

Common Core Standards & CSD Curriculum Alignment

2014/2015 Curriculum Map – Algebra I – Middlestead and Evinger

Estimated Duration of Unit	Unit Title/Theme	Content Big Ideas/Goals	Instructional Activities Examples	CCSS Emphasis (Primary CCS in Bold)
40 days	Unit 1: Relationships Between Quantities and Reasoning with Equations and Their Graphs	<p>Perform arithmetic operations on polynomials</p> <p>Create equations that describe numbers or relationships</p> <p>Understand solving equations as a process of reasoning and explain the reasoning</p> <p>Solve equations and inequalities in one variable</p> <p>Solve systems of equations</p> <p>Represent and solve equations and inequalities graphically</p> <p>Summarize, represent, and interpret data on a single count or measurement variable</p>	<p>Students will analyze and explain precisely the process of solving an equation. Students, through reasoning, develop fluency writing, interpreting, and translating between various forms of linear equations and inequalities, and make conjectures about the form that a linear equation might take in a solution to a problem. They reason abstractly and quantitatively by choosing and interpreting units in the context of creating equations in two variables to represent relationships between quantities. They master the solution of linear equations and apply related solution techniques and the properties of exponents to the creation and solution of simple exponential equations. They learn the terminology specific to polynomials and understand that polynomials form a system analogous to the integers.</p>	<p>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.</p> <p>N-Q.2 Define appropriate quantities for the purpose of descriptive modeling.</p> <p>N-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p> <p>A-SSE.1 Interpret expressions that represent a quantity in terms of its context.</p> <p style="padding-left: 20px;">a) Interpret parts of an expression, such as terms, factors, and coefficients.</p> <p style="padding-left: 20px;">b) Interpret complicated expressions by viewing one or more of their parts as a single entity.</p> <p>A-SSE.2 Use the structure of an expression to identify ways to rewrite it.</p> <p>A-APR.1 Understand that polynomials form a system analogous to the integers; namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.</p> <p>A-CED.1 Create equations and inequalities in one variable and use them to solve problems.</p> <p>A-CED.2 Create equations in two or more variables to represent relationships between quantities; graph Equations on coordinate axes with labels and scales.</p> <p>A-CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.</p> <p>A-CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.</p>

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40 days	Unit 1: Relationships Between Quantities and Reasoning with Equations and Their Graphs Continued	<p style="text-align: center;">Perform arithmetic operations on polynomials</p> <p style="text-align: center;">Create equations that describe numbers or relationships</p> <p style="text-align: center;">Understand solving equations as a process of reasoning and explain the reasoning</p> <p style="text-align: center;">Solve equations and inequalities in one variable</p> <p style="text-align: center;">Solve systems of equations</p> <p style="text-align: center;">Represent and solve equations and inequalities graphically</p> <p style="text-align: center;">Summarize, represent, and interpret data on a single count or measurement variable</p>	<p>Students will analyze and explain precisely the process of solving an equation. Students, through reasoning, develop fluency writing, interpreting, and translating between various forms of linear equations and inequalities, and make conjectures about the form that a linear equation might take in a solution to a problem. They reason abstractly and quantitatively by choosing and interpreting units in the context of creating equations in two variables to represent relationships between quantities. They master the solution of linear equations and apply related solution techniques and the properties of exponents to the creation and solution of simple exponential equations. They learn the terminology specific to polynomials and understand that polynomials form a system analogous to the integers.</p>	<p>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.</p> <p>A-REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</p> <p>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.</p> <p>A-REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.</p> <p>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).</p> <p>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.</p>

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25 Days	Unit 2: Descriptive Statistics	<p>Summarize, represent, and interpret data on a single count or measurement variable</p> <p>Summarize, represent, and interpret data on two categorical and quantitative variables</p> <p>Interpret linear models</p>	<p>This unit builds upon students' prior experiences with data, providing students with more formal means of assessing how a model fits data. Students display and interpret graphical representations of data, and if appropriate, choose regression techniques when building a model that approximates a linear relationship between quantities. They analyze their knowledge of the context of a situation to justify their choice of a linear model. With linear models, they plot and analyze residuals to informally assess the goodness of fit.</p>	<p>S-ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).</p> <p>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.</p> <p>S-ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</p> <p>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.</p> <p>S-ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</p> <ul style="list-style-type: none"> a) Fit a function to the data; use functions fitted to data to solve problems in the context of the data. 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. <p>S-ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p> <p>S-ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.</p> <p>S-ID.9 Distinguish between correlation and causation.</p>

