# GRADE 8

## The Number System

**Know that there are numbers that are not rational, and approximate them by rational numbers** — **Supporting**

### 8.NS.1

**Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.**

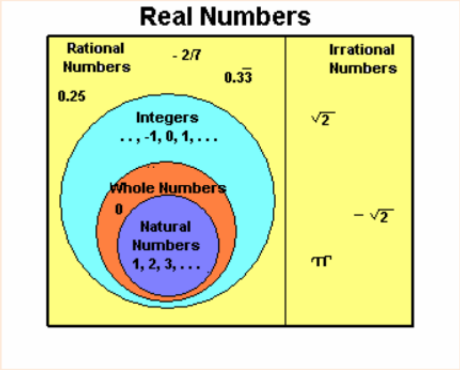
### Desired Student Performance

#### A student should know

- Real numbers is the set of rational numbers together with the set of irrational numbers.
- A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.
- An irrational number is a number that cannot be expressed as the ratio *a/b*, where *a* and *b* are integers and *b ≠ 0.*
- The decimal form of a fraction is called a repeating or terminating decimal.
- A repeating decimal is the decimal form of a rational number. Repeating decimals can be represented using bar notation where a bar is drawn only over the digit(s) that repeat. For example, 0.333333…. = $0.\overline{3}$
- A decimal is called terminating if its repeating digit is 0. For example, $0.25\overline{0}$ is typically written 0.25.

#### A student should understand

- Real numbers are either rational or irrational.
- That the set of real numbers can be represented with a Venn diagram.



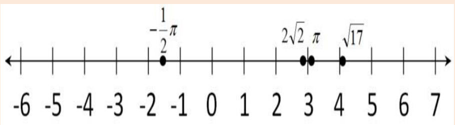

#### A student should be able to do

- Write a fraction or mixed number as a repeating decimal by showing, filling in, or otherwise producing the steps of long division.
- Write a repeating decimal as a fraction or mixed number in simplest form.
- Name all sets of numbers to which a given real number belongs.
- Convert a repeating decimal into a rational number.

# GRADE 8

## The Number System

**Know that there are numbers that are not rational, and approximate them by rational numbers** | **Supporting**

| Standard | Desired Student Performance: A student should know | A student should understand | A student should be able to do |
|---|---|---|---|
| **8.NS.2**<br>**Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., $\pi^2$).** ***For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*** | • The square root of a number is one of its two equal factors. If $a^2 = b$, then $a = \pm\sqrt{b}$<br>• A perfect square is a rational number whose square root is a whole number. *For example, 36 is a perfect square because its square root is 6.*<br>• The cube root of a number is one of three equal factors of a number. If $a^3 = b$, then $a = \sqrt[3]{b}$.<br>• Real numbers is the set of rational numbers together with the set of irrational numbers.<br>• A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.<br>• An irrational number is a number that cannot be expressed as the ratio *a/b*, where *a* and *b* are integers and $b \neq 0$.<br>• The decimal form of a fraction is called a repeating or terminating decimal. | • Every positive number has both a positive and negative square root. In real-world situations, only the positive or principal square root is considered.<br>• How to compare and order rational and irrational numbers.<br>• The value of a square root can be approximated between integers.<br>• The square root of a non-perfect square is irrational.<br>• Square roots may be negative and written as $-\sqrt{24}$.<br>• How to plot irrational numbers on a number line.<br><br> | • Find the square and cube roots of numbers.<br>• Estimate square roots and cube roots to the nearest integer using perfect squares and perfect cubes.<br>• Estimate square roots and cube roots to an appropriate approximation by truncating, or dropping, the digits after the first decimal place, then after the second decimal place and so on.<br>• Compare and order rational and irrational numbers using a number line.<br>• Use the estimated value of an irrational number to evaluate an expression. |

# GRADE 8

## Expressions and Equations

| Work with radicals and integer exponents | | | Major |
|---|---|---|---|
| **8.EE.1** **Know and apply the properties of integer exponents to generate equivalent numerical expressions.** *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A power is a product of repeated factors using an exponent and a base.<br>• The base in a power is the number that is the common factor.<br>• The exponent in a power is the number of times the base is used as a factor.<br>• A monomial is a number, a variable, or a product of a number and one or more variables.<br>• To multiply powers with the same base, add their exponents. (Product of Powers) $a^m \times a^n = a^{m+n}$<br>• To divide powers with the same base, subtract their exponents. (Quotient of Powers) $\frac{a^m}{a^n} = a^{m-n}$<br>• To find the power of a power, multiply the exponents. (Power of a Power) $(a^m)^n = a^{m \times n}$<br>• To find the power of a product, find the power of each factor and multiply. (Power of a Product) $(ab)^m = a^m b^m$<br>• Any nonzero number to the zero power is 1. $x^0 = 1$, $x \neq 0$<br>• Any nonzero number to the negative n power is the multiplicative inverse of its nth power. $x^{-n} = \frac{1}{x^n}$, $x \neq 0$ | • All operations involving the properties of addition and the distributive property of multiplication over addition can be used to simplify expressions.<br>• Variables can be used to represent quantities in a real-world or mathematical problem.<br>• Expressions are powerful tools for exploring, reasoning about, and representing situations.<br>• Two or more expressions may be equivalent even when their symbolic forms differ. | • Write an expression using exponents.<br>• Evaluate an expression containing exponents.<br>• Simplify expressions involving one, two, or three properties using the Laws of Exponents.<br>• Write an expression using a positive exponent.<br>• Write a fraction as an expression using a negative exponent other than -1.<br>• Multiply and divide with negative exponents.<br>• Classify expressions by their equivalence to a given expression. |

