# DETERMINING OUR ESSENTIALS - Algebra 1

| Prioritize | Standard | | |
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| | ***Number and Quantity - N*** | | |
| | **The Real Number System (N-RN)** | | |
| | **A1.N-RN.B**<br>**Use properties of rational and irrational numbers.** | **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. |
| | **Quantities (N-Q)** | | |
| | **A1.N-Q.A**<br>**Reason quantitatively and use units to solve problems.** | **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 - A*** | | |
| | **Seeing Structure in Expressions (A-SSE)** | | |
| | **A1.A-SSE.A**<br>**Interpret the structure of expressions.** | **A1.A-SSE.A.1** | Interpret expressions that represent a quantity in terms of its context.<br><br>a. Interpret parts of an expression, such as terms, factors, and coefficients.<br><br>b. Interpret expressions by viewing one or more of their parts as a single entity. |

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| | **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**<br>**Write expressions in equivalent forms to solve problems.** | **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.<br><br>a. Factor a quadratic expression to reveal the zeros of the function it defines.<br><br>b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. |
| **Arithmetic with Polynomials and Rational Expressions (A-APR)** | | |
| **A1.A-APR.A**<br>**Perform arithmetic operations on polynomials.** | **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**<br>**Understand the relationship between zeros and factors of 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.<br>Focus on quadratic and cubic polynomials in which linear and quadratic factors are available. |
| **Creating Equations (A-CED)** | | |
| **A1.A-CED.A**<br>**Create equations that describe numbers or relationships.** | **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.<br>Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |

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| | **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. |
| **Reasoning with Equations and Inequalities (A-REI)** | | |
| **A1.A-REI.A**<br>**Understand solving equations as a process of reasoning and explain the reasoning.** | **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.REI.B**<br>**Solve equations and inequalities in one variable.** | **A1.A-REI.B.3** | Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. |

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| | **A1.A-REI.B.4** | Solve quadratic equations in one variable.<br><br>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.<br><br>b. Solve quadratic equations by inspection (e.g., x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.<br>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**<br>**Solve systems of equations.** | **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**<br>**Represent and solve equations and inequalities graphically.** | **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. |

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| | | **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).<br>Focus on cases where f(x) and/or g(x) are linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| | | **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 - F*** | | |
| | **Interpreting Functions (F-IF)** | | |
| | **A1.F-IF.A**<br>**Understand the concept of a function and use function notation.** | **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. |

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| **A1.F-IF.B**<br>**Interpret functions that arise in applications in terms of the context** | **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.<br>Include problem-solving opportunities utilizing real-world context.<br>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums.<br>Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| | **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.<br>Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| **A1.F-IF.C**<br>**Analyze functions using different representations.** | **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.<br>Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |

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| | | **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.<br>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).<br>Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| | **Building Functions (F-BF)** | | |
| | **A1.F-BF.A**<br>**Build a function that models a relationship between two quantities.** | **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.<br>Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| | **A1.F-BF.B**<br>**Build new functions from existing 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.<br>Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| | **Linear, Quadratic, and Exponential Models (F-LE)** | | |

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| **A1.F-LE.A**<br>**Construct and compare linear, quadratic, and exponential models and solve problems.** | **A1.F-LE.A.1** | Distinguish between situations that can be modeled with linear functions and with exponential functions.<br><br>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.<br><br>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.<br><br>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. |
| **A1.F-LE.B**<br>**Interpret expressions for functions in terms of the situation they model.** | **A1.F-LE.B.5** | Interpret the parameters in a linear or exponential function with integer exponents utilizing real world context. |
| ***Statistics and Probability - S*** | | |
| **Interpreting Categorical and Quantitative Data (S-ID)** | | |
| **A1.S-ID.A**<br>**Summarize, represent, and interpret data on a single count or measurement variable.** | **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. |

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| **A1.S-ID.B**<br>**Summarize, represent, and interpret data on two categorical and quantitative variables.** | **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.<br><br>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.<br><br>b. Informally assess the fit of a function by plotting and analyzing residuals. |
| **A1.S-ID.C**<br>**Interpret linear models.** | **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. |
| **Conditional Probability and the rules of Probability (S-CP)** | | |
| **A1.S-CP.A**<br>**Understand independence and conditional probability and use** | **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. |

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| **them to interpret data.** | **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. |