Common Core Standards Curriculum Map - Algebra
QUARTER ONE

Unit One - Creating and Interpreting Expressions and Equations (10 days/5 blocks)

Common Core Standards and Content to Be Learned	***Mathematical Practices and Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Interpret the structure of expressions [Such as linear, exponential, quadratic expressions]. **A-CED.2** 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. *For example, interpret P(1+r)n as the product of P and a factor not depending on P.* **Create equations that describe numbers or relationships [Such as, linear, quadratic, and exponential (integer inputs only); for A.CED.3 linear only]** **A-CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.★ **A-CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★ **(For each of the bullets below, the expressions and equations refer to, but are not limited to, linear, quadratic, and exponential relationships.)** • Simplify expressions. • Write expressions in equivalent forms. • Identify parts of expressions and equations and view one or more of their parts as a single entity • Interpret the parts of expressions and equations	**SMP 1** Makes sense of problems and perseveres in solving them. **SMP 4** Model with mathematics. **SMP 7** Look for and make use of structure. How do you determine which symbol of equality or inequality is appropriate in a given context? How are variables used to create meaning in algebraic expressions and equations? What are the multiple representations for mathematical situations and when is each useful in a problem solving	**Prior Learning:** In grade 6, students wrote, read, and evaluated expressions in which letters stood for numbers. They identified parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient). They viewed one or more parts of an expression as a single entity. They evaluated expressions as specific values of their variables. They applied properties of operations to generate equivalent expressions and identified when two expressions were equivalent. (6.EE.2, 3, 4) By grade 7, the students began to recognize that rewriting expressions in different forms could be useful in problem solving. (7.EE.2) In grade 8, students graphed proportional relationships, interpreting the unit rate as the slope of the graph. Also, they interpreted the equation y = mx + b as defining a linear function whose graph is a line. **Current Learning:** Students interpret the parts of an expression and view one or more of its parts as a single entity. They write expressions to represent real-world quantities, and they recognize the real-world significance of the parts of the expression. Students extend their knowledge of properties of operations to rewrite expressions, gain fluency, and engage in the reasoning of expressions. Students recognize patterns in tables and graphs and write expressions and equations that represent these patterns. **Future Learning:** Students will use the knowledge gained in this unit throughout the rest of algebra 1, and they will continue to expand their use of expressions throughout the rest of their high school years and into the future. More immediately, students will use this knowledge in unit of study 1.2 of this course as they solve one-variable equations and inequalities.

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related to real-world situations. • Use tables, graphs, and equations to represent verbal descriptions. • Model relationships by creating expressions and equations. • Recognize and use patterns to write expressions and equations. • Create equations in two or more variables. • Use tables to graph equations on coordinate axes. • Identify independent and dependent variables	situation?	

Unit Two - Solving Single Variable Equations and Inequalities (15 days/7-8 blocks)

Common Core Standards and Content to Be Learned	***Mathematical Practices and Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Reason quantitatively and use units to solve problems. ***[Foundation for work with expressions, equations and functions]*** **N-Q.1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and	**SMP 1** Makes sense of problems and perseveres in solving them. **SMP 2** Reason abstractly and quantitatively.	**Prior Learning:** In grade 6, students reasoned about and solved one-variable equations and inequalities as a process of answering a question (for example, "Which values make the equation or inequality true?") They also solved equations of the form x + p = q and xp = q for cases in which p, q, and x were non-negative rational numbers. Students also learned that inequalities such as x > c have infinitely many solutions. (6.EE.5, 7, 8) In grade 7, students continued to solve equations and inequalities, but with positive and negative rational numbers. (7.EE.3, 4) By grade 8, students solved linear equations and

