Algebra (80-minutes)
CCSS Pacing Guide

WRAP AROUND:

NQ.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.
NQ.Q #2: Define appropriate quantities for the purpose of descriptive modeling.
NQ.Q #3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

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UNIT 1 ~ REVIEW & POWERS **EE #1:** Know and apply the properties of integer exponents to generate equivalent numerical expressions. **EE #2**: Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. **EE #3:** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. **EE #4**: Perform operations with numbers expressed in scientific notation, including problems where	**UNIT 5 ~ GRAPHING** **A.CE #2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **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. **F.IF #6**: Calculate and interpret the average rate of change of a function	**UNIT 8 ~ COMPLEX NUMBERS** **NQ.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. --- **UNIT 9 ~ QUADRATIC FUNCTIONS** **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.	**UNIT 13 ~ PATTERNS** **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). --- **Self-Paced, Independent Study** **VOLUME** **G #9:** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. **PYTHAGOREAN THEOREM** **NS #2:** Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., $\pi 2$).

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2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
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both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology. **NQ.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. **NQ.RN #2:** Rewrite expressions involving radicals and rational exponents using the properties of exponents. --- **UNIT 2 ~ EXPRESSIONS** *(Hypatia)* **MP #3:** Reason abstractly and quantitatively. **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.	(presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. --- **UNIT 6 ~ LINEAR 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 #3:** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. **F.IF #4:** For a function that models a relationship between two quantities, interpret key features of graphs and	**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. **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. --- **UNIT 10 ~ LINEAR SYSTEMS** **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	**EE #2:** Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. **G #6:** Explain a proof of the Pythagorean Theorem and its converse. **G #7:** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. **G #8:** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. **TRANSFORMATIONS** **G #1:** Verify experimentally the properties of rotations, reflections, and translations: **a.** Lines are taken to lines, and line segments to line segments of the same length.

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b. Interpret complicated expressions by viewing one or more of their parts as a single entity. **A.SSE #2:** Use the structure of an expression to identify ways to rewrite it. **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.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. --- **UNIT 3 ~ EQUATIONS & INEQUALITIES** **A.REI #3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A.REI #1:** Explain each step in solving a simple equation as following from	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. --- **UNIT 7 ~ NONLINEAR FUNCTIONS** **F.IF #7:** Graph functions expressed	equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. --- **UNIT 11 ~ OTHER SYSTEMS** **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. --- **UNIT 12 ~ STATISTICS** **SP.ID #1:** Represent data with plots on the real number line (dot plots, histograms, and box plots). **SP.ID #2**: Use statistics appropriate to the shape of the data distribution to	**b.** Angles are taken to angles of the same measure. **c.** Parallel lines are taken to parallel lines. **G #2:** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. **G #3:** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **CONGRUENCE OF TRIANGLES** **G #1:** Verify experimentally the properties of rotations, reflections, and translations: **a.** Lines are taken to lines, and line segments to line segments of the same length. **b.** Angles are taken to angles of the same measure. **c.** Parallel lines are taken to parallel lines.

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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.CE #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.CE #4:** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. --- **UNIT 4 ~ REAL NUMBER SYSTEM** *(Article)* **NQ.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.	symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. 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. b. Use the properties of exponents to interpret expressions for exponential functions. **F.LE #1:** Distinguish between situations that can be modeled with linear functions and with exponential functions. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **F.LE #3:** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly,	compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. **SP.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). **SP.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. **SP.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	**G #2:** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. **G #3:** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **SIMILARITY** **G #4:** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. **LINE & ANGLE RELATIONSHIPS** **EE #6:** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-

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	quadratically, or (more generally) as a polynomial function. **F.LE #5:** Interpret the parameters in a linear or exponential function in terms of a context.	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. **SP.ID #7:** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **SP.ID #8**: Compute (using technology) and interpret the correlation coefficient of a linear fit. **SP.ID #9:** Distinguish between correlation and causation.	vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. **F #3:** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **G #1:** Verify experimentally the properties of rotations, reflections, and translations: **a.** Lines are taken to lines, and line segments to line segments of the same length. **b.** Angles are taken to angles of the same measure. **c.** Parallel lines are taken to parallel lines. **G #5:** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

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