# GRADE 8

## Expressions and Equations

| Work with radicals and integer exponents | | | Major |
|---|---|---|---|
| **8.EE.2**<br>**Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • The radical sign is the symbol $\sqrt{\ }$ placed before a number or quantity to indicate the extraction of a root, which will be the square root. The value of a higher root is indicated by a raised digit in front of the symbol, as in $\sqrt[3]{\ }$, $\sqrt[4]{\ }$, …., $\sqrt[n]{\ }$, where n is an integer.<br>• The square root of a number is one of its two equal factors. If $a^2 = b$, then $a = \pm\sqrt{b}$<br>• A perfect square is a rational number whose square root is a whole number. *For example, 36 is a perfect square because its square root is 6.*<br>• The cube root of a number is one of three equal factors of a number. If $a^3 = b$, then $a = \sqrt[3]{b}$.<br>• A perfect cube is a rational number whose cube root is a whole number. *For example, 64 is a perfect cube because its cube root is 4.*<br>• A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.<br>• An irrational number is a number that cannot be expressed as the ratio *a/b*, where *a* and *b* are integers and *b ≠ 0.* | • How to recognize perfect squares.<br>• How to recognize perfect cubes.<br>• That non-perfect squares and non-perfect cubes are irrational numbers.<br>• Squaring a number and taking the square root ($\sqrt{\ }$) of a number are inverse operations.<br>• Cubing a number and taking the cube root ($\sqrt[3]{\ }$) of a number are inverse operations.<br>• When solving $x^2 = 36$, there are two solutions, $\pm 6$ since 6 x 6 = 36 and -6 x -6 = 36. | • Find square roots of numbers.<br>• Find cube roots of numbers.<br>• Estimate square roots and cube roots to the nearest integer.<br>• Order and compare real numbers.<br>• Find the distance between two points using the distance formula.<br>• Find parts of a right triangle using the Pythagorean Theorem.<br>• Find the edge length of a cubical object with a given volume. |

# GRADE 8

## Expressions and Equations

| Work with radicals and integer exponents | | | Major |
|---|---|---|---|
| **8.EE.3** **Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other**. *For example, estimate the population of the United States as 3 times $10^8$ and the population of the world as 7 times $10^9$, and determine that the world population is more than 20 times larger.* | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Scientific notation is when you express a number as product of two factors. The first factor must be greater than or equal to one but less than ten and the second factor is a power of ten. $a \times 10^n$, *where* $1 \le a < 10$ *and n is an integer*<br>• How to write a number in scientific notation from standard form.<br>• How to write a number in standard form from scientific notation.<br>• Exponential and standard forms of powers of 10. For example, 0.1 is $10^{-1}$. | • Scientific notation is used to express very large or very small numbers.<br>• When looking at a number in scientific notation, if the exponent increases by one, the value increases 10 times.<br>• When looking at a number in scientific notation, if the exponent decreases by one, the value decreases 10 times. | • Compare and interpret scientific notation quantities in the context of the situation.<br>• Evaluate expressions involving addition, subtraction, multiplication, or division and express the answer in scientific notation. |

# GRADE 8

## Expressions and Equations

| Work with radicals and integer exponents | | | Major |
|---|---|---|---|
| **8.EE.4** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Scientific notation is when you express a number as product of two factors. The first factor must be greater than or equal to one but less than ten and the second factor is a power of ten. $a \times 10^n$, *where* $1 \leq a < 10$ *and n is an integer*<br>• How to write a number in scientific notation from standard form.<br>• How to write a number in standard form from scientific notation.<br>• Exponential and standard forms of powers of 10. For example, 0.1 is $10^{-1}$.<br>• How to convert a number from standard form to scientific notation with and without the use of technology. | • Scientific notation is used to express very large or very small numbers.<br>• How to compare and interpret scientific notation quantities in the context of the situation with or without a scientific calculator.<br>• When looking at a number in scientific notation, if the exponent increases by one, the value increases 10 times.<br>• When looking at a number in scientific notation, if the exponent decreases by one, the value decreases 10 times.<br>• How to read a number that is written in scientific notation using technology. For example, 3.7E-2 is $3.7 \times 10^{-2}$. | • Perform operations with numbers expressed in both decimal and scientific notation and express the answer in scientific notation without a scientific calculator.<br>• Compare and order numbers expressed as decimals and scientific notation without a calculator.<br>• Choose a meaningful unit of measure in the context of the situation with and without a scientific calculator.<br>• Interpret scientific notation that has been generated by a scientific calculator. |