interpret the scale and the origin in graphs and data displays. **N-Q.2.** Define appropriate quantities for the purpose of descriptive modeling. **N-Q.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **Creating equations that describe numbers or relationships. *[Linear, quadratic, and exponential (integer inputs only); ~~for A.CED.3 linear only~~]*** **A-CED.1.** Create equations and inequalities in one variable and use them to solve problems.*Include equations arising from linear and quadratic functions, and simple rational ~~and exponential functions.~~* **A-CED.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.* **Understand solving equations as a process of reasoning and explain the reasoning. *[Master linear; learn as general principle]*** **A-REI.1.** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **Solve equations and inequalities in one variable. [Linear inequalities; literal that are linear in the variables being solved for; quadratics with real solutions]** **A-REI.3.** Solve linear equations and inequalities in 1 variable, including equations	**SMP 4** Model with mathematics. What are the possible number of solutions to an equation and to an inequality? How do units of measure guide accuracy and create meaning in problem solving? In what situations would it be useful and/or necessary to solve an equation for another variable within that equation? What is the process that you should follow to solve an equation for a given variable?	inequalities with rational coefficients, including those equations whose solutions required expanding expressions using the distributive property and combining like terms. They also solved equations with infinitely many solutions and those with no solutions. (8.EE.7) **Current Learning:** This unit is both developmental and a reinforcement of students' prior work with solving simple equations. Students build on these skills to solve more complex single-variable equations and inequalities, including linear and quadratic equations, simple rational and exponential equations, compound inequalities, and absolute value equations. Students use and solve literal equations and inequalities related to formulas. They reason quantitatively and use units to solve problems. **Future Learning:** Students will use the knowledge gained in this unit throughout the rest of algebra 1, and continue to expand on their equation solving throughout the rest of their high school years, as they solve more complex equations. More immediately, students will use this knowledge in unit of study 1.3 as they graph linear equations and inequalities.

with coefficients represented by letters. • Create single-variable linear, simple quadratic, absolute value, simple rational, and simple exponential equations and inequalities, including compound inequalities, and use them to solve problems. • Solve and justify the steps involved in solving single-variable equations and inequalities, including those with coefficients represented by letters. • Identify and use appropriate units of measure to solve single-variable equations and inequalities. • Solve equations and inequalities, including formulas, for any variable.		

Unit Three - Graphing the Solutions to Linear Equations and Linear Inequalities in Two Variables (10 days/5 blocks)

Common Core Standards and Content to Be Learned	***Mathematical Practices and Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Reason quantitatively and use units to solve problems. ***[Foundation for work with expressions, equations and functions]*** **N-Q.1.** ~~Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas;~~ choose and interpret the scale and the origin in graphs and data displays.	**SMP 1** Make sense of problems and persevere in solving them. **SMP 4** Model with mathematics.	**Prior Learning:** In grade 6, students used variables to represent two quantities and identified independent and dependent relationships in graphs, tables, and equations. (6.EE.9) In grade 7, students analyzed proportional relationships and identified constants of proportionality in tables, graphs, equations, diagrams, and verbal descriptions. (7.RP.2) Students explained what a point on the graph meant in terms of a situation. In grade 8, students identified equations of the form y = mx + b as linear functions whose graphs are a straight line, and they identified functions that are not linear (e.g., A = s2). (8.F.3) Students defined a function (not using function notation) and created function tables to generate ordered pairs as a means of

Represent and solve equations and inequalities graphically *[Linear ~~and exponential;~~ learn as general principle]* **A-REI.10.** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **Represent and solve equations and inequalities graphically. [Linear ~~and exponential;~~ learn as general principle]** **A-REI.12.** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), ~~and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.~~ **G-GPE.5.** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (for example, find an equation of a line, parallel or perpendicular to a given line that passes through a given point). • Choose and interpret the scale and the origin in graphs and data displays. • Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. • Graph the solutions to a linear inequality in two variables as a half-plane. • Choose an appropriate graphing technique based on the form of the equation or inequality (i.e., standard form, slope-	How can you use linear equations and inequalities to model a real-world situation? What are the differences and similarities between the solution set of an inequality versus the solution set of an equation? What are the different methods used to graph an equation and an inequality; in what equation form is each method most appropriate?	graphing a function. Students determined rate of change and represented it in multiple ways. (8.F.4) Students graphed proportional relationships and interpreted the unit rate as the slope of the graph. (8.EE.5) They used similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line and derived the equation y = mx + b. (8.EE.6) In units 1.1 and 1.2, students created expressions and equations, and they solved equations in one variable. **Current Learning:** Students deepen their knowledge of graphing and expand their understanding of linear and non-linear equations and their graphs. Students graph equations and inequalities from multiple forms including slope-intercept form, standard form, and point-slope form. They explore the graphs of non-linear equations and inequalities and determine the difference between equations and inequalities that are linear vs. non-linear. Students choose and interpret an appropriate scale and the origin in graphs and data displays. **Future Learning:** Students will use the knowledge gained in this unit to investigate and solve systems of linear equations (unit 2.1) and to support their further study of the graphs of more complex functions (unit 2.3). Students will also use the material learned in this unit during unit 3.3 when they fit a linear function to a given set of data. They will continue to build on these concepts in subsequent mathematics courses.

