New York Next Generation Mathematics: Algebra 1

New York Next Generation Math Standards	Algebra 1 Lesson
Algebra	
Seeing Structure in Expressions	
Interpret the structure of expressions. **A-SSE.A.1** Interpret expressions and represent a quantity in terms of its context.*	6.1, 10.1
A-SSE.A.1a Given a polynomial, write the standard form and interpret the parts of the polynomial: terms, factors, coefficients, degree, leading coefficient, and constant term.	6.1
A-SSE.A.1b Fluently 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	10.1
A-SSE.A.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 $(x^2 - y^2)(x^2 + y^2)$. *Note: Does not include factoring by grouping or factoring the sum and difference of cubes.*	1.2, 4.3, 6.4, 7.1, 7.2, 7.3, 7.4
Write expressions in equivalent forms to solve problems.* **A-SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	7.1, 7.2, 7.3, 7.4
A-SSE.B.3a Factor quadratic expressions completely: i) using the greatest common factor; ii) recognizing the difference of two perfect squares; and iii) with trinomials where the leading coefficient is +/–1 only after removing possible GCF.	7.1, 7.2, 7.3, 7.4
A-SSE.B.3c Use the properties of exponents to rewrite exponential expressions. Algebra I tasks are limited to exponential expressions whose exponent contains a linear expression in which the linear term has an integer coefficient.	10.1
Arithmetic with Polynomials & Rational Expressions	
Perform arithmetic operations on polynomials. **A-APR.A.1** Fluently add, subtract, and multiply polynomials.	6.2, 6.3, 6.4
Understand the relationship between zeros and factors of polynomials. **A-APR.B.3** Identify zeros of polynomials.	8.1, 9.2
A-APR.B.3b Identify: i) the zeros of quadratic and cubic polynomials in which linear and quadratic factors are available; For example, find the zeros of $(x - 2)(x2 - 9) = 0$. ii) the graph of the function defined by the polynomial equation; and iii) an appropriate equation of a function given the zeros of that function.	8.1, 9.2

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Creating Equations*	
Create equations that describe numbers or relationships.* **A-CED.A.1a** Create equations and linear inequalities in one variable to represent a real world context. Limit equations to linear, quadratic, and simple exponentials.	3.3
A-CED.A.2 Create equations and linear inequalities in two variables to represent a real world context. Limit equations to linear, quadratic, and simple exponentials.	2.2, 2.3, 3.2, 3.4, 8.5, 10.2
A-CED.A.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.	4.1, 4.3, 4.4
A-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	1.3
Understand solving equations as a process of reasoning and explain the reasoning. **A-REI.A.1a** Identify the property used in each step when solving a linear or quadratic 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.	1.3
Solve equations and inequalities in one variable. **A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	1.2, 1.4
A-REI.B.4 Solve quadratic equations in one variable. Solutions may include simplifying radicals.	8.1, 8.2, 8.5
A-REI.B.4a 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. *Note: The quadratic's leading coefficient must be 1 and the coefficient of the linear term must be even (after factoring out any GCF).*	8.2, 8.5
A-REI.B.4b Solve quadratic equations by: i) inspection; ii) taking square roots; iii) factoring; iv) completing the square; and v) the quadratic formula. Recognize when the quadratic formula yields no real solutions.	8.1, 8.2
Solve systems of equations. **A-REI.C.5** Justify that, given a system of two equations in two variables, replacing one equation by a multiple of that equation produces a system with the same solution.	4.3
A-REI.C.6a Solve systems of linear equations in two variables both algebraically and graphically.	4.1, 4.2, 4.3

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A.REI.C.7a Solve a system, with rational solutions, consisting of a linear equation and a quadratic equation (parabolas only) in two variables both algebraically and graphically.	9.4
Represent and solve equations and inequalities graphically. **A-REI.D.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	2.2, 3.1
A-REI.D.11 Given the equations $y = f(x)$ and $y = g(x)$: i) recognize that each x-coordinate of the intersection(s) is the solution to the equation $f(x) = g(x)$; and ii) find the solutions approximately using technology to graph the functions or make tables of values; and iii) interpret the solution in context. Algebra I Cases are limited to where $f(x)$ and $g(x)$ are linear, polynomial, absolute value, and simple exponential functions.	4.1, 4.2, 4.3, 4.4, 9.4
A-REI.D.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.	3.4, 4.4
Functions	
Interpreting Functions	
Understand the concept of a function and use function notation. **F-IF.A.1** Define a function in terms of domain and range, and the graph of f is the graph of the equation $y = f(x)$. *Note: Domain and range can be expressed using inequality, set builder, or interval notations.*	2.4, 2.5, 2.6, 11.5, 11.6
F-IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	2.4, 11.3
F-IF.A.3a Recognize that a sequence is a function whose domain is a subset of the integers. Sequences must be written explicitly and only in subscript notation. *Note: Functional notation for sequences and recursive forms should be introduced in Algebra II.*	11.4, 11.5, 11.6
Interpret functions that arise in application in terms of the context.* **F-IF.B.4** For a function that models a relationship between two quantities: i) interpret key features of graphs and tables in terms of the quantities; and ii) sketch graphs showing key features given a verbal description of the relationship. Algebra I Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maxima, minima; and symmetries. Tasks have a real-world context and are limited to the following functions: linear, quadratic, square root, cube root, piece-wise defined (including step and absolute value) and simple exponential.	8.3, 9.1

