Mathematics Standard
Catalina Foothills School District
High School: Algebra 1

In Algebra 1, the focus of instructional time is on the following areas:

1. Deepen and extend understanding of solving equations and systems.
2. Compare and contrast the difference in behaviors between linear and non-linear relationships.
3. Engage in methods of analyzing, solving, and using quadratic functions.
4. Apply linear models to data that exhibit a linear trend.

(1) In earlier grades, students have learned to solve linear equations in one variable and have applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. In Algebra I, students analyze and justify the processes of solving an equation and a system of linear equations. Students develop fluency in writing, interpreting, and translating various forms of linear equations and inequalities, and use them to solve problems. They solve linear equations and apply related techniques, along with the laws of exponents, to solve simple exponential equations.

(2) In Algebra I, students learn function notation and develop the concepts of domain and range. They focus on linear, quadratic, and exponential functions, including sequences, absolute value, step and piecewise-defined functions; they interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations. Students build on and extend their understanding of integer exponents to consider exponential functions. Students compare the key characteristics of quadratic functions to those of linear and exponential functions. Students identify the real solutions of those functions.

(3) Function development continues as students analyze and interpret intercepts, vertices, extrema, and limitations on domain and range of quadratic functions. Students use techniques to find and interpret the parameters and determine how they relate and differ in the various models. Students use multiple strategies for solving quadratics.

(4) Building upon prior experiences with data, students explore a more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities. They use graphical representations and knowledge of context to make judgments about the appropriateness of linear models including the use of residuals to analyze the goodness of fit.

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years. Mathematical modeling is integrated throughout Algebra 1 by utilizing real world context.

Honors Credit in Algebra 1

Performance expectations are differentiated for Honors level coursework. All students complete the same summative assessments, and their performance is measured with the Mathematics Scoring Rubric. On any given assessment, students can score at the Honors level. This means that they have demonstrated both proficiency of the selected course standards and also mastery of Honors-level learning goals. Students who consistently score at the Honors level (with an overall average of 3.5 or higher and who earn a 3.5 or higher on the semester Final Assessment) will be awarded Honors Credit at the end of the semester.

Students who wish to earn Honors Credit will need to maximize their learning in and out of the classroom. Alongside the teacher's efforts to support Honors-level learning, students must demonstrate the initiative, work ethic, and commitment required to achieve Honors learning goals. Performance expectations are differentiated for Honors level coursework.

Standards for Algebra 1

NUMBER AND QUANTITY: The Real Number System (N-RN)	
A1.N-RN.B.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.
NUMBER AND QUANTITY: Quantities (N-Q)	
A1.N-Q.A.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, include utilizing real-world context.
A1.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.
A1.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.
ALGEBRA: Seeing Structure in Expressions (A-SSE)	
A1.A-SSE.A.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 expressions by viewing one or more of their parts as a single entity.
A1.A-SSE.A.2	Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.
A1.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. 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.
ALGEBRA: Arithmetic with Polynomials and Rational Expressions (A-APR)	
A1.A-APR.A.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.
A1.A-APR.B.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. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available.
ALGEBRA: Creating Equations (A-CED)	
A1.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities that are linear, quadratic, or exponential.
A1.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A1.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.
A1.A-CED.A.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).
ALGEBRA: Reasoning with Equations and Inequalities (A-REI)	
A1.A-REI.A.1	Explain each step in solving linear and quadratic equations 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.
A1.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A1.A-REI.B.4	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - k)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.

	Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.
A1.A-REI.C.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.
A1.A-REI.C.6	Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. Include problem solving opportunities utilizing real-world context.
A1.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, often forming a curve, which could be a line.
A1.A-REI.D.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). Focus on cases where $f(x)$ and/or $g(x)$ are linear, absolute value, quadratic, and exponential functions.
A1.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.
FUNCTIONS: Interpreting Functions (F-IF)	
A1.F-IF.A.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 $y = f(x)$.
A1.F-IF.A.2	Evaluate a function for inputs in the domain, and interpret statements that use function notation in terms of a context.
A1.F-IF.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
A1.F-IF.B.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. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums. Focus on linear, absolute value, quadratic, exponential and piecewise-defined functions (limited to the aforementioned functions).
A1.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
A1.F-IF.B.6	Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Focus on linear, absolute value, quadratic, and exponential functions.
A1.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, exponential, quadratic, and piecewise- defined functions (limited to the aforementioned functions).
A1.F-IF.C.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 of a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
A1.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, absolute value, quadratic, exponential and piecewise-defined functions (limited to the aforementioned functions).
FUNCTIONS: Building Functions (F-BF)	
A1.F-BF.A.1	Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from real-world context. Focus on linear, absolute value, quadratic, exponential and piecewise-defined functions (limited to the aforementioned functions).
A1.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, 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. Focus on linear, absolute value, quadratic, exponential and piecewise-defined functions (limited to the aforementioned functions).
FUNCTIONS: Linear, Quadratic, and Exponential Models (F-LE)	
A1.F-LE.A.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.
A1.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.
A1.F-LE.A.3	Observe, using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
A.1.F-LE.B.5	Interpret the parameters in a linear or exponential function with integer exponents utilizing real world context.
STATISTICS AND PROBABILITY: Summarize, Represent, and Interpret Data on a Single Count or Measurement Variable (S-ID)	
A1.S-ID.A.1	Represent real-value data with plots for the purpose of comparing two or more data sets.
A1.S-ID.A.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.
A1.S-ID.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers if present.
A1.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.
A1.S-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Focus on linear models. b. Informally assess the fit of a function by plotting and analyzing residuals.
A1.S-ID.C.7	Interpret the slope as a rate of change and the constant term of a linear model in the context of the data.
A1.S-ID.C.8	Compute and interpret the correlation coefficient of a linear relationship.
A1.S-ID.C.9	Distinguish between correlation and causation.
STATISTICS AND PROBABILITY: Conditional Probability and the Rules of Probability (S-CP)	
A1.S-CP.A.1	Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.
A1.S-CP.A.2	Use the Multiplication Rule for independent events to understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
STANDARDS FOR MATHEMATICAL PRACTICE	
HS.MP.1	Make sense of problems and persevere in solving them.
HS.MP.2	Reason abstractly and quantitatively.
HS.MP.3	Construct viable arguments and critique the reasoning of others.
HS.MP.4	Model with mathematics.
HS.MP.5	Use appropriate tools strategically.
HS.MP.6	Attend to precision.
HS.MP.7	Look for and make use of structure.
HS.MP.8	Look for an express regularity in repeated reasoning.