# GRADE 8

## Expressions and Equations

| Understand the connections between proportional relationships, lines, and linear equations | | | Major |
|---|---|---|---|
| **8.EE.5**<br>**Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.** *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Students build on their work with ratios, unit rates, and proportional relationships from $6^{th}$ and $7^{th}$ grade.<br>• A rate is a ratio that compares two quantities with different kinds of units.<br>• A unit rate is a rate that has a denominator of 1 unit.<br>• A proportional relationship exists when the rate is constant.<br>• Constant rate of change is when the rate of change between any two points is the same.<br>• Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.<br>• Constant of proportionality (unit rate) is the constant ratio in a proportional linear relationship. | • A linear relationship has a constant rate of change and a straight line graph.<br>• Slope is the rate of change between any two points on a line. The ratio of the rise, or vertical change, to the run, or horizontal change.<br>• The rise is the vertical change between any two points on a line.<br>• The run is the horizontal change between any two points on a line.<br>• Slope = $\frac{rise}{run}$<br>• A linear relationship is a direct variation when the ratio of *y* to *x* is a constant, *m*. We say *y* varies directly with *x*.<br>$m = \frac{y}{x}$ $or$ $y = mx$, where m is the constant of variation and m $\neq$ 0<br>• In a direct variation equation *y = mx, m* represents the constant of variation, the constant of proportionality, the slope, and the unit rate. | • Graph real-world proportional relationships such as earnings per hour.<br>• Determine whether the relationship between two quantities is linear.<br>• Find the constant rate of change in a linear relationship.<br>• Compare proportional relationship between two different quantities represented in different forms.<br>• Find the slope of a line using a table, graph, equation, diagram, and verbal description.<br>• Find the slope of a line that passes through two given points.<br>• Given an equation of a proportional relationship, students can graph the relationship and recognize that the unit rate is the coefficient of x. |

# GRADE 8

## Expressions and Equations

| Understand the connections between proportional relationships, lines, and linear equations | | | Major |
|---|---|---|---|
| **8.EE.6**<br>**Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation *y = mx + b* for a line intercepting the vertical axis at *b*.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Similar triangles have the same shape.<br>• The ratio of the rise to the run of two slope triangles formed by a line is equal to the slope of the line.<br>• The slope m of a line passing through points ($x_1$, $y_1$) and ($x_2$, $y_2$) is the ratio of the difference in the y-coordinates to the corresponding difference in the x-coordinates.<br>$m = \frac{y_2 - y_1}{x_2 - x_2}$, where $x_2 \neq x_1$ | • Since the ratios of the rise to the run of two similar triangles are the same as the slope of the line, the slope *m* of a line is the same between any two distinct points on a non-vertical line in the coordinate plane.<br>• The ratio of the vertical leg to the horizontal leg of given similar slope triangles formed by a line is equivalent to the absolute value of the slope of the line.<br>• How to use the slope formula, point *(x,y)* and the origin *(0,0)* to derive the equation *y = mx*.<br>• How to use the slope formula, point *(x,y),* and point *(0,b)* to derive *y = mx + b* | • Graph two triangles given the vertices of both and determine if they are similar.<br>• Graph a pair of similar triangles, write a proportion comparing the rise to the run for each of the similar slope triangles, and find the numeric value.<br>• Given the hypotenuse of a right triangle in a coordinate plane, choose two pair of points and record the rise, run, and slope relative to each pair and verify that they are the same. |

# GRADE 8

## Expressions and Equations

| Analyze and solve linear equations and pairs of simultaneous linear equations | | | Major |
|---|---|---|---|
| **8.EE.7a**<br>**Solve linear equations in one variable.**<br>**a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x* = *a*, *a* = *a*, or *a* = *b* results (where *a* and *b* are different numbers).** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • The product of a number and its multiplicative inverse is 1. $\frac{a}{b} \times \frac{b}{a} = 1$, where a and b $\neq 0$<br>• The coefficient is the numerical factor of a term that contains a variable.<br>• An equation is a sentence stating that two quantities are equal.<br>• The solution of an equation is the value of a variable that makes the equation true.<br>• Addition property of equality.<br>• Subtraction property of equality<br>• Multiplication property of equality.<br>• Division property of equality.<br>• A two-step equation contains two operations.<br>• How to solve simple one-step equations. | • How to find the multiplicative inverse of a number.<br>• To solve an equation in which the coefficient is not 1, you must multiply or divide each side by the coefficient of the variable. *For example, in the equation -3x = 12, you must divide both sides by -3. A common error in problems of this type is for students to divide both sides by 3.*<br>• Some equations have variables on each side of the equals sign. To solve, use the properties of equality to write an equivalent equation with the variables on one side of the equals sign and then solve the equation.<br>• Some equations have no solution. When this occurs, the solution is the null set or empty set and is shown by the symbol ∅ or { }. After solving the equation the solution will look like a = b, where a and b are different numbers.<br>• Other equations may have every number as their solution. An equation that is true for every value of the variable is called an identity. After solving the equation the solution will look like a = a. | • Solve an equation using the multiplicative inverse.<br>• Solve an equation using the addition, subtraction, multiplication, or division properties of equality to justify the steps to the solution.<br>• Solve multi-step equations in which coefficients and constants may be any rational number.<br>• Translate a word phrase or real-world problem into an equation.<br>• Solve equations with variables on both sides of the equals sign.<br>• Determine if an equation has no solution.<br>• Determine if an equation is an identity with infinitely many solutions.<br>• Create equations that have one solution, infinitely many solutions, or no solution.<br>• Classify equations by number of solutions. |

