**Algebra I Curriculum Map**

**Common Core State Standards for Mathematics**

Prior to Algebra I, through the progression of Common Core Standards, students have already begun their study of algebraic concepts. They have investigated variables and expressions, solved equations, constructed and analyzed tables, used equations and graphs to describe relationships between quantities, and studied linear equations and systems of linear equations.

The Algebra I course outlined in this curriculum map begins with connections back to that earlier work, efficiently reviewing algebraic and statistical concepts that students have already studied while at the same time moving students forward into the new ideas described in the high school standards. Students contrast exponential and linear functions as they explore exponential models using the familiar tools of tables, graphs, and symbols. Finally, they apply these same tools to a study of quadratic functions. Throughout, the connection between functions and equations is made explicit to give students more ways to model and make sense of problems.

This scope and sequence assumes 160 days for instruction, divided among 12 units. The units are sequenced in a way that we believe best develops and connects the mathematical content described in the Common Core State Standards for Mathematics; however, the order of the standards included in any unit does not imply a sequence of content within that unit. Some standards may be revisited several times during the course; others may be only partially addressed in different units, depending on the mathematical focus of the unit.

Throughout Algebra I, students should continue to develop proficiency with the Common Core's eight Standards for Mathematical Practice:

**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.**

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| **Unit** | **Common Core Standards for Math** | **Standards for**  **Mathematical**  **Practice** | **Days** | **Comments** |
| **Connecting**  **patterns 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. )  **N-­‐Q.2** (Define appropriate quantities for the purpose of descriptive modeling.)  **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-­‐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.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.★)  **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.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.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.)  **F-­‐BF.1.a**(Determine an explicit expression, a recursive process, or steps for calculation from a context.) | **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. | **20** | The standards listed here will be revisited  multiple times throughout the course, as students encounter new function families. In this unit, connections should be made from students' work in prior courses describing relationships to the general concept of a function and its attributes. |

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| **Unit** | **Common Core Standards for Math** | **Standards for**  **Mathematical**  **Practice** | **Days** | **Comments** |
| **Linear**  **functions** | **A-­‐CED.2**  **F-­‐IF.1; F-­‐IF.2; F-­‐IF.4 F-­‐IF.5**  **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.★)**[Comment]**  **F-­‐IF.7a** (Graph linear and quadratic functions and show intercepts, maxima, and minima.) **[Comment]**  **F-­‐IF.9**  **A-­‐REI.10**  **F-­‐BF.1.a**  **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.) **[Comment]**  **F-­‐BF.4a** (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***) = 2 ***x***3 or ***f***(***x***) = (***x*** + 1)/(***x*** -­‐ 1) for ***x*** ≠ 1.) **[Comment]**  **F-­‐LE.1a** (Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals.) **[Comment]**  **F-­‐LE.1.b** (Recognize situations in which one quantity changes at a constant 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).)**[Comment]**  **F-­‐LE.5** (Interpret the parameters in a linear or exponential function in terms of a context.)  **S-­‐ID.7** (Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.) | **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. | **15** | **F-­‐IF.6**: Linear functions only  **F-­‐IF.7a**: Linear functions only  **F-­‐BF.3**: Linear functions only  **F-­‐BF.4a**: Linear functions only  **F-­‐LE.1a**: Linear functions only  **F-­‐LE.2**: Linear functions only |
| **Modeling**  **linear data** | **S-­‐ID.6.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 and exponential models.)  **S-­‐ID.6.b** (Informally assess the fit of a function by plotting and analyzing residuals.)  **S-­‐ID.6.c** (Fit a linear function for a scatter plot that suggests a linear association.)  **S-­‐ID.7**  **S-­‐ID.8** (Compute (using technology) and interpret the correlation coefficient of a linear fit.)  **S-­‐ID.9** (Distinguish between correlation and causation.) | **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. | **15** |  |

