COMMON CORE STATE STANDARDS TO BOOK CORRELATION

After a standard is introduced, it is revisited many times in subsequent activities, lessons, and exercises.

Conceptual Category: Number and Quantity

Domain: The Real Number System

N.RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- **Section 6.3**   Radicals and Rational Exponents

N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **Section 6.2**   Properties of Exponents
- **Section 6.3**   Radicals and Rational Exponents
- **Section 10.2**   Solving Square Root Equations

N.RN.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.
- **Section 6.1**   Properties of Square Roots

Domain: Quantities

N.Q.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.
Found throughout. For example:
- **Section 1.4**   Rewriting Equations and Formulas
- **Section 2.1**   Graphing Linear Equations
- **Section 6.4**   Exponential Functions

N.Q.2 Define appropriate quantities for the purpose of descriptive modeling.
Found throughout. For example:
- **Section 1.1**   Solving Simple Equations
- **Section 3.2**   Solving Inequalities Using Addition or Subtraction
- **Section 4.5**   Systems of Linear Inequalities

N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Found throughout. For example:
- **Section 6.1**   Properties of Square Roots
- **Section 10.2**   Solving Square Root Equations
- **Section 12.5**   Scatter Plots and Lines of Fit

Conceptual Category: Algebra

Domain: Seeing Structure in Expressions

Domain: Arithmetic with Polynomials and Rational Expressions

Domain: Creating Equations

A.CED.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.*

- **Section 1.1**   Solving Simple Equations
- **Section 1.2**   Solving Multi-Step Equations
- **Section 1.3**   Solving Equations with Variables on Both Sides
- **Section 3.1**   Writing and Graphing Inequalities
- **Section 3.2**   Solving Inequalities Using Addition or Subtraction
- **Section 3.3**   Solving Inequalities Using Multiplication or Division
- **Section 3.4**   Solving Multi-Step Inequalities
- **Section 6.4**   Exponential Functions
- **Section 9.1**   Solving Quadratic Equations by Graphing
- **Section 11.7**   Solving Rational Equations

A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

- **Section 2.1**   Graphing Linear Equations
- **Section 2.3**   Graphing Linear Equations in Slope-Intercept Form
- **Section 2.4**   Graphing Linear Equations in Standard Form
- **Section 2.5**   Writing Equations in Slope-Intercept Form
- **Section 2.6**   Writing Equations in Point-Slope Form
- **Section 2.7**   Solving Real-Life Problems
- **Section 6.4**   Exponential Functions
- **Section 8.1**   Graphing $y = ax^2$
- **Section 10.1**   Graphing Square Root Functions
- **Section 11.2**   Graphing Rational Functions

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.

- **Section 2.5**   Writing Equations in Slope-Intercept Form
- **Section 3.1**   Writing and Graphing Inequalities
- **Section 3.2**   Solving Inequalities Using Addition or Subtraction
- **Section 3.3**   Solving Inequalities Using Multiplication or Division
- **Section 3.4**   Solving Multi-Step Inequalities
- **Section 4.1**   Solving Systems of Linear Equations by Graphing
- **Section 4.2**   Solving Systems of Linear Equations by Substitution
- **Section 4.3**   Solving Systems of Linear Equations by Elimination
- **Section 4.4**   Solving Special Systems of Linear Equations
- **Section 4.5**   Systems of Linear Inequalities

A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

- **Section 1.4**   Rewriting Equations and Formulas

Domain: Reasoning with Equations and Inequalities

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

  a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

- **Section 4.1**   Solving Systems of Linear Equations by Graphing
- **Section 4.4**   Solving Special Systems of Linear Equations

  b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.

- **Section 4.1**   Solving Systems of Linear Equations by Graphing
- **Section 4.2**   Solving Systems of Linear Equations by Substitution
- **Section 4.3**   Solving Systems of Linear Equations by Elimination
- **Section 4.4**   Solving Special Systems of Linear Equations

  c. Solve real-world and mathematical problems leading to two linear equations in two variables.

- **Section 4.1**   Solving Systems of Linear Equations by Graphing
- **Section 4.2**   Solving Systems of Linear Equations by Substitution
- **Section 4.3**   Solving Systems of Linear Equations by Elimination
- **Section 4.4**   Solving Special Systems of Linear Equations

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.