# GRADE 8

## Expressions and Equations

| Analyze and solve linear equations and pairs of simultaneous linear equations | | | Major |
|---|---|---|---|
| | Desired Student Performance | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| **8.EE.7b**<br>**Solve linear equations in one variable.**<br>**b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.** | • The product of a number and its multiplicative inverse is 1. $\frac{a}{b} \times \frac{b}{a} = 1$, where a and b $\neq 0$<br>• The coefficient is the numerical factor of a term that contains a variable.<br>• An equation is a sentence stating that two quantities are equal.<br>• The solution of an equation is the value of a variable that makes the equation true.<br>• Addition property of equality.<br>• Subtraction property of equality<br>• Multiplication property of equality.<br>• Division property of equality.<br>• A two-step equation contains two operations.<br>• How to solve simple one-step equations. | • How to find the multiplicative inverse of a number.<br>• To solve an equation in which the coefficient is not 1, you must multiply or divide each side by the coefficient of the variable. *For example, in the equation -3x = 12, you must divide both sides by -3. A common error in problems of this type is for students to divide both sides by 3.*<br>• Some equations have variables on each side of the equals sign. To solve, use the properties of equality to write an equivalent equation with the variables on one side of the equals sign and then solve the equation.<br>• How to use the Distributive Property. For example, 3(x+2) is equivalent to 3x+6.<br>• How to combine like terms. For example, 2r+r+5r = 8r. | • Solve an equation using the multiplicative inverse.<br>• Solve an equation using the addition, subtraction, multiplication, or division properties of equality to justify the steps to the solution.<br>• Solve multi-step equations in which coefficients and constants may be any rational number.<br>• Create equivalent expressions by combining like terms and using the Distributive Property.<br>• Translate a word phrase or real-world problem into an equation.<br>• Solve equations with variables on both sides of the equals sign.<br>• Solve equations containing grouping symbols.<br>• Determine if an equation has no solution.<br>• Determine if an equation is an identity with infinitely many solutions. |

# GRADE 8

## Expressions and Equations

| Analyze and solve linear equations and pairs of simultaneous linear equations | | | Major |
|---|---|---|---|
| **8.EE.8a**<br>**Analyze and solve pairs of simultaneous linear equations.**<br>**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.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A line represents the infinite number of solutions to a linear equation with two variables.<br>• Linear equations graph a straight line.<br>• Solutions of an equation are the values of the variables that make the equation true.<br>• A system of linear equations is two or more linear equations that represent constraints on the variables used.<br>• The point of intersection is the point where two lines intersect.<br>• Reason abstractly and quantitatively. | • The points *(x, y)* on a nonvertical line are the solutions of the equation $y = mx + b$.<br>• The relationship between equivalent forms of linear equations.<br>• Three solutions to systems of two linear equations: one solution, no solution, and infinitely many solutions.<br>• When there is no solution, the lines are parallel, the slopes are the same, and the y-intercepts are different.<br>• When there are an infinite number of solutions, the lines are the same and both the slopes and y-intercepts are the same.<br>• When there is only one solution, the lines intersect and both the slopes and y-intercepts are different. | • Graph lines in a plane.<br>• Use graphs and tables and relate them to equations.<br>• Interpret a point as an ordered pair *(x, y)*.<br>• Identify the point of intersection of two lines as the solution to the system.<br>• Verify by computation that a point of intersection is a solution to each equation in the system.<br>• Determine the number of solutions using the slope and y-intercepts.<br>• Write a second equation to create a specified solution.<br>• Work without use of a scientific calculator. |

# GRADE 8

## Expressions and Equations

| Analyze and solve linear equations and pairs of simultaneous linear equations | | | Major |
|---|---|---|---|
| **8.EE.8b**<br>**Analyze and solve pairs of simultaneous linear equations.**<br>**b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.** *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.* | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A system of linear equations is two or more linear equations that represent constraints on the variables used.<br>• Solutions of an equation are the values of the variables that make the equation true.<br>• Expressions in different forms can be equivalent.<br>• Coordinates are ordered pairs of numbers used to locate a point on a coordinate grid.<br>• Solve linear equations with one variable.<br>• Look for and make use of structure. | • Pairs of lines in a plane intersect, are parallel, or are the same line.<br>• The relationship between linear equations in two variables and lines in a plane.<br>• The relationship between equivalent forms of linear equations.<br>• Three solutions to systems of two linear equations: one solution, no solution, and infinitely many solutions.<br>• Point-slope form: $y - y_1 = m(x - x_1)$<br>• Standard form: $Ax+By = C$<br>• Slope-intercept form: $y = mx + b$.<br>• Substitution is an algebraic model that can be used to find the exact solution of a system of equations. | • Decide whether two quantities are in a proportional relationship and identify the constant of proportionality.<br>• Use algebraic and mathematical reasoning.<br>• Solve pairs of simultaneous linear equations using various methods such as substitution.<br>• Use properties of equality.<br>• Use technology to graph two linear equations to estimate the solution of the system.<br>• Perform operations with a zero coefficient, and with non-zero rational coefficients. |