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| **Unit** | **Common Core Standards for Math** | **Standards for**  **Mathematical**  **Practice** | **Days** | **Comments** |
|  | **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 (outliers).)  **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. )  **N-­‐Q.1; N-­‐Q.2**  **N-­‐Q.3** (Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.) |  | **15** |  |
| **Linear**  **equations and inequalities** | **A-­‐CED.1; A-­‐CED.3**  **A-­‐CED.4** (Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law ***V*** = ***IR*** to highlight resistance ***R***.)  **A-­‐REI.1** (Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.)  **A-­‐REI.3** (Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.)  **A-­‐REI.10; A-­‐REI.11**  **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.) **[Comment]**  **A-­‐BF.4.a** | **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. | **10** | **A.REI.12** Focus on single linear inequalities in two variables |

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| **Unit** | **Common Core Standards for Math** | **Standards for**  **Mathematical**  **Practice** | **Days** | **Comments** |
| **Systems of**  **linear equations and inequalities** | **A-­‐CED.1; A-­‐CED.3**  **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.11; A-­‐REI.12** | **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. | **10** |  |
| **Sequences**  **and functions** | **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-­‐BF.1.a**  **F-­‐BF.2** (Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★)  **F-­‐LE.1.a; F-­‐LE.1.b**  **F-­‐LE.1.c** (Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.)  **F-­‐LE.2** | **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. | **10** |  |

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| **Unit** | **Common Core Standards for Math** | **Standards for**  **Mathematical**  **Practice** | **Days** | **Comments** |
| **Exponential**  **functions and equations** | **A-­‐SSE.1.a** (Interpret parts of an expression, such as terms, factors, and coefficients.) **[Comment]**  **A-­‐SSE.3.c** (Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15***t*** can be rewritten as (1.151/12)12***t*** ≈ 1.01212***t*** to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.)  **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.)  **F-­‐IF.1; F-­‐IF.2; F-­‐IF.3; F-­‐IF.4; F-­‐IF.5**  **F-­‐IF.7.e** (Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.)  **F-­‐IF.8.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)12***t***, ***y*** = (1.2)***t***/10, and classify them as representing exponential growth or decay.)  **F-­‐IF.9**  **F-­‐BF.1.a**  **F-­‐BF.1.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-­‐BF.2; F-­‐BF.3**  **S-­‐ID.6.a** | **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. | **15** | **A-­‐SSE.1.a** Focus on Initial values and constant  multipliers in exponential expressions. |
| **Linear and**  **exponential models** | **F-­‐BF.1.b; F-­‐BF.2**  **F-­‐LE.1.a; F-­‐LE.1.b; F-­‐LE.1.c**  **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.)  **F-­‐LE.5** | **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. | **10** |  |

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| **Unit** | **Common Core Standards for Math** | **Standards for**  **Mathematical**  **Practice** | **Days** | **Comments** |
| **Quadratic**  **functions** | **A-­‐SSE.1.a**  **A-­‐CED.2**  **A-­‐REI.10**  **F-­‐LE.3**  **F-­‐IF.1; F-­‐IF.2; F-­‐IF.4; F-­‐IF.5**  **F-­‐IF.7.a**  **F-­‐IF.8.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**  **F-­‐BF.1.a; F-­‐BF.1.b; F-­‐BF.3; F-­‐BF.4.a** | **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. | **15** |  |

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| **Unit** | **Common Core Standards for Math** | **Standards for**  **Mathematical**  **Practice** | **Days** | **Comments** |
| **Operations**  **on polynomials** | **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.)  **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.) | **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. | **10** |  |
| **Quadratic**  **equations** | **A-­‐SSE.3.a** (Factor a quadratic expression to reveal the zeros of the function it defines.)  **A-­‐SSE.3.b** (Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.)  **A-­‐CED.1**  **A-­‐REI.4.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.)  **A-­‐REI.4.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*** ± ***bi*** for real numbers ***a*** and ***b***.**)**  **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*** = –3***x*** and the circle ***x***2 + ***y***2 = 3.)  **A-­‐REI.11**  **F-­‐IF.8.a**  **N-­‐RN.3** | **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. | **15** |  |