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35 Days	Unit 3: Linear and Exponential Functions	<p style="text-align: center;">Write expressions in equivalent forms to solve problems</p> <p style="text-align: center;">Create equations that describe numbers or relationships</p> <p style="text-align: center;">Represent and solve equations and inequalities graphically</p> <p style="text-align: center;">Understand the concept of a function and use function notation</p> <p style="text-align: center;">Interpret functions that arise in applications in terms of the context</p> <p style="text-align: center;">Analyze functions using different representations</p> <p style="text-align: center;">Build a function that models a relationship between two quantities</p> <p style="text-align: center;">Build new functions from existing functions</p> <p style="text-align: center;">Construct and compare linear, quadratic, and exponential models and solve problems</p> <p style="text-align: center;">Interpret expressions for functions in terms of the situation they model</p>	<p>In earlier grades, students defined, evaluated, and compared functions in modeling relationships between quantities. In this unit, students learn function notation and develop the concepts of domain and range. They explore many examples of functions, including sequences; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. Students build on their understanding of integer exponents to consider exponential functions with integer domains. They compare and contrast linear and exponential functions, looking for structure in each and distinguishing between additive and multiplicative change. Students explore systems of equations and inequalities, and they find and interpret their solutions. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions. In building models of relationships between two quantities, students analyze the key features of a graph or table of a function.</p>	<p>A-SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Use the properties of exponents to transform expressions for exponential functions.</p> <p>A-CED.1 Create equations and inequalities in one variable and use them to solve problems.</p> <p>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.</p> <p>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 $y = f(x)$.</p> <p>F-IF.2 Use function notations, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p> <p>F-IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.</p> <p>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.</p>

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35 Days	Unit 3: Linear and Exponential Functions (continued)	<p>Write expressions in equivalent forms to solve problems</p> <p>Create equations that describe numbers or relationships</p> <p>Represent and solve equations and inequalities graphically</p> <p>Understand the concept of a function and use function notation</p> <p>Interpret functions that arise in applications in terms of the context</p> <p>Analyze functions using different representations</p> <p>Build a function that models a relationship between two quantities</p> <p>Build new functions from existing functions</p> <p>Construct and compare linear, quadratic, and exponential models and solve problems</p> <p>Interpret expressions for functions in terms of the situation they model</p>	<p>In earlier grades, students defined, evaluated, and compared functions in modeling relationships between quantities. In this unit, students learn function notation and develop the concepts of domain and range. They explore many examples of functions, including sequences; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. Students build on their understanding of integer exponents to consider exponential functions with integer domains. They compare and contrast linear and exponential functions, looking for structure in each and distinguishing between additive and multiplicative change. Students explore systems of equations and inequalities, and they find and interpret their solutions. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions. In building models of relationships between two quantities, students analyze the key features of a graph or table of a function.</p>	<p>F-IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p> <p>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.</p> <p>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. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>F-IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).</p> <p>F-BF.1 Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> <p>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.</p>

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35 Days	Unit 3: Linear and Exponential Functions (continued)	<p>Write expressions in equivalent forms to solve problems</p> <p>Create equations that describe numbers or relationships</p> <p>Represent and solve equations and inequalities graphically</p> <p>Understand the concept of a function and use function notation</p> <p>Interpret functions that arise in applications in terms of the context</p> <p>Analyze functions using different representations</p> <p>Build a function that models a relationship between two quantities</p> <p>Build new functions from existing functions</p> <p>Construct and compare linear, quadratic, and exponential models and solve problems</p> <p>Interpret expressions for functions in terms of the situation they model</p>	<p>In earlier grades, students defined, evaluated, and compared functions in modeling relationships between quantities. In this unit, students learn function notation and develop the concepts of domain and range. They explore many examples of functions, including sequences; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. Students build on their understanding of integer exponents to consider exponential functions with integer domains. They compare and contrast linear and exponential functions, looking for structure in each and distinguishing between additive and multiplicative change. Students explore systems of equations and inequalities, and they find and interpret their solutions. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions. In building models of relationships between two quantities, students analyze the key features of a graph or table of a function.</p>	<p>F-LLE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <ul style="list-style-type: none"> 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. <p>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).</p> <p>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.</p> <p>F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context.</p>

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30 Days	Unit 4: Polynomial and Quadratic Expressions, Equations and Functions	<p>Use properties of rational and irrational numbers.</p> <p>Interpret the structure of expressions</p> <p>Write expressions in equivalent forms to solve problems</p> <p>Perform arithmetic operations on polynomials</p> <p>Understand the relationship between zeros and factors of polynomials</p> <p>Create equations that describe numbers or relationships</p> <p>Solve equations and inequalities in one variable</p> <p>Represent and solve equations and inequalities graphically</p> <p>Interpret functions that arise in applications in terms of the context</p> <p>Analyze functions using different representations</p> <p>Build new functions from existing functions</p>	<p>In this unit, students build on their knowledge from unit 3. Students strengthen their ability to discern structure in polynomial expressions. They create and solve equations involving quadratic and cubic expressions. In this unit’s modeling applications, students reason abstractly and quantitatively in interpreting parts of an expression that represent a quantity in terms of its context; they also learn to make sense of problems and persevere in solving them by choosing or producing equivalent forms of an expression (e.g., completing the square in a quadratic expression to reveal a maximum value). Students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They learn through repeated reasoning to anticipate the graph of a quadratic function by interpreting the structure of various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function.</p>	<p>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.</p> <p>A-SSE.1 Interpret expressions that represent a quantity in terms of its context.</p> <ol style="list-style-type: none"> 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. <p>A-SSE.2 Use the structure of an expression to identify ways to rewrite it. <i>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 $(x^2 - y^2)(x^2 + y^2)$</i></p> <p>A-SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ol style="list-style-type: none"> a) Factor a quadratic expression to reveal the zeros of the function it defines. b) Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. <p>A-APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.</p> <p>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.</p> <p>A-CED.1 Create equations and inequalities in one variable and use them to solve problems.</p>

