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| N | Number \& Quantity |  |
| N-Q | Quantities |  |
| N-Q.A | Reason quantitatively and use units to solve problems. |  |
| 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. |  |
|  |  | Dimensional Analysis |
|  |  | Quantitative Reasoning |
|  |  | Writing and Graphing Equations in Two Variables |
| N-Q.A. 2 | Define appropriate quantities for the purpose of descriptive modeling. |  |
|  |  | Dimensional Analysis |
|  |  | Quantitative Reasoning |
| N-Q.A. 3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. |  |
|  |  | Dimensional Analysis |
| A | Algebra |  |
| A-SSE | Seeing Structure in Expressions |  |
| A-SSE.A | Interpret the structure of expressions. |  |
| A-SSE.A. 1 | Interpret expressions that represent a quantity in terms of its context. |  |
| A-SSE.A.1a | Interpret parts of an expression, such as terms, factors, and coefficients. |  |
|  |  | Simplifying Expressions |
| A-SSE.A.1b | Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^{\wedge} n$ as the product of $P$ and a factor not depending on $P$. |  |
|  |  | Simplifying Expressions |
| A-CED | Creating Equations |  |
| A-CED.A | Create equations that describe numbers or relationships. |  |
| A-CED.A. 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. |  |
|  |  | Introduction to Compound Inequalities |
|  |  | Solving Absolute Value Equations |
|  |  | Solving Linear Equations: Distributive Property |
|  |  | Solving Linear Equations: Variable on One Side |
|  |  | Solving Linear Equations: Variables on Both Sides |


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| A-CED.A. 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. <br> (Cont'd) | Solving Mixture Problems <br> Solving One-Variable Inequalities |
| 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. | Writing and Graphing Equations in Two Variables <br> Writing and Solving Equations in Two Variables |
| A-CED.A. 3 | Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. | Introduction to Compound Inequalities <br> Modeling with Systems of Linear Inequalities <br> Regression Models <br> Solving Absolute Value Equations <br> Solving Linear Equations: Distributive Property <br> Solving Mixture Problems <br> Solving Systems of Linear Equations: Linear Combinations <br> Solving Systems of Linear Equations: <br> Substitution <br> Solving Systems: Introduction to Linear Combinations <br> Writing and Solving Equations in Two Variables |
| 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 $R$. | Literal Equations |


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| A-REI | Reasoning with Equations and Inequalities |  |
| A-REI.A | Understand solving equations as a process of reasoning and explain the reasoning. |  |
| A-REI.A. 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. |  |
|  |  | Literal Equations |
|  |  | Solving Linear Equations: Variable on One Side |
|  |  | Solving Linear Equations: Variables on Both Sides |
| A-REI.B | 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. |  |
|  |  | Literal Equations |
|  |  | Solving Absolute Value Equations |
|  |  | Solving Linear Equations: Distributive |
|  |  | Property |
|  |  | Solving Linear Equations: Variable on One |
|  |  | Side |
|  |  | Solving Linear Equations: Variables on Both Sides |
|  |  | Solving Mixture Problems |
|  |  | Solving One-Variable Inequalities |
| A-REI.C | Solve systems of equations. |  |
| 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. |  |
|  |  | Solving Systems: Introduction to Linear Combinations |
| A-REI.C. 6 | Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. |  |
|  |  | Solving Systems of Linear Equations: |
|  |  | Graphing |
|  |  | Solving Systems of Linear Equations: Linear |
|  |  | Combinations |
|  |  | Solving Systems of Linear Equations: |
|  |  | Substitution |
|  |  | Solving Systems: Introduction to Linear |
|  |  | Combinations |
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| A-REI.D | 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, often forming a curve (which could be a line). | Writing and Graphing Equations in Two Variables |
| 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. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. | Solving Linear Equations: Variable on One Side <br> Solving Linear Equations: Variables on Both Sides |
| 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. | Graphing Two-Variable Linear Inequalities Modeling with Systems of Linear Inequalities Solving Systems of Linear Inequalities |
| F | Functions |  |
| F-IF | Interpreting Functions |  |
| F-IF.A | Understand the concept of a function and use function notation. |  |
| 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 $y=$ $f(x)$. |  |
|  |  | Analyzing Graphs |
|  |  | Introduction to Functions |
|  |  | Introduction to Linear Functions |
|  |  | Point-Slope Form of a Line |
|  |  | Slope-Intercept Form of a Line |
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| 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. |  |
|  |  | Evaluating Functions |
|  |  | Function Notation |
|  |  | Line of Best Fit |
|  |  | Regression Models |
| F-IF.A. 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 $f(0)=f(1)=1, f(n+1)=f(n)+f(n-1) f o r$ $n \geq 1$. |  |
|  |  | Geometric Sequences |
|  |  | Recognizing Patterns |
|  |  | Special Linear Relationships |
| F-IF.B | Interpret functions that arise in applications in terms of the context. |  |
| 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. |  |
|  |  | Analyzing Graphs |
|  |  | Analyzing Tables |
|  |  | Special Linear Relationships |
| F-IF.B. 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. |  |
|  |  | Analyzing Graphs |
|  |  | Introduction to Linear Functions |
|  |  | Point-Slope Form of a Line |
|  |  | Slope-Intercept Form of a Line |
|  |  | Special Linear Relationships |
|  |  | Writing Linear Equations |


