| Ohio Learning Standards Mathematics | *Ohio Learning Standards for Mathematics: Algebra 1* |
|---|---|
| **Reporting Category: Number, Quantities, Equations, and Expressions** | |
| **N.Q.1** Use units as a way to understand problems and 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. | 3.1 |
| **N.Q.2** Define appropriate quantities for the purpose of descriptive modeling. | 3.1, 5.3, 11.3 |
| **N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | 1.4 |
| **A.APR.1** Understand that polynomials form a system analogous to the integers, namely, that they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.<br>**a.** Focus on polynomial expressions that simplify to forms that are linear or quadratic. (A1, M2) | 7.2, 7.3, 7.4 |
| **A.SSE.1** Interpret express*ions that represent a quantity in terms of its context.*<br>**a.** Interpret parts of an expression, such as terms, factors, and coefficients.<br>**b.** Interpret complicated expressions by viewing one or more of their parts as a single entity. | 7.1, 8.1, 10.1, 10.2 |
| **A.SSE.2** Use the structure of an expression to identify ways to rewrite it. *For example, to factor* $3x(x–5) + 2(x – 5)$ *students should recognize that* "$x – 5$" *is common to both expressions being added, so it simplifies to* $(3x + 2)(x – 5)$; *or 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* $(x^2 – y^2)(x^2 + y^2)$. | 8.1, 8.2, 8.3, 8.4, 8.5 |
| **A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.<br>**a.** Factor a quadratic expression to reveal the zeros of the function it defines.<br>**b.** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.<br>**c.** Use the properties of exponents to transform expressions for exponential functions. *For example,* $8^t$ *can be written as* $2^{3t}$. | 8.5, 9.2, 9.3, 10.1, 10.2, 10.3 |
| **A.CED.1** Create equations and inequalities in one variable and use them to solve problems. *Include equations and inequalities arising from linear, quadratic, simple rational, and exponential functions.*<br>**a.** Focus on applying linear and simple exponential expressions. (A1, M1)<br>**b.** Focus on applying simple quadratic expressions. (A1, M2) | 1.2, 1.3, 2.3, 3.3 |
| **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.<br>**a.** Focus on applying linear and simple exponential expressions. (A1, M1)<br>**b.** Focus on applying simple quadratic expressions. (A1, M2) | 2.2, 2.3, 3.1, 5.1, 5.3, 10.2 |
| **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*. (A1, M1) | 3.3, 3.4, 5.3, 5.4 |

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| **A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.<br>**a.** Focus on formulas in which the variable of interest is linear or square. *For example, rearrange Ohm's law V = IR to highlight resistance R, or rearrange the formula for the area of a circle A = (π)r² to highlight radius r*. (A1) | 1.2 |
| **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. | 1.1, 1.2 |
| **A.REI.3** Solve linear equations and inequalities in one variable including equations with coefficients represented by letters. | 1.1, 1.2, 1.3 |
| **A.REI.4** Solve quadratic equations in one variable.<br>**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.<br>**b.** Solve quadratic equations as appropriate to the initial form of the equation by inspection, e.g., for $x^2 = 49$; taking square roots; completing the square; applying the quadratic formula; or utilizing the Zero-Product Property after factoring.<br>**c.** Derive the quadratic formula using the method of completing the square. | 9.1, 9.2 |
| **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 $y = -3x$ and the circle $x^2 + y^2 = 3$. | 9.6 |
| **Reporting Category: Functions** | |
| **A.REI.5** Verify 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 solution. | 5.3 |
| **A.REI.6** Solve systems of linear equations algebraically and graphically.<br>**a.** Limit to pairs of linear equations in two variables. (A1, M1) | 5.1, 5.2, 5.3 |
| **A.REI.10** Understand that the graph of an equation in two variable is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). | 2.1, 2.2, 3.1, 3.2 |
| **A.REI.11** Explain why the $x$-coordinates of the points where the graphs of the equation $y = f(x)$ 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, making tables of values, or finding successive approximations. | 5.1, 9.6 |
| **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. | 3.4, 5.4 |
| **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 $y = f(x)$. | 4.1, 4.2, 4.3 |
| **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. | 4.1, 4.2 |

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| **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* $n \geq 1$. | 1.5, 2.4, 10.4 |
| **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 the following: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*. (A2, M3)<br>**b.** Focus on linear, quadratic, and exponential functions. (A1, M2) | 3.2, 9.3, 9.4, 10.3 |
| **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.*<br>**b.** Focus on linear, quadratic, and exponential functions. (A1, M2) | 4.2 |
| **F.IF.7** Graph functions expressed symbolically and indicate key features of the graph, by hand, in simple cases, and using technology, for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.<br>**a.** Graph linear functions and indicate intercepts. (A1, M1)<br>**b.** Graph quadratic functions and indicate intercepts, maxima, and minima. (A1, M2)<br>**e.** Graph simple exponential functions, indicating intercepts and end behavior. (A1, M1) | 3.1, 3.2, 9.4, 10.3 |
| **F.IF.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 in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. (A2, M3)<br>**i.** Focus on completing the square of quadratic functions with the leading coefficient of 1. (A1)<br>**b.** Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of *change*[G] in functions such as $y = (1.02)^t$, $y = (0.97)^t$ and classify them as representing exponential growth or decay. (A2, M3)<br>**i.** Focus on exponential functions evaluated at integer inputs. (A1, M2) | 9.2, 9.4, 10.1, 10.2 |
| **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*. (A2, M3)<br>**b.** Focus on linear, quadratic, and exponential functions. (A1, M2) | 11.1, 11.3 |
| **F.BF.1** Write a function that describes a relationship between two quantities.<br>**a.** Determine an explicit expression, a recursive process, or steps for calculation from context.<br>**i.** Focus on linear and exponential functions. (A1, M1)<br>**i.** Focus on situations that exhibit quadratic or exponential relationships. (A1, M2) | 2.1, 2.2, 2.3, 11.3 |

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| **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. | 2.4, 10.4 |
| **F.BF.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$ and 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. (A2, M3)<br>**a.** Focus on transformations of graphs of quadratic functions, except for $f(kx)$. (A1, M2) | 6.1, 6.2, 6.3, 6.5, 9.5 |
| **F.BF.4** Find inverse functions.<br>**a.** Informally determine the input of a function when the output is known. (A1, M1) | 4.4, 6.4 |
| **F.LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.<br>**a.** Show that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.<br>**b.** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.<br>**c.** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. | 11.1, 11.2, 11.3 |
| **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). | 2.1, 2.2, 2.3, 2.4, 10.4 |
| **F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. (A1, M2) | 11.1 |
| **F.LE.5** Interpret the parameters in a linear or exponential function in terms of a context. | 2.3, 3.2, 10.1, 10.2 |
| **Reporting Category: Statistics** | |
| **S.ID.1** Represent data with plots on the real number line (dot plots, histograms, and box plots) in the context of real-world applications using the GAISE model. | 12.1 |
| **S.ID.2** In the context of real-world applications by using the GAISE model, use statistics appropriate to the shape of the data distribution to compare center (median and mean), and spread (mean absolute deviation, interquartile range, and standard deviation) of two or more different data sets. | 12.3 |
| **S.ID.3** In the context of real-world applications by using the GAISE model, 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 |
| **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. | 12.2 |

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| **S.ID.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.<br>**c.** Fit a linear function for a scatterplot that suggests a linear association. (A1, M1) | 12.5 |
| **S.ID.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. | 12.5 |
| **S.ID.8** Compute (using technology) and interpret the correlation coefficient of a linear fit. | 12.6 |

The Modeling and Reasoning category is dependent on the other standards for content.