# GRADE 8

## Expressions and Equations

| Analyze and solve linear equations and pairs of simultaneous linear equations | | | Major |
|---|---|---|---|
| **8.EE.8c** | **Desired Student Performance** | | |
| **Analyze and solve pairs of simultaneous linear equations.**<br>**c. Solve real-world and mathematical problems leading to two linear equations in two variables.**<br>*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.* | **A student should know**<br>• A line represents the infinite number of solutions to a linear equation with two variables.<br>• The x-intercept is the point where the graph crosses the x-axis.<br>• The y-intercept is the point where the graph crosses the y-axis.<br>• Coordinates are ordered pairs of numbers used to locate a point on a coordinate grid.<br>• The slope is the ratio of the vertical change to the horizontal change between any two points on a line.<br>• The slope formula: $m = (y_2 - y_1) / (x_2 - x_1)$<br>• Look for and make use of structure. | **A student should understand**<br>• Algebraic expressions and equations are used to model real-world problems and represent quantitative relationships.<br>• In the equation $y = mx + b$, $m$ is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0).<br>• The slope of a line is a constant rate of change.<br>• The relationship between the slope formula and point-slope form of a linear equation. | **A student should be able to do**<br>• Analyze the relationship between the dependent and independent variables.<br>• Use variables to represent two quantities in a real-world problem.<br>• Write an equation to express one quantity in terms of the other quantity.<br>• Represent proportional relationships by equations.<br>• Explain what a point on the graph of a proportional relationship means in terms of the situation.<br>• Interpret solutions in the context of the problem.<br>• Graph two linear equations on the coordinate grid and find their intersection point. |

# GRADE 8

## Functions

| Define, evaluate, and compare functions | | | Major |
|---|---|---|---|
| **8.F.1**<br>**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.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Input is the number or piece of data that is put into a function.<br>• Output is the number or piece of data that is the result of an input of a function.<br>• A rule is a summary of a predictable relationship that tells how to find the value of a variable.<br>• This standard extends the understanding of constant rate.<br>• Reason abstractly and quantitatively.<br>• The parts of the coordinate plane. | • Functions are useful in making sense of patterns and making predictions.<br>• Functions describe situations where one quantity determines another.<br>• A function represents a relationship between an input and an output where the output depends on the input; therefore, there can be only one output for each input.<br>• How to graph ordered pairs.<br>• How to name ordered pairs from a graph. | • Determine functions from non-numerical data.<br>• Graph inputs and outputs as ordered pairs in the coordinate plane.<br>• Graph functions in the coordinate plane.<br>• Read inputs and outputs from the graph of a function in the coordinate plane.<br>• Tell whether a set of points in the plane represent a function.<br>• Work without the use of a scientific calculator. |

# GRADE 8

## Functions

| Define, evaluate, and compare functions | | | Major |
|---|---|---|---|
| **8.F.2** **Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions.)** *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.* | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Rate of change is the amount of change in the dependent variable produced by a given change in the independent variable.<br>• A function is a rule that assigns to each input exactly one output.<br>• A linear function is a function whose graph is a line.<br>• The y-intercept is the point where the graph crosses the y-axis.<br>• Reason abstractly and quantitatively. | • The slope (m) of a line is a constant rate of change.<br>• Functions can be represented in a table, as a rule, as a formula or equation, as a graph, or as a verbal description.<br>• Functions describe situations where one quantity determines another.<br>• How to determine the rate of change (slope) from an equation, a graph, a table, and a verbal description.<br>• How to find the y-intercept. | • Translate among representations and partial representations of functions.<br>• Determine the properties of a function from a verbal description, table, graph, or algebraic form.<br>• Make comparisons between the properties of two functions represented differently.<br>• Work with a scientific calculator. |

# GRADE 8

## Functions

| Define, evaluate, and compare functions | | | Major |
|---|---|---|---|
| **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.** *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.* | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A linear function graphs a straight line.<br>• In the equation *y* = *mx* + *b*, *m* is the slope of the line and *b* is the y-intercept of the line.<br>• Functions that are not linear will not graph straight lines.<br>• Interpretation means to communicate symbolically, numerically, abstractly, and/or with a model.<br>• Look for and make use of structure. | • Functions are described in terms of their inputs and outputs.<br>• Linear functions may not always be in the form *y = mx + b.*<br>• The slope and y-intercept in relation to the function represented by the equation *y* = *mx* + *b*.<br>• Constant rates and proportional relationships can be described by a function.<br>• Non-linear functions do not have a constant rate of change.<br>• A function machine may use *y* as an input and *x* as an output or vice versa. | • Identify the rate of change between input and output values.<br>• Provide examples of relationships that are non-linear functions.<br>• Create a table of values that can be defined as a non-linear function.<br>• Analyze rates of change to determine linear and non-linear functions.<br>• Determine rate of change from equations in forms other than the slope-intercept form. |