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| F-IF.B. 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. | Introduction to Linear Functions <br> Performance Task: Super Survey Simulator <br> Point-Slope Form of a Line <br> Slope of a Line <br> Slope-Intercept Form of a Line <br> Writing Linear Equations |
| $\begin{aligned} & \text { F-IF.C } \\ & \text { F-IF.C. } 7 \end{aligned}$ | Analyze functions using different representations. <br> Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. |  |
| F-IF.C.7a | Graph linear and quadratic functions and show intercepts, maxima, and minima. | Point-Slope Form of a Line Slope-Intercept Form of a Line |
| F-IF.C.7e | Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. | Exponential Decay Functions Exponential Growth Functions Reflections of Exponential Functions Translations of Exponential Functions Vertical Stretches and Shrinks of Exponential Functions |
| F-IF.C. 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. | Introduction to Linear Functions |
| F-BF <br> F-BF.A <br> F-BF.A. 1 | Building Functions <br> Build a function that models a relationship between two quantities. Write a function that describes a relationship between two quantities. |  |
| F-BF.A.1a | Determine an explicit expression, a recursive process, or steps for calculation from a context. | Geometric Sequences <br> Recognizing Patterns <br> Special Linear Relationships |


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| F-BF.A.1b | Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. |  |
|  |  | Translations of Exponential Functions |
| F-BF.A. 2 | Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. |  |
|  |  | Geometric Sequences |
|  |  | Recognizing Patterns |
|  |  | Special Linear Relationships |
| F-BF.B | Build new functions from existing functions. |  |
| F-BF.B. 3 | Identify the effect on the graph of replacing $f(x)$ by $f(x)+k, k f(x), f(k x)$, 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 using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. |  |
|  |  | Reflections of Exponential Functions |
|  |  | Translations of Exponential Functions |
|  |  | Vertical Stretches and Shrinks of |
|  |  | Exponential Functions |
| F-LE | Linear, Quadratic, and Exponential Models |  |
| F-LE.A | 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. |  |
| F-LE.A.1a | Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. |  |
|  |  | Exponential Growth Functions |
|  |  | Introduction to Linear Functions |
| F-LE.A.1b | Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. |  |
|  |  | Introduction to Linear Functions |
|  |  | Point-Slope Form of a Line |
|  |  | Slope of a Line |
|  |  | Slope-Intercept Form of a Line |
|  |  |  |
| F-LE.A.1c | Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. |  |
|  |  | Exponential Decay Functions |
|  |  | Exponential Growth Functions |


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| F-LE.A. 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). |  |
|  |  | Geometric Sequences |
|  |  | Special Linear Relationships |
| F-LE.A. 3 | Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. |  |
|  |  | Exponential Growth Functions |
| F-LE.B | 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. |  |
|  |  | Exponential Decay Functions |
|  |  | Exponential Growth Functions |
|  |  | Reflections of Exponential Functions |
|  |  | Translations of Exponential Functions |
|  |  | Vertical Stretches and Shrinks of Exponential Functions |
| G | Geometry |  |
| G-CO | Congruence |  |
| G-CO.A | Experiment with transformations in the plane |  |
| G-CO.A. 1 | Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. |  |
|  |  | Defining Terms |
|  |  | Euclidean Geometry |
|  |  | Measuring Length and Angles |
| G-CO.A. 2 | Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). |  |
|  |  | Compositions |
|  |  | Introduction to Transformations |
|  |  | Reflections |
|  |  | Rotations |
|  |  | Translations |
| G-CO.A. 3 | Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. |  |
|  |  | Symmetry |


