

Connections to the Common Core State Standards

In this correlation you will find some lessons that span several grade levels. A lesson can be used as an introduction to different types of representations, developing the student’s understanding of the general nature of graphs, tables, or equations. It can be used later in the student’s career to refresh their understanding or to assess their knowledge of a topic as they proceed with the development of more complex problems. Lessons, homework suggestions, and extensions that encompass the lessons were all considered when creating the correlation.

Modeling is best interpreted not as a collection of isolated topics but in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol sometimes appears on the heading for a group of standards; in that case, it should be understood to apply to all standards in that group (corestandards.org/assets/CCSSI_Math_Standards.pdf).

Grade 6	
Domain: Ratios and Proportional Relationships—6.RP	
Understand ratio concepts and use ratio reasoning to solve problems.	
3. Use ratio and rate reasoning to solve real-world and mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).	
a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	Lessons 3.5 and 4.6
b. Solve unit rate problems including those involving unit pricing and constant speed. <i>For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</i>	Lessons 1.1, 1.4, 1.5, 1.7, 2.4, 2.5, and 3.5
The Number System — 6.NS	
Apply and extend previous understandings of numbers to the system of rational numbers.	
6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	
b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.	Lesson 2.1
c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	Lesson 2.1
8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	Lesson 2.1
Expressions and Equations — 6.EE	
Reason about and solve one-variable equations and inequalities.	
5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	Lessons 4.1, 4.2, 4.5, and 4.6

Grade 6	
6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	Lessons 4.1 and 4.5
7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.	Lessons 4.4 and 4.5
Represent and analyze quantitative relationships between dependent and independent variables.	
9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. <i>For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.</i>	Lessons 1.1, 1.2, 1.3, 1.4, 1.A, 4.2, 4.3, 4.5, and 4.6

Grade 7	
Ratios and Proportional Relationships — 7.RP	
Analyze proportional relationships and use them to solve real-world and mathematical problems.	
2. Recognize and represent proportional relationships between quantities.	
a. Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).	Lessons 1.7, 1.8, 1.9, 1.10, 2.5, and 4.6
b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.	Lessons 1.7, 1.8, 1.9, 1.10, 4.6, and 4.7
c. Represent proportional relationships by equations. <i>For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.</i>	Lessons 1.8, 1.9, 1.10, and 4.6
d. Explain what a point (x,y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0,0)$ and $(1,r)$ where r is the unit rate.	Lessons 2.5, 3.6, 3.A, and 4.6
Expressions and Equations — 7.EE	
Solve real-life and mathematical problems using numerical and algebraic expressions and equations.	
4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.	
a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where $p, q,$ and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. <i>For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</i>	Lessons 4.4, and 4.6, and 4.7

Grade 8	
Expressions and Equations — 8.EE	
Understand the connections between proportional relationships, lines, and linear equations.	
5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i>	Lessons 1.10, 1.11, 3.5, and 4.6
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.	Lessons 1.10 and 1.11
c. Solve real-world and mathematical problems leading to two linear equations in two variables. <i>For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</i>	Lessons 2.8 and 2.9
Functions — 8.F	
Define, evaluate, and compare functions.	
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. ¹ Note: Function notation is not required in Grade 8.	All Lessons
2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</i>	Lessons 3.1 and 3.6
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. <i>For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.</i>	Lessons 1.B, 2.4, 2.6, 4.5, 4.7, 4.8, and 4.9
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.	Lessons 1.1, 1.2, 1.3, 1.C, 2.3, 2.7, 3.2, 4.3, 4.4, 4.5, and 4.7
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.	Lessons 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.B, 2.3, 2.8, 2.9, 3.6, 4.3, 4.4, 4.5, 4.7, 4.8, and 4.9

Algebra	
Creating Equations — A-CED	
Create equations that describe numbers or relationships.	
1. Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i>	Lessons 4.2, 4.6, 4.7, 4.8, and 4.9
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Lessons: 2.9, 4.5, 4.6, 4.7, 4.8, and 4.9
Reasoning with Equations and Inequalities — A-REI	
Solve equations and inequalities in one variable.	
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Lessons 4.2 and 4.4
Represent and solve equations and inequalities graphically.	
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).	Lessons 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.3, 3.4, 3.7, 4.8, and 4.9

Functions	
Interpreting Functions — F-IF	
Understand the concept of a function and use function notation.	
1. Understand that a function from one set (called the <i>domain</i>) to another set (called the <i>range</i>) 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 $y = f(x)$.	All Lessons
Interpret functions that arise in applications in terms of the context.	
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. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★	Lessons 1.3, 1.4, 1.5, 1.6, 1.7, 1.10, 2.2, 2.4, 3.8, 4.5, 4.8, and 4.9
Analyze functions using different representations.	
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.	Lessons 2.9, 2.11, 2.12, 3.7, 4.5, 4.8 and 4.9
Building Functions — F-BF	
Build a function that models a relationship between two quantities	
1. Write a function that describes a relationship between two quantities. ★ b. Combine standard function types using arithmetic operations. <i>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.</i>	Lessons 1.3, 1.5, and 2.10