# GRADE 8

## Functions

| Use functions to model relationships between quantities | | | Major |
|---|---|---|---|
| **8.F.4**<br>**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.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • The equation $y = mx + b$ defines a linear function whose graph is a line.<br>• Rate of change is the amount of change in the dependent variable produced by a given change in the independent variable.<br>• The y-intercept is the point where the graph crosses the y-axis.<br>• The initial value of a linear function is the value of the *y*-variable when the *x* value is zero.<br>• Reason abstractly and quantitatively.<br>• Model with mathematics. | • Functions describe situations where one quantity determines another.<br>• Functions are useful in solving problems involving quantitative relationships.<br>• In the linear equation $y = mx + b$, the slope *m* represents the rate of change and the y-intercept *b* represents the initial value.<br>• Linear functions can have discrete rates and continuous rates. | • Use variables to represent quantities in a real-world or mathematical problem.<br>• Analyze a variety of function representations such as verbal description, table, two (x,y) values, graph, and equation.<br>• Write a linear function modeling a situation.<br>• Find the initial value of the function in relation to the situation.<br>• Find the rate of change in relation to the situation.<br>• Find the y-intercept in relation to the situation.<br>• Explain constraints on the domain in relation to the situation. |

# GRADE 8

## Functions

| Use functions to model relationships between quantities | | | Major |
|---|---|---|---|
| **8.F.5**<br>**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.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Qualitative graphs are graphs used to represent situations that may not have numerical values or graphs in which numerical values are not included.<br>• A positive rate of change indicates that a linear function is increasing.<br>• A negative rate of change indicates that a linear function is decreasing.<br>• A linear function graphs a straight line.<br>• A non-linear function does not graph a straight line.<br>• Reason abstractly and quantitatively.<br>• Look for and make use of structure. | • Functions describe situations where one quantity determines another.<br>• The slope of a line can provide useful information about the functional relationship between the two types of quantities.<br>• The graph of a function can be used to help describe the relationship between two quantities.<br>• The information represented on the axes of the graph.<br>• How to interpret the y-axis. | • Match the graph of a function to a given situation. For example, the speed of a school bus on its route to school.<br>• Create a graph of a function that describes the relationship between two variables.<br>• Write a verbal description of the functional relationship between two variables depicted on a graph. |

# GRADE 8

## Geometry

| Understand congruence and similarity using physical models, transparencies, or geometry software | | | Major |
|---|---|---|---|
| **8.G.1a**<br>**Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A transformation is a geometric operation that relates each point of a figure to an image point.<br>• Symmetry transformations produce images that are identical in size and shape to the original figure.<br>• Verify means to demonstrate something is true, accurate or justified.<br>• Look for and express regularity in repeated reasoning. | • Ideas about how distance behaves under transformations are used to describe and analyze two-dimensional figures.<br>• Translations do not change the orientation.<br>• Reflections reverse the orientation.<br>• Rotations change the orientation.<br>• Geometric attributes of lines provide descriptive information about an object's properties and position in space.<br>• Reflections, rotations, and translations are symmetry transformations. | • Identify lines and line segments in two-dimensional figures.<br>• Measure and compare lengths of a figure and its image.<br>• Verify that after a figure has been translated, reflected, or rotated, corresponding lines and line segments remain the same length.<br>• Determine the change in orientation to isolate the transformations used. |

# GRADE 8

## Geometry

| Understand congruence and similarity using physical models, transparencies, or geometry software | | | Major |
|---|---|---|---|
| **8.G.1b**<br>**Verify experimentally the properties of rotations, reflections, and translations:**<br>**b. Angles are taken to angles of the same measure.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A transformation is a geometric operation that relates each point of a figure to an image point.<br>• Symmetry transformations produce images that are identical in size and shape to the original figure.<br>• Verify means to demonstrate something is true, accurate or justified.<br>• An angle is a figure formed by two rays or line segments that have a common vertex.<br>• Look for and express regularity in repeated reasoning. | • Ideas about how angles behave under transformations are used to describe and analyze two-dimensional figures.<br>• Geometric attributes of angles provide descriptive information about an object's properties and position in space.<br>• Reflections, rotations, and translations are symmetry transformations. | • Identify angles in two-dimensional figures.<br>• Measure and compare angle measures of a figure and its image.<br>• Verify that after a figure has been translated, reflected, or rotated, corresponding angles have the same measure. |

# GRADE 8

## Geometry

| Understand congruence and similarity using physical models, transparencies, or geometry software | | | Major |
|---|---|---|---|
| **8.G.1c**<br>**Verify experimentally the properties of rotations, reflections, and translations:**<br>**c. Parallel lines are taken to parallel lines.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A transformation is a geometric operation that relates each point of a figure to an image point.<br>• Symmetry transformations produce images that are identical in size and shape to the original figure.<br>• Verify means to demonstrate something is true, accurate or justified.<br>• Parallel lines are lines in a plane that never meet.<br>• Look for and express regularity in repeated reasoning. | • Ideas about how distance behaves under transformations are used to describe and analyze two-dimensional figures.<br>• Geometric attributes of lines provide descriptive information about an object's properties and position in space.<br>• Reflections, rotations, and translations are symmetry transformations. | • Identify parallel lines in two-dimensional figures.<br>• Measure and compare parallelism of a figure and its image.<br>• Verify that after a figure has been translated, reflected, or rotated, corresponding parallel lines remain parallel. |