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| G-CO.A. 4 | Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments. |  |
|  |  | Reflections |
|  |  | Rotations |
|  |  | Translations |
| G-CO.A. 5 | Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. |  |
|  |  | Compositions |
|  |  | Reflections |
|  |  | Rotations |
|  |  | Translations |
|  |  | Triangle Congruence: ASA and AAS |
|  |  | Triangle Congruence: SAS |
|  |  | Triangle Congruence: SSS and HL |
| G-CO.B | Understand congruence in terms of rigid motions |  |
| G-CO.B. 6 | Use geometric descriptions of rigid motions to transform figures and to predict the effect of a rigid motion on a figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. |  |
|  |  | Congruent Figures |
|  |  | Triangle Congruence: ASA and AAS |
|  |  | Triangle Congruence: SAS |
|  |  | Triangle Congruence: SSS and HL |
| G-CO.B. 7 | Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. |  |
|  |  | Congruent Figures |
|  |  | Triangle Congruence: SSS and HL |
| G-CO.B. 8 | Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence. |  |
|  |  | Performance Task: Congruency Proofs |
|  |  | Triangle Congruence: ASA and AAS |
|  |  | Triangle Congruence: SAS |
|  |  | Triangle Congruence: SSS and HL |


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| G-CO.D | Make geometric constructions |  |
| G-CO.D. 12 | Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. |  |
|  |  | Performance Task: Constructions |
| G-CO.D. 13 | Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle. |  |
|  |  | Performance Task: Circle Constructions |
| G-GPE | Expressing Geometric Properties with Equations |  |
| G-GPE.B | Use coordinates to prove simple geometric theorems algebraically |  |
| G-GPE.B. 4 | Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{ } 3)$ lies on the circle centered at the origin and containing the point $(0,2)$. |  |
|  |  | Equation of a Circle |
|  |  | Figures in the Coordinate Plane |
| G-GPE.B. 5 | Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). |  |
|  |  | Slopes of Parallel and Perpendicular Lines Writing Linear Equations |
| G-GPE.B. 7 | Use coordinates to compute perimeters of polygons and areas for triangles and rectangles, e.g. using the distance formula. |  |
|  |  | Area of Triangles and Parallelograms |
|  |  | Figures in the Coordinate Plane |
|  |  | Perimeter and Area of Rhombi, Trapezoids, and Kites |
| S | Statistics \& Probability |  |
| S-ID | Interpreting Categorical and Quantitative Data |  |
| S-ID.A | 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). |  |
|  |  | Box Plots |
|  |  | Measures of Center |


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| 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. | Box Plots <br> Measures of Center <br> Standard Deviation |
| 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). | Box Plots <br> Describing Data <br> Measures of Center <br> Standard Deviation |
| S-ID.B | 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. | Relative Frequencies and Association Two-Way Tables |
| S-ID.B. 6 | Represent data on two quantitative variables on a scatter plot and describe how the variables are related. |  |
| S-ID.B.6a | 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 exponential models. | Analyzing Residuals Line of Best Fit Regression Models |
| S-ID.B.6b | Informally assess the fit of a model function by plotting and analyzing residuals. | Analyzing Residuals |
| S-ID.B.6c | Fit a linear function for scatter plots that suggest a linear association. | Analyzing Residuals Line of Best Fit Regression Models Strength of Correlation |
| S-ID.C | Interpret linear models |  |
| S-ID.C. 7 | Interpret the slope (rate of change) and the intercept (constant term) of a linear fit in the context of the data. | Line of Best Fit Regression Models |


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| S-ID.C. 8 | Compute (using technology) and interpret the correlation coefficient of a linear fit. | Strength of Correlation |
|  |  | Strength of Correlation |
| S-ID.C.9 | Distinguish between correlation and causation. |  |