intercept form, point slope form). • Choose an appropriate graphing technique based on the context of a given situation. • Write equations of lines that are parallel or perpendicular to a given line and passing through a given point.		

QUARTER TWO

Unit Four - Creating, Solving and Graphing Systems of Linear Equations and Linear Inequalities (15 days/7-8 blocks)

Common Core Standards and Content to Be Learned	***Mathematical Practices and Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Create equations that describe numbers or relationships. ***[Linear, quadratic, and exponential (integer inputs only); for A.CED.3 linear only]*** **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. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*	**SMP 1** Make sense of problems and persevere in solving them. **SMP 4** Model with mathematics. **SMP 6** Attend to precision. **SMP 8** Look for and	**Prior Learning:** In grade 8, students used systems of linear equations to represent, analyze, and solve a variety of problems. (8.EE.8c) They understood that a solution to a system of two linear equations in two variables corresponds to a point of intersection of a graph. (8.EE.8a) They also solved simple systems of two linear equations in two variables algebraically and by estimating solutions by graphing the equations. (8.EE.8b) In the previous unit of this course, students graphed linear equations and inequalities in two variables. They graphed a single linear inequality in two variables in the coordinate plane by graphing its boundary line and then shading the half-plane. (A-REI.12) **Current Learning:** Students determine the solutions to more complex systems of linear equations by graphing, substitution, and elimination. Students identify which method is most appropriate for a given system or a given situation.

Solve systems of equations. *[Linear-linear and ~~linear-quadratic~~]* **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. **Represent and solve equations and inequalities graphically *[Linear ~~and exponential;~~ learn as general principle]*** **A-REI.11.** Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; ~~find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.~~ Include cases where $f(x)$ and/or $g(x)$ are linear, ~~polynomial, rational, absolute value, exponential, and logarithmic functions.~~ ★ **A-REI.12.** ~~Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and~~ graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-plane. xxxxxx - Denotes additional standards not assessed on PARCC • Solve systems of linear equations graphically, including those that have infinitely many solutions and those that have no solution. • Solve systems of linear equations using	express regularity in repeated reasoning. How can you use a system of linear equations or inequalities to model a real-world situation? What are the similarities and differences between the solutions of a system of linear equations and a system of linear inequalities? What are the possible number of solutions to a system of linear equations and what does the graphical representation of each look like? What are the different methods to solve a system; how is each method performed, and when is each method most efficient?	Students extend their knowledge of systems by solving systems of linear inequalities. Embedded in the unit, students create systems of linear equations and inequalities to model various situations. **Future Learning:** Students will use methods of solving systems of equations and inequalities in algebra 2 when studying linear programming (unit 1.1). Solving systems is a skill that students will continue to use in subsequent course work as they solve systems of non-linear equations and inequalities.

substitution and elimination and decide which of these methods is most appropriate. • Write a system of linear equations and/or inequalities to fit a given situation. • Solve systems of linear inequalities graphically and understand that the solution to the system is the region where the graphs of the individual inequalities overlap.		

Unit Five - Interpreting Functions (10 days/5 blocks)

