Summer School CC Algebra 1 Curricular Map

Week	Conceptual Cat	CCSS Standards	Domains and Clusters	Resources (Concept Tasks)
1	**Functions** *Interpreting Functions* *Building Functions*	A.CED.1-3 F-IF.1-3 F-IF.4-6 F-IF.7-9 **MP 1, 3, 4**	**Creating Equations** Create equations that describe numbers or relationships **Interpreting Functions** • Understand the concept of a function and use function notation. • Interpret functions that arise in applications in terms of the context. • Analyze functions using different representations.	Tying the knot  Surround the Pool MARS Task: Function and Everyday Situations
2	**Functions** *Building Functions* *Linear, Quadratic, and Exponential Models*	F-BF.1-2 F-BF.3-5 F-LE.1-4 F-LE.5 **MP 1, 3, 4, 5**	**Building Functions** • Build a function that models a relationship between two quantities. • Build new functions from existing functions. **Linear, Quadratic, and Exponential Models** • Construct and compare linear, quadratic, and exponential models and solve problems.	Bend it like Beckham  S-Pattern  Quadratic quandary  Illustrative Math Skeleton Tower Engage New York
3	**Functions** *Linear, Quadratic, and Exponential Models*	F-LE.1-4 F-LE.5 **MP 1, 3, 4, 5**	**Linear, Quadratic, and Exponential Models** • Construct and compare linear, quadratic, and exponential models and solve problems. • Interpret expressions for functions in terms of the situation they model.	Bend it like Beckham  S-Pattern  MARS: Comparing Investment
4	**Statistics and Probability**	S.ID.1-4 S.ID.5-6 S.ID.7-9 **MP 1, 3, 4**	**Interpreting Categorical and Quantitative Data** • Summarize, represent, and interpret data on a single count or measurement variable. • Summarize, represent, and interpret data on two categorical and quantitative variables. • Interpret linear models	Stack of Cups NCTM Illuminations: Line of Best Fit Illustrative Math: Haircut Costs
5	**Algebra** *Reasoning with Equations and Inequalities*	A.SSE.1, 2, 4 A-REI.5-9 A-REI.10-12 **MP 1, 2,3, 4, 6, 7, 8**	**Seeing Structure in Expressions** Interpret the structure of expressions **Reasoning with Equations and Inequalities** • Solve systems of equations. • Represent and solve equations and inequalities graphically. **Mathematics Modeling**	Two Storage Tanks  MARS Task: Interpreting Algebraic Expressions

*Emphasize the Mathematical Practices (MP) in **Bold** type*

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Week	Domains	Standards
1	**Creating Equations**	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. 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. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. 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.
	Interpreting Functions	**Understand the concept of a function and use function notation.** 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) = f(n) + f(n – 1) for n ≥ 1.* 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.★ **Interpret functions that arise in applications in terms of the context.** 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 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. **Analyze functions using different representations.** F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. 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 $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, and $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.

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		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.
2	**Building Functions** **Construct and compare linear, quadratic, and exponential models and solve problems.**	**Build a function that models a relationship between two quantities.** 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. F-BT.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. **Build new functions from existing functions**. F-BF.3. Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. [In Algebra I this standard addresses linear, exponential, quadratic, and absolute value functions.] F-BF.4. Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2x3 or f(x) = (x + 1)/(x □ 1) for x ≠ 1. **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. 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.
3	**Liner, Quadratic and Exponential Functions**	**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. 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. F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.
4	**Interpreting Categorical and**	**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 context of the data sets, accounting for possible effects of extreme data points

	Quantitative Data	(outliers). **Summarize, represent, and interpret data on two categorical and quantitative variables.** 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. 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.
5	**Interpret the structure of expressions.** **Reasoning with Equations and Inequalities**	**Algebra - Seeing Structure in Expressions** 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 $(x^2 - y^2)(x^2 + y^2)$. **Algebra - Seeing Structure in Expressions** **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. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15t can be rewritten as ⟦(⟦1.15⟧^(1⁄2))⟧^12t≈⟦1.012⟧^12t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **Solve systems of equations.** A-REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. A-REI.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 $x^2 + y^2 = 3$.*

		Represent and solve equations and inequalities graphically. 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). 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.

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.**

Resources

Illustrative Mathematics

Logistic Growth Model, Explicit Version: F-IF.4 **http://www.illustrativemathematics.org/illustrations/804**

Influenza epidemic : F.IF.4 **http://www.illustrativemathematics.org/illustrations/637**

Average Cost – F.IF.B.4-**5** **http://www.illustrativemathematics.org/illustrations/387**

Haircut Costs:S.ID.1-3 **http://www.illustrativemathematics.org/illustrations/942**

Speed Trap – S.ID.1, 2, 3 **http://www.illustrativemathematics.org/illustrations/1027**

Coffee and Crime – S.ID.6-9 **http://www.illustrativemathematics.org/illustrations/1307**

Warming and Cooling – F.IF.4: http://www.illustrativemathematics.org/illustrations/639

How is the weather – F.IF.4: http://www.illustrativemathematics.org/illustrations/649

The Canoe Trip, Variation 1 – F.IF.4-5 http://www.illustrativemathematics.org/illustrations/386

The High School Gym – F.IF.6b http://www.illustrativemathematics.org/illustrations/577

Temperature Change –F.IF.6

http://www.illustrativemathematics.org/illustrations/1500

Which Function? - F.IF.8a http://www.illustrativemathematics.org/illustrations/640

Throwing Baseballs – F.IF.9 and F.IF.4

http://www.illustrativemathematics.org/illustrations/1279

Mathematics Assessment Project – MARS Task

Function and Everyday Situations - F.IF.7-8 **http://map.mathshell.org/materials/download.php?fileid=1259**

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Comparing Investment – F.LE 1-5. **http://map.mathshell.org/materials/download.php?fileid=1250**

Devising a Measure for Correlation – S.ID : http://map.mathshell.org/materials/download.php?fileid=1234

Interpreting Statistics: A Case of Muddying the Waters – S.ID 7-9 http://map.mathshell.org/materials/download.php?fileid=686

Solving Linear Equations in Two Variables – A.REI.5-7: http://map.mathshell.org/materials/download.php?fileid=669

Noyce Foundation – Inside Mathematics

Sorting Functions – F.IF.4, 7a, 7c, 8a, F.LE.2 **http://insidemathematics.org/common-core-math-tasks/high-school/HS-F-2008%20Sorting%20Functions.pdf**

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Function and Everyday Situations - F.IF.7-8 http://map.mathshell.org/materials/download.php?fileid=1259