# GRADE 8

## Geometry

| Understand congruence and similarity using physical models, transparencies, or geometry software | | | Major |
|---|---|---|---|
| **8.G.2**<br>**Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A transformation is a geometric operation that relates each point of a figure to an image point.<br>• A rigid motion is a sequence of one or more rotations, reflections, and/or translations.<br>• Understand means to know how something works or happens.<br>• How to identify corresponding sides and angles from congruency statement and/or figures.<br>• Look for and make use of structure. | • Transformations can be used to prove that two figures are congruent.<br>• Geometric attributes of figures provide descriptive information about an object's position in space.<br>• The connection between congruence and transformations.<br>• Ideas about congruence can be used to describe and analyze two-dimensional figures and to solve problems.<br>• Two plane figures are congruent if one can be obtained from the other by rigid motion.<br>• Matching tick marks and arcs may be used to show congruency of sides and angles. | • Perform a series of transformations to prove or disprove that two given figures are congruent.<br>• Describe a sequence of transformations that exhibit congruence of two figures. |

# GRADE 8

## Geometry

<table>
<tr><td colspan="3">Understand congruence and similarity using physical models, transparencies, or geometry software</td><td>Major</td></tr>
<tr><td rowspan="2">8.G.3<br>Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.</td><td colspan="3">Desired Student Performance</td></tr>
<tr><td>A student should know<br><ul><li>A transformation is a geometric operation that relates each point of a figure to an image point.</li><li>Symmetry transformations produce images that are identical in size and shape to the original figure.</li><li>Dilations move each point along the ray through the point emanating from a fixed center and multiply distances from the center by a common scale factor.</li><li>A similarity transformation is a rigid motion followed by a dilation.</li><li>Coordinates are ordered pairs of numbers used to locate points on a coordinate grid.</li><li>Reason abstractly and quantitatively.</li></ul></td><td>A student should understand<br><ul><li>The relationship between x- and y- coordinates and the x- and y- axes.</li><li>In a dilation, each coordinate of the original image is multiplied by the scale factor.</li><li>In a translation, the x and y coordinates of the original image changes by the value of the horizontal and vertical changes.</li><li>In a rotation, each point of the original figure and its new image are the same distance from the center of rotation.</li><li>In a reflection, each point of the original image and its new image are the same distance from the line of reflection.</li></ul></td><td>A student should be able to do<br><ul><li>Name an ordered pair as the coordinates of a point in a coordinate plane.</li><li>Graph coordinates in a coordinate plane.</li><li>Describe the changes occurring to coordinates of a figure after transformations and dilations.</li><li>Determine the new coordinates of an image given the original coordinates and a series of transformations and/or dilations to be applied.</li></ul></td></tr>
</table>

| GRADE 8 | | | |
|---|---|---|---|
| **Geometry** | | | |
| **Understand congruence and similarity using physical models, transparencies, or geometry software** | | | **Major** |
| **8.G.4**<br>**Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • A transformation is a geometric operation that relates each point of a figure to an image point.<br>• A rigid motion is a sequence of one or more rotations, reflections, and/or translations.<br>• Understand means to know how something works or happens.<br>• Two polygons are similar when their corresponding angles are congruent and the measures of their corresponding sides are proportional.<br>• Dilations move each point along the ray through the point emanating from a fixed center and multiply distances from the center by a common scale factor.<br>• A similarity transformation is a rigid motion followed by a dilation.<br>• Look for and make use of structure. | • Transformations and dilations can be used to prove that two figures are similar.<br>• Geometric attributes of figures provide descriptive information about an object's position in space.<br>• Dilations create similar figures.<br>• Ideas about similarity can be used to describe and analyze two-dimensional figures and to solve problems.<br>• Similarity transformation is a rigid motion followed by a dilation. | • Perform a series of transformations and dilations to prove or disprove that two given figures are similar.<br>• Describe a sequence of transformations and dilations that exhibit similarity of two figures. |

# GRADE 8

## Geometry

| Understand congruence and similarity using physical models, transparencies, or geometry software | | | Major |
|---|---|---|---|
| **8.G.5**<br>**Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.** *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.* | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • An exterior angle is an angle at a vertex of a polygon where the sides of the angle are one side of the polygon and the extension of the other side meeting at the vertex.<br>• An interior angle is the angle inside a polygon formed by two adjacent sides of the polygon.<br>• Parallel lines are lines in a plane that never meet.<br>• A transversal is a line that intersects two or more lines. | • The angle-angle criterion for similarity of triangles states that two triangles with two pairs of equal angles are similar.<br>• The sum of any triangle's interior angles will have the same measure as a straight angle.<br>• The measure of an exterior angle of a triangle is equal to the sum of the measures of its two remote interior angles.<br>• The relationships and measurements of the angles created when two parallel lines are cut by a transversal. | • Construct triangles from three measures of angles.<br>• Construct viable arguments.<br>• Make conjectures regarding relationships and measurements of the angles created when two parallel lines are cut by a transversal.<br>• Apply proven relationships to establish properties to justify similarity.<br>• Show that the sum of the angles in a triangle is the angle formed by a straight line. |

