of k.	**Vocabulary** Dilation Reflection Translation See how the a,b,c values change the graph
6. Standard form of Quadratics to Vertex form using completing the square	**A1.A.REI.B.3** Solve quadratic equations and inequalities in one variable. a. Use the method of completing the square to rewrite any quadratic equation in x into an equation of the form (x – p)2 =	TSW transform a quadratic equation written in standard form to an equation in vertex form $y = a(x+h)^2 + k$ by completing the square (only with a leading coefficient of 1.)	Convert a Quadratic from Standard Form to Vertex Form by Completing the Square

	q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions. **A1.A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression in the form Ax2 + Bx + C to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to rewrite exponential expressions.	TSW identify the transformations of a quadratic function when compared to the parent function. TSW predict whether a quadratic will have a minimum or a maximum based on the value of a.	
7. Quadratic Formula and the Discriminant	**A1.A.REI.B.3** Solve quadratic equations and inequalities in one variable. a. Use the method of completing the square to rewrite 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. b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.	TSW derive the quadratic formula by completing the square on the standard form of a quadratic equation. TSW compute the discriminants and interpret the results as having no real solutions, 1 real solution, or 2 real solutions. TSW use the quadratic formula to solve any quadratic equation, recognizing the formula produces all complex solutions.	**Vocabulary** Discriminant Quadratic formula **Holt McDougal** 9-9 Derivation of the Quadratic formula is found on p.792 of Carnegie Learning vol.2 Proof of quadratic formula

8. Quadratic Word Problems	**A1.N.Q.A.2** Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling.		**Vocabulary** Extraneous solution Applications of Quadratic Equations Projectile Quadratic Word Problem Real-World Examples Better Lessons Application **Carnegie Learning** vol.2 11.3, 13.1
9. Compare different graphs Piece Wise Function Graphs	**A1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. **A1.F.IF.C.8** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)	TSW be able to graph functions by hand and using technology to identify its components. TSW use a variety of function representations (algebraically, graphically, numerically in tables, or by verbal descriptions) to compare and contrast properties of two functions.	**Carnegie Learning** vol.1 1.1 - 1.3 **Carnegie Learning** vol.2 15.1, 16.5 **Holt McDougal**: Pg. AT5

EOC REVIEW/TESTING WINDOW: APRIL 15 – MAY 3			
QUARTER 4 OUTLINE			
UNIT 10: GEOMETRY PREPARATION			
Lesson	**Standards**	**TSW**	**Resources**
1. Pythagorean Theorem	**8.G.B.4** (was 8.G.6) Explain a proof of the Pythagorean Theorem and its converse. **8.G.B.5** (was 8.G.7) Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. **8.G.B.6** (was 8.G.8) Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	I can explain the proof of the Pythagorean Theorem. I can use the Pythagorean Theorem to determine if a triangle is a right triangle. (use the converse) TSW determine the unknown side length in right triangles in real world mathematical problems. TSW determine the unknown side length in two and three dimensional geometric objects. TSW apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	**Vocabulary** Converse Hypotenuse Leg Pythagorean Theorem Right Triangle Right Angle Distance **Curriculum Associates:** Lesson 23,24,25
2. Transformations	**8.G.A.1** Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length.	TSW verify experimentally the properties of rotations, reflections, and translations.	**Vocabulary:** Reflection Rotation Translation

	b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. **8.G.A.2** (WAS 8.G.3) Describe the effect of dilations, translations, rotations, and reflections on two- dimensional figures using coordinates.	TSW verify that angle measures are unchanging through transformations. TSW verify that parallelness is unchanging through transformations. TSW describe the effects of transformations on two dimensional figures using coordinates. TSW derive the rules for transformations on a coordinate plan.	Parallel Transformation Dilation Scale Factor **Curriculum Associates:** Lessons 18,19,20
3. Angle Relationships	**8.G.A.3** (WAS 8.G.5) Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	TSW calculate and justify the triangle sum of angle rule. TSW classify angles formed by parallel lines and transversals. TSW classify angles as similar or non-similar using angle- angle criterion.	**Vocabulary** Adjacent Angles Alternate Exterior Angles Alternate Interior Angles Complementary Angles Congruent Corresponding Angles Diagonals Parallel Lines Perpendicular Lines Similar Supplementary Angles Transversal Vertical Angles **Curriculum Associates:** Lesson 21

4. Volume	**8.G.C.7** (was 8.G.9) Know and understand the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	TSW identify and apply formulas to find the volume of cones and cylinders. TSW identify and apply formulas to find the volume of spheres.	**Vocabulary:** Area Circumference Cone Cylinder Diameter Radius Sphere Volume **Curriculum Associates:** Lesson 26 and 27