Common Core Standards* and *Content to Be Learned	***Mathematical Practices* and *Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Understand the concept of a functions and use function notation. ***[Learn as a general principle; focus on linear and exponential and on arithmetic and geometric sequences]*** **F-IF.1.** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*). **F-IF.2.** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. **F-IF.3**. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1)*	**SMP 2** Reason abstractly and quantitatively. **SMP 6** Attend to precision. How do you determine	**Prior Learning:** In grade 5, students defined the coordinate system and graphed ordered pairs called coordinates. (5.G.1) In grade 6, students drew polygons in the coordinate plane given coordinates for the vertices. (6.G.3) In grade 7, students drew (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. (7.G.2) Students also solved problems involving scale drawings of geometric figures. This included computing actual lengths and areas and reproducing scale drawings at a different scale. (7.G.1) In grade 8, students verified experimentally the properties of rotations, reflections, and translations. They learned that lines, segments, and angles maintain their shape and size when transformed. (8.G.1) Students recognized that a two-dimensional figure is congruent (8.G.2)/similar (8.G.4) to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Furthermore, students described the effect of dilations, translation, rotations, and reflections on two-dimensional figures using coordinates. (8.G.3) In unit 1.2 of this course, students studied the concept of rigid

= f(n) + f(n-1) for n ≥ 1. *This is major and is assessed.* **Interpret functions that arise in applications in terms of the context. *[Linear, exponential, and quadratic]*** F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; ~~end behavior; and periodicity~~.* ★ F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* ★ 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.★ xxxxxx - Denotes additional standards not assessed on PARCC • Understand the concept of a function as assigning to each element of the domain exactly one element of the range. • Use function notation and interpret statements that use function notation, including notation in terms of a given situation. • Determine the domain and range of a given function (both algebraically and graphically) and a function in a given context. • Evaluate functions for any input. • Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. • Interpret key features of graphs and tables of functions (i.e., intercepts, intervals where the function is increasing, decreasing, positive or negative, relative maximums and minimums, and symmetries). • Given key features of the functional relationship, sketch graphs. • Calculate and interpret the average rate of change of a function over a specified interval. • Estimate the rate of change from a graph.	the domain and the range of a function and in what situations could there be restrictions on the domain and the range? How can you determine if a relation is a function? What are the key features of a function and how could you use them to sketch a graph of the function? What is the advantage of using the notation **f(x)** = as opposed to **y** = ? How would you represent a sequence using function notation?	motion and its effect on polygons. **Current Learning:** Students represent, construct, and draw transformations in the plane using a variety of tools such as transparencies and geometry software. They describe transformations as functions that take points in the plane as inputs and give other points as outputs. Students compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). Students develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. Students specify a sequence of transformations that will carry a given figure onto another. Students verify experimentally the properties of dilations given by a center and a scale factor: • The dilation of a line segment is longer or shorter in the ratio given by the scale factor. • Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. **Future Learning:** In algebra 2 and precalculus, students will use their knowledge of transformations when building functions from existing functions. Students pursuing art-related programs and careers will continue the study of visual transformations.

Unit Six - Building and Graphing Functions (15 days/7-8 blocks)

Common Core Standards and Content to Be Learned	***Mathematical Practices and Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Analyze functions using different representations. [Linear, exponential, quadratic, absolute value, step, piecewise-defined] **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 and quadratic functions and show intercepts, maxima, and minima. e. Graph exponential ~~and logarithmic~~ functions, showing intercepts and end behavior, ~~and trigonometric functions, showing period, midline, and amplitude.~~ **Build a function that models a relationship between two quantities.** ***[For F.BF.1,2,linear, exponential and quadratic]*** **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. b . Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* **Build new functions from existing functions. *[Linear, exponential, quadratic and absolute value; for F.BF.4a, linear only]*** F-BF.3. Identify the effect on the graph of replacing *f*(*x*) by *f*(*x*) + *k*, *k f*(*x*),	**SMP 4** Model with mathematics. **SMP 5** Use appropriate tools strategically. How do you graph various types of functions (linear, exponential, quadratic, absolute value, step, piece-wise defined), and what are the key features of the graphs of these functions? What are the characteristics of an explicit formula and a recursive formula? What are the various transformations on the graph of a parent function and how do those change	**Prior Learning:** In grade 8, students used functions to model relationships between quantities and constructed a function to model a linear relationship between two quantities. They determined the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading quantities by analyzing a graph. (8.F.4 and 8.F.5) In the previous unit of this course, students were introduced to function notation. They evaluated and interpreted functions, and determined the domain and range of a function. **Current Learning:** Students graph linear and quadratic functions and show intercepts, maxima, and minima. Students graph exponential functions, absolute value functions, step functions, and piecewise-defined functions. Technology is used to graph more complicated cases and to also determine where the graphs of two functions intersect. Students determine an explicit expression, a recursive process or the steps for calculation from a given situation in order to write a function that describes a relationship between two quantities. They build functions to model situations by combining standard function types using arithmetic operations. Students write arithmetic and geometric sequences both recursively and with an explicit formula. They use arithmetic and geometric sequences to model situations. Students identify the effect on the graph of replacing f(x) with f(x) + k, kf(x), f(kx), and f(x + k). Students determine if a function is even or odd. **Future Learning:** In algebra 2, students will graph and identify key features of the parent functions f(x) = x2, f(x) = |x|, f(x) = √x, and f(x) = x3. In addition, students will