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30 Days	Unit 4: Polynomial and Quadratic Expressions, Equations and Functions (continued)	<p>Use properties of rational and irrational numbers.</p> <p>Interpret the structure of expressions</p> <p>Write expressions in equivalent forms to solve problems</p> <p>Perform arithmetic operations on polynomials</p> <p>Understand the relationship between zeros and factors of polynomials</p> <p>Create equations that describe numbers or relationships</p> <p>Solve equations and inequalities in one variable</p> <p>Represent and solve equations and inequalities graphically</p> <p>Interpret functions that arise in applications in terms of the context</p> <p>Analyze functions using different representations</p> <p>Build new functions from existing functions</p>	<p>In this unit, students build on their knowledge from unit 3. Students strengthen their ability to discern structure in polynomial expressions. They create and solve equations involving quadratic and cubic expressions. In this unit’s modeling applications, students reason abstractly and quantitatively in interpreting parts of an expression that represent a quantity in terms of its context; they also learn to make sense of problems and persevere in solving them by choosing or producing equivalent forms of an expression (e.g., completing the square in a quadratic expression to reveal a maximum value). Students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They learn through repeated reasoning to anticipate the graph of a quadratic function by interpreting the structure of various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function.</p>	<p>A-CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>A-REI.4 Solve quadratic equations in one variable.</p> <p>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.</p> <p>b) Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.²³</p> <p>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.</p> <p>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.</p>

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30 Days	Unit 4: Polynomial and Quadratic Expressions, Equations and Functions(continued)	<p>Use properties of rational and irrational numbers.</p> <p>Interpret the structure of expressions</p> <p>Write expressions in equivalent forms to solve problems</p> <p>Perform arithmetic operations on polynomials</p> <p>Understand the relationship between zeros and factors of polynomials</p> <p>Create equations that describe numbers or relationships</p> <p>Solve equations and inequalities in one variable</p> <p>Represent and solve equations and inequalities graphically</p> <p>Interpret functions that arise in applications in terms of the context</p> <p>Analyze functions using different representations</p> <p>Build new functions from existing functions</p>	<p>In this unit, students build on their knowledge from unit 3. Students strengthen their ability to discern structure in polynomial expressions. They create and solve equations involving quadratic and cubic expressions. In this unit’s modeling applications, students reason abstractly and quantitatively in interpreting parts of an expression that represent a quantity in terms of its context; they also learn to make sense of problems and persevere in solving them by choosing or producing equivalent forms of an expression (e.g., completing the square in a quadratic expression to reveal a maximum value). Students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They learn through repeated reasoning to anticipate the graph of a quadratic function by interpreting the structure of various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function.</p>	<p>F-IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p> <p>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.</p> <p>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.</p> <ol style="list-style-type: none"> 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. <p>F-IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. 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.</p> <p>F-IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).</p> <p>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.</p>

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20 Days	Unit 5: A Synthesis of Modeling with Equations and Functions	<p>Reason quantitatively and use units to solve problems.</p> <p>Create equations that describe numbers or relationships.</p> <p>Interpret functions that arise in applications in terms of the context.</p> <p>Build a function that models a relationship between two quantities.</p> <p>Construct and compare linear, quadratic, and exponential models and solve problems</p>	<p>In this unit, students expand their experience with functions to include more specialized functions—linear, exponential, quadratic, and square and cube root, and those that are piecewise-defined, including absolute value and step. Students select from among these functions to model phenomena using the modeling cycle</p>	<p>N-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p> <p>A-CED.1 Create equations and inequalities in one variable and use them to solve problems.</p> <p>A-CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>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.</p> <p>F-IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p> <p>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.</p> <p>F-BBF.1 Write a function that describes a relationship between two quantities.</p> <p>a) Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> <p>F-LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>b) Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p>

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20 Days	Unit 5: A Synthesis of Modeling with Equations and Functions	<p>Reason quantitatively and use units to solve problems.</p> <p>Create equations that describe numbers or relationships.</p> <p>Interpret functions that arise in applications in terms of the context.</p> <p>Build a function that models a relationship between two quantities.</p> <p>Construct and compare linear, quadratic, and exponential models and solve problems</p>	<p>In this unit, students expand their experience with functions to include more specialized functions—linear, exponential, quadratic, and square and cube root, and those that are piecewise-defined, including absolute value and step. Students select from among these functions to model phenomena using the modeling cycle</p>	<p>c) Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.</p> <p>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).</p>