- **Section 1.1**   Solving Simple Equations
- **Section 1.2**   Solving Multi-Step Equations
- **Section 1.3**   Solving Equations with Variables on Both Sides

A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

- **Section 1.1**   Solving Simple Equations
- **Section 1.2**   Solving Multi-Step Equations
- **Section 1.3**   Solving Equations with Variables on Both Sides
- **Section 3.2**   Solving Inequalities Using Addition or Subtraction
- **Section 3.3**   Solving Inequalities Using Multiplication or Division
- **Section 3.4**   Solving Multi-Step Inequalities
- **Section 6.4**   Exponential Functions

A.REI.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 $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

- **Section 9.3**   Solving Quadratic Equations by Completing the Square
- **Section 9.4**   Solving Quadratic Equations Using the Quadratic Formula

  b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

- **Section 7.5**   Solving Polynomial Equations in Factored Form
- **Section 7.6**   Factoring Polynomials Using the GCF
- **Section 7.7**   Factoring $x^2 + bx + c$

Conceptual Category: Functions
Domain: Interpreting Functions

8.F.1   Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
- **Section 5.1**   Domain and Range of a Function
- **Section 5.2**   Discrete and Continuous Domains

8.F.2   Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- **Section 5.4**   Function Notation
- **Section 6.5**   Exponential Growth

8.F.3   Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
- **Section 2.3**   Graphing Linear Equations in Slope-Intercept Form
- **Section 2.5**   Writing Equations in Slope-Intercept Form
- **Section 5.3**   Linear Function Patterns
- **Section 5.5**   Comparing Linear and Nonlinear Functions

8.F.4   Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
- **Section 2.7**   Solving Real-Life Problems
- **Section 5.3**   Linear Function Patterns

8.F.5   Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. *Found throughout. For example:*
- **Section 5.5**   Comparing Linear and Nonlinear Functions
- **Section 8.1**   Graphing $y = ax^2$
- **Section 8.3**   Graphing $y = ax^2 + c$

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 $y = f(x)$.
- **Section 5.1**   Domain and Range of a Function
- **Section 5.2**   Discrete and Continuous Domains
- **Section 5.4**   Function Notation

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.
- **Section 5.4**   Function Notation

F.IF.3   Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
- **Section 5.6**   Arithmetic Sequences
- **Section 6.7**   Geometric Sequences

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: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- **Section 2.2**   Slope of a Line
- **Section 2.3**   Graphing Linear Equations in Slope-Intercept Form
- **Section 2.4**   Graphing Linear Equations in Standard Form
- **Section 2.6**   Writing Equations in Point-Slope Form
- **Section 2.7**   Solving Real-Life Problems
- **Section 8.2**   Focus of a Parabola
- **Section 8.4**   Graphing $y = ax^2 + bx + c$
- **Section 8.5**   Comparing Linear, Exponential, and Quadratic Functions
- **Section 10.1**   Graphing Square Root Functions

F.IF.5   Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
- **Section 5.1**   Domain and Range of a Function
- **Section 5.2**   Discrete and Continuous Domains

F.IF.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.
- **Section 2.2**   Slope of a Line
- **Section 2.6**   Writing Equations in Point-Slope Form
- **Section 8.5**   Comparing Linear, Exponential, and Quadratic Functions

F.IF.7   Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- **a.**   Graph linear and quadratic functions and show intercepts, maxima, and minima.
  - **Section 2.3**   Graphing Linear Equations in Slope-Intercept Form
  - **Section 8.4**   Graphing $y = ax^2 + bx + c$
  - **Section 8.5**   Comparing Linear, Exponential, and Quadratic Functions
- **b.**   Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
  - **Section 5.4**   Function Notation
  - **Section 10.1**   Graphing Square Root Functions
- **e.**   Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
  - **Section 6.4**   Exponential Functions
  - **Section 6.5**   Exponential Growth
  - **Section 6.6**   Exponential Decay

F.IF.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 in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
  - **Section 9.3**   Solving Quadratic Equations by Completing the Square

b. Use the properties of exponents to interpret expressions for exponential functions.
- **Section 6.4** Exponential Functions
- **Section 6.5** Exponential Growth
- **Section 6.6** Exponential Decay

F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- **Section 5.4** Function Notation
- **Section 6.5** Exponential Growth