$f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. ~~Include recognizing even and odd functions from their graphs and algebraic expressions for them.~~ **Represent and solve equations and inequalities graphically. *[Linear and exponential; learn as a general principle]*** **A-REI.**11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, ~~exponential, and logarithmic functions~~.★ xxxxxx - Denotes additional standards not assessed on PARCC • Graph linear and quadratic functions showing intercepts, maxima, and minima. • Graph exponential functions showing intercepts and end behavior. • Graph absolute value, step, and piecewise defined functions. • Utilize technology to graph complicated functions. • Utilize technology to determine where the graphs of two functions intersect. • Determine an explicit expression, a recursive process, or the steps for calculations from a given situation to write a function that describes a relationship between two quantities. • Build a function to model situations by combining standard function types using arithmetic operations. • Write arithmetic and geometric sequences with an explicit formula. • Use arithmetic and geometric sequences to model situations. • Identify the effect on the graph of replacing **f(x)** with **f(x)** + **k**, **kf(x)**, **f(kx)**, and **f(x** + **k)**	the parent function? How is technology used to make connections between graphs, tables of values and solutions?	continue to explore transformations of selected functions. They will also graph more advanced piecewise and step functions. (F.IF.4, F.IF.5, F.IF.7)

QUARTER THREE

Unit Seven - Comparing and Using Linear and Exponential Functions (21 days/10-11 blocks)

Common Core Standards* and *Content to Be Learned	***Mathematical Practices* and *Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Extend the properties of exponents to rational exponents. **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 51/3 to be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5. **N-RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents. **Write expressions in equivalent forms to solve problems** ***[Quadratic and exponential]*** A-SSE.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 transform expressions for exponential functions. For example the expression 1.15t can be rewritten as (1.151/12)12t ≈ 1.01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **Construct and compare linear, quadratic, and exponential models and solve problems.** **F-LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.★	**SMP 3** Construct viable arguments and critique the reasoning of others. **SMP 5** Use appropriate tools strategically. **SMP 6** Attend to precision. How can the radical be rewritten in terms of rational exponents? How can expressions be rewritten in equivalent forms and how is this useful? In what situations would it be appropriate use a linear model verses an exponential model?	

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a. Prove 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 percent rate per unit interval relative to another. F-LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).★ **F-LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.★ **Interpret expressions for functions in terms of the situation they model** ***[Linear and exponential of form f(x) = b^x + k]*** **F-LE.5** Interpret the parameters in a linear or exponential function in terms of a context.★ **Analyze functions using different representations** ***[Linear, exponential, quadratic, absolute value, step, piecewise-defined]*** F-IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay. xxxxxx - Denotes additional standards not assessed on PARCC		

Unit Eight - Polynomial Operations and Factoring (15 days/7-8 blocks)

Common Core Standards* and *Content to Be Learned	***Mathematical Practices* and *Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Use properties of rational and irrational numbers. **N-RN.3** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. **Perform arithmetic operations on polynomials *[Linear and quadratic]*** nderstand that polynomia**A-APR.1** Uls form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. **A-APR.3.** 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. **NOT IN ORIGINAL TEMPLATE BUT IS EXPECTED BY PARCC TO BE TAUGHT AND TESTED*** **Create equations that describe numbers or relationships [Linear, quadratic, and exponential (integer inputs only); for A.CED.3 linear only]** **A-CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential	**SMP 1** Make sense of problems and persevere in solving them. **SMP 2** Reason abstractly and quantiatively. **SMP 6** Attend to precision. **SMP 7** Look for and make use of structure. Explain why rational numbers and polynomials are closed under addition, subtraction, and multiplication? How do the key features of linear, exponential, and quadratic equations and graphs differ? What does factoring a quadratic expression reveal?	

functions.★ **A-CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★ **Interpret the structure of expressions *[Linear, exponential, quadratic]*** **A-SSE.1** Interpret expressions that represent a quantity in terms of its context.★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P. **A-SSE.2** Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. **Write expressions in equivalent forms to solve problems *[Quadratic and exponential]*** **A-SSE.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.		