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F-IF.B.5 Determine the domain of a function from its graph and, where applicable, identify the appropriate domain for a function in context.	2.5
F-IF.B.6a Calculate and interpret the average rate of change of a function presented over a specified interval. Algebra I tasks have a real-world context and are limited to the following functions: linear, quadratic, square root, cube root, piece-wise defined (including step and absolute value), and simple exponential.	2.1
Analyze functions using different representations. **F-IF.C.7** Graph a function expressed as an equation and show key features of the graph, by hand in simple cases, and by using technology in cases that are more complicated.*	3.2
F-IF.C.7a Graph linear, quadratic, and simple exponential functions and show intercepts, maxima, and minima. *Note: Graphing linear functions is a fluency expectation for Algebra I.*	3.2, 8.4
F-IF.C.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	5.1, 5.2, 5.3, 11.1, 11.2
F-IF.C.8 Write a function in different but equivalent forms to reveal and explain different properties of the function.	8.2, 8.4, 8.5, 10.5
F-IF.C.8a Use the process of factoring and completing the square in a quadratic function to show zeros, maxima, minima, and symmetry of the graph, and interpret these in terms of a context.	8.2, 8.4, 8.5
F-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Algebra I Course: Tasks are limited to the following functions: linear, quadratic, square root, cube root, piecewise defined (including step and absolute value), and simple exponential.	10.5
Building Functions	
Build a function that models a relationship between two quantities. **F-BF.A.1** Write a function that describes a relationship between two quantities.* Algebra I course is limited to linear, quadratic, and simple exponential functions.	2.2, 10.5
F-BF.A.1a Determine a function from context. Algebra I: Define a sequence explicitly or steps for calculation from a context. *Note: The committee feels that the recursive process should be covered in Algebra II.*	10.5
Build new functions from existing functions. **F-BF.B.3** Using $f(x) + k$, $kf(x)$, and $f(x + k)$: i) Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, and $f(x + k)$ for specific values of k (both positive and negative); ii) Find the value of k given the graphs; iii) Write a new function using the value of k; and iv) Use technology to experiment with cases and explore the effects on the graph. Algebra I tasks are limited to linear functions, quadratic functions, square root functions, cube root functions, absolute value functions, and simple exponential functions.	5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 9.3, 11.1, 11.2

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Linear, Quadratic, and Exponential Models*	
Construct and compare linear, quadratic, and exponential models and solve problems. **F-LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.	10.3, 10.4, 10.5
F-LE.A.1a Justify that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.	10.3, 10.4, 10.5
F-LE.A.1b Recognize when a model has a constant rate of change, and identify the model as linear.	10.3, 10.4, 10.5
F-LE.A.1c Recognize when a model has a constant percent rate of change and identify the model as exponential.	10.3, 10.4, 10.5
F-LE.A.2 Construct a linear or exponential function rule given: i) a graph; ii) a description of the relationship; and iii) two input-output pairs (include reading these from a table). Simple exponential function limit for Algebra I.	2.3, 10.4
F-LE.A.3 Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) a polynomial function.	10.4, 10.5
Interpret expressions for functions in terms of the situation they model. **F-LE.B.5** Interpret the parameters in a linear or exponential function in terms of a context. Simple exponential function limit for Algebra I.	3.2
Number and Quantity	
The Real Number System	
Use properties of rational and irrational numbers. **N-RN.B.3** Use properties and operations to understand different forms of rational and irrational numbers.	1.1
N-RN.B.3a Perform operations and apply properties to generate equivalent forms of rational and irrational numbers (limited to square roots), without rationalizing denominators.	1.1
N-RN.B.3b Explain why (using definitions): i) the sum or product of two rational numbers is rational; ii) the sum of a rational number and an irrational number is irrational; iii) the product of a nonzero rational number and an irrational number is irrational; and iv) the product of two irrationals could be either rational or irrational.	1.1

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Quantities	
Reason quantitatively and use units to solve problems.* **N-Q.A.1** Use units as a way to: i) interpret and guide the solution of multi-step problems; ii) choose and interpret units consistently in formulas; and iii) choose and interpret the scale and the origin in graphs and data displays.	3.1
N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. The greatest precision for a result is only at the level of the least precise data point. For example, if units are tenths and hundredths, then the appropriate preciseness is tenths.	1.5
Statistics & Probability	
Interpreting Categorical & Quantitative Data	
Summarize, represent, and interpret data on a single count or measurement variable. **S-ID.A.1** Represent data with plots on the real number line (dot plots, histograms, and box plots).	12.1
S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (inter-quartile range, standard deviation) of two or more different data sets.	12.3
S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	12.3, 12.4
Summarize, represent, and interpret data on two categorical and quantitative variables. **S-ID.B.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.	12.2
S-ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	13.1, 13.3
S-ID.B.6a Fit a function to real-world data; use functions fitted to data to solve problems in the context of the data. Use the given functions or choose a function suggested by the context. Algebra I emphasis is on linear, quadratic, and exponential models and includes the regression capabilities of the calculator.	13.1, 13.3
Interpreting Categorical and Quantitative Data	
Interpret linear models. **S-ID.C.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	13.1
S-ID.C.8 Calculate (using technology) and interpret the correlation coefficient of a linear fit.	13.2
S-ID.C.9 Distinguish between correlation and causation.	13.4