Domain: Building Functions

F.BF.1 Write a function that describes a relationship between two quantities.

a. Determine an explicit expression, a recursive process, or steps for calculation from a context. *Found throughout. For example:*
- **Section 2.5** Writing Equations in Slope-Intercept Form
- **Section 5.3** Linear Function Patterns
- **Section 6.5** Exponential Growth
- **Section 6.6** Exponential Decay

b. Combine standard function types using arithmetic operations.
- **Section 6.5** Exponential Growth

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.
- **Section 5.6** Arithmetic Sequences
- **Section 6.7** Geometric Sequences

F.BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, 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.*
- **Section 5.4** Function Notation
- **Section 6.4** Exponential Functions
- **Section 8.1** Graphing $y = ax^2$
- **Section 8.3** Graphing $y = ax^2 + c$
- **Section 8.4** Graphing $y = ax^2 + bx + c$

F.BF.4 Find inverse functions.

a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.
- **Section 11.2** Graphing Rational Functions

Domain: Linear, Quadratic, and Exponential Models

F.LE.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.
- **Section 6.4** Exponential Functions

b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- **Section 5.5** Comparing Linear and Nonlinear Functions

    c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

- **Section 6.5** Exponential Growth
- **Section 6.6** Exponential Decay

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).

- **Section 5.3** Linear Function Patterns
- **Section 5.6** Arithmetic Sequences
- **Section 6.4** Exponential Functions
- **Section 6.7** Geometric Sequences

F.LE.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.

- **Section 8.5** Comparing Linear, Exponential, and Quadratic Functions

F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.

- **Section 2.3** Graphing Linear Equations in Slope-Intercept Form
- **Section 6.4** Exponential Functions

Conceptual Category: Geometry

Domain: Geometric Measurement and Dimension

8.G.6 Explain a proof of the Pythagorean theorem and its converse.

- **Section 10.3** The Pythagorean Theorem
- **Section 10.4** Using the Pythagorean Theorem

8.G.7 Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

- **Section 10.3** The Pythagorean Theorem
- **Section 10.4** Using the Pythagorean Theorem

8.G.8 Apply the Pythagorean theorem to find the distance between two points in a coordinate system.

- **Section 10.4** Using the Pythagorean Theorem

Conceptual Category: Statistics and Probability

Domain: Interpreting Categorical and Quantitative Data

8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

- **Section 12.5** Scatter Plots and Lines of Fit
- **Section 12.6** Analyzing Lines of Fit

8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

- **Section 12.5** Scatter Plots and Lines of Fit

8.SP.3   Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
- **Section 12.5**   Scatter Plots and Lines of Fit

8.SP.4   Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.
- **Section 12.7**   Two-Way Tables

S.ID.1   Represent data with plots on the real number line (dot plots, histograms, and box plots).
- **Section 12.1**   Measures of Central Tendency
- **Section 12.3**   Box-and-Whisker Plots
- **Section 12.4**   Shapes of Distributions
- **Section 12.8**   Choosing a Data Display

S.ID.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.
- **Section 12.1**   Measures of Central Tendency
- **Section 12.2**   Measures of Dispersion
- **Section 12.3**   Box-and-Whisker Plots
- **Section 12.4**   Shapes of Distributions

S.ID.3   Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- **Section 12.1**   Measures of Central Tendency
- **Section 12.2**   Measures of Dispersion
- **Section 12.3**   Box-and-Whisker Plots
- **Section 12.4**   Shapes of Distributions

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.
- **Section 12.7**   Two-Way Tables

S.ID.6   Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

  a.   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 and exponential models.*
- **Section 12.5**   Scatter Plots and Lines of Fit

  b.   Informally assess the fit of a function by plotting and analyzing residuals.
- **Section 12.6**   Analyzing Lines of Fit

  c.   Fit a linear function for a scatter plot that suggests a linear association.
- **Section 12.5**   Scatter Plots and Lines of Fit

S.ID.7   Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
- **Section 12.5**   Scatter Plots and Lines of Fit

S.ID.8   Compute (using technology) and interpret the correlation coefficient of a linear fit.
- **Section 12.6**   Analyzing Lines of Fit

S.ID.9   Distinguish between correlation and causation.
- **Section 12.6**   Analyzing Lines of Fit