QUARTER FOUR

Unit Nine - Solving, Graphing, and Modeling Quadratic Functions (25 days/14-15 blocks)

Common Core Standards* and *Content to Be Learned	***Mathematical Practices* and *Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Write expressions in equivalent forms to solve problems **[**Quadratic and ~~exponential~~**]** **A-SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **Solve equations and inequalities in one variable *~~[Linear inequalities; literal that are linear in the variables being solved for;~~ quadratics with real solutions]*** **A-REI.4** Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)2 = q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and ~~write them as a ± bi for real numbers a and b.~~ **Solve systems of equations [~~Linear-linear~~ and linear-quadratic]** **A-REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = –3x and the circle x2 + y2 = 3.	**SMP 4** Model with mathematics. **SMP 5** Use appropriate tools strategically. **SMP 7** Look for and make use of structure. How is the discriminant used to determine the number and type of solutions? In what situations would taking square roots, completing the square, quadratic formula, and factoring be most appropriate and how is each performed? What are the key features of a function, how could you use them to sketch a graph of the function, and how can they be used to compare two functions? How can expressions be rewritten in equivalent forms and what properties does each form reveal? How can expressions be rewritten	

Adapted from the Charles A. Dana Center work with SORICO 2012

Interpret functions that arise in applications in terms of the context [~~Linear, exponential,~~ and quadratic] **F-IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★ **F-IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★ **Analyze functions using different representations *[Linear, exponential, quadratic, absolute value, step, piecewise-defined]*** **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 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. **F-IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **F-IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*	in equivalent forms and how is this useful? What are the various transformations on the graph of a polynomial functions?	

Build new functions from existing functions *[Linear, exponential, quadratic, and absolute value; for F.BF.4a, linear only]* **F-BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **Construct and compare linear, quadratic, and exponential models and solve problems.** **F-LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. xxxxxx - Denotes additional standards not assessed on PARCC		

Unit Ten - Univariate Data (12 days/6 blocks)

** This unit can be taught at any opportune time, as it does not build off previous algebraic knowledge*

Common Core Standards* and *Content to Be Learned	***Mathematical Practices* and *Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Summarize, represent, and interpret data on a single count or measurement variable. **S-ID.1** Represent data with plots on the real number line (dot plots, histograms, and box plots).★ **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	**SMP 4** Model with mathematics. **SMP 5** Use appropriate tools strategically. **SMP 6** Attend to precision. What are the different ways to	

context of the data sets, accounting for possible effects of extreme data points (outliers).★ S-ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. use calculators, spreadsheets, and tables to estimate areas under the normal curve. ***WAS NOT IN ORIGINAL TEMPLATE BUT IS EXPECTED BY PARCC TO BE TAUGHT AND TESTED*** **Summarize, represent, and interpret data on two categorical and quantitative variables.** [Linear focus, discuss general principle] S-ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.★	represent data and how is each used? How can the shape of the distribution help you analyze associations and trends in data?	

Unit Eleven - Bivariate Data (Optional) (12 days/6 blocks)

Common Core Standards* and *Content to Be Learned	***Mathematical Practices* and *Essential Questions***	***Prior Learning, Current Learning and Future Learning***
Summarize, represent, and interpret data on two categorical and quantitative variables *[Linear focus, discuss general principle]* **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. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. **Interpret linear models** **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.★ xxxxxx - Denotes additional standards not assessed on PARCC	**SMP 4** Model with mathematics. **SMP 5** Use appropriate tools strategically. **SMP 6** Attend to precision. How can you use functions and graphs to model a set of data and how do you determine whether the function is appropriate? How do you write a linear model for a data set and what do the key features of the linear equation mean in the context of the data? How do you distinguish between correlation and causation?	