# GRADE 8

## Geometry

| Understand and apply the Pythagorean Theorem | | | Major |
|---|---|---|---|
| **8.G.6** Explain a proof of the Pythagorean Theorem and its converse. | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Legs are the sides of a right triangle that are adjacent to the right angle.<br>• The hypotenuse is the side of a right triangle that is opposite the right angle.<br>• The hypotenuse is the longest side of a right triangle.<br>• The Pythagorean Theorem states that if *a* and *b* are the lengths of the legs of a right triangle and *c* is the length of the hypotenuse, then $a^2 + b^2 = c^2$.<br>• The converse of the Pythagorean Theorem states that if side lengths of a triangle *a*, *b*, *c* satisfy $a^2 + b^2 = c^2$, then the triangle is a right triangle. | • Visual models can be used to demonstrate the relationship of the three side lengths of any right triangle.<br>• The converse of the Pythagorean Theorem can be used to determine if a given triangle is a right triangle.<br>• There are various proofs of the Pythagorean Theorem.<br>• The Pythagorean Theorem and its converse can be used to solve problems. | • Use algebraic reasoning to relate a visual model to the Pythagorean Theorem.<br>• Explain why the Pythagorean Theorem holds. |

<table>
<tr><td colspan="4">GRADE 8</td></tr>
<tr><td colspan="4">Geometry</td></tr>
<tr><td colspan="3">Understand and apply the Pythagorean Theorem</td><td>Major</td></tr>
<tr><td rowspan="2">8.G.7<br>Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.</td><td colspan="3">Desired Student Performance</td></tr>
<tr><td>A student should know<br>• Legs are the sides of a right triangle that are adjacent to the right angle.<br>• The hypotenuse is the side of a right triangle that is opposite the right angle.<br>• The hypotenuse is the longest side of a right triangle.<br>• Irrational numbers cannot be written as a quotient of two integers where the denominator is not 0.<br>• Decompose polygons into triangles.<br>• The Pythagorean Theorem states that if a and b are the lengths of the legs of a right triangle and c is the length of the hypotenuse, then $a^2 + b^2 = c^2$.</td><td>A student should understand<br>• The Pythagorean Theorem relates to work in irrational numbers.<br>• The Pythagorean Theorem is useful in practical problems.</td><td>A student should be able to do<br>• Apply the Pythagorean Theorem to find an unknown side length of a right triangle.<br>• Use the Pythagorean Theorem in a diagram to solve real-world problems involving right triangles.<br>• Find right triangles in a three-dimensional figure.<br>• Use the Pythagorean Theorem to calculate various dimensions of right triangles found in a three-dimensional figure.<br>• Provide answers as whole numbers and irrational numbers approximated to three decimal places with the use of a calculator.</td></tr>
</table>

| GRADE 8 | | | |
|---|---|---|---|
| **Geometry** | | | |
| **Understand and apply the Pythagorean Theorem** | | | **Major** |
| **8.G.8**<br>**Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Legs are the sides of a right triangle that are adjacent to the right angle.<br>• The hypotenuse is the side of a right triangle that is opposite the right angle.<br>• The Pythagorean Theorem states that if *a* and *b* are the lengths of the legs of a right triangle and *c* is the length of the hypotenuse, then $a^2 + b^2 = c^2$. | • Geometric attributes of figures provide descriptive information that support visualization.<br>• Applying the Pythagorean Theorem to find the distance between two points is related to finding lengths and analyzing polygons. | • Connect any two points on a coordinate grid to a third point so that the three points form a right triangle.<br>• Use a right triangle built from two original points connecting a third point in a coordinate grid and the Pythagorean Theorem to find the distance between the two original points. |

| GRADE 8 | | | |
|---|---|---|---|
| **Geometry** | | | |
| **Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres** | | | **Additional** |
| **8.G.9**<br>**Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.** | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Volume is the capacity of a three-dimensional shape.<br>• Recognize three-dimensional shapes cone, cylinder, and sphere.<br>• The formulas used to find the volumes of cones, cylinders, and spheres.<br>• This is the culminating standard of acquiring a well-developed set of geometric measurement skills. | • The volume is the number of unit cubes that will fit into a three-dimensional figure.<br>• The similarity between finding the volume of a cylinder and the volume of a right prism.<br>• The relationship between the volume of a cylinder and the volume of a cone with the same base.<br>• The relationship between the volume of a sphere and the volume of a circumscribed cylinder. | • Use the formulas to find the volume of cylinders, cones, and spheres.<br>• Solve real-world problems involving the volume of cylinders, cones, and spheres. |

# GRADE 8

## Statistics and Probability

| Investigate patterns of association in bivariate data | | | Supporting |
|---|---|---|---|
| **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. | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Scatter plot is a graph in the coordinate plane representing a set of bivariate data.<br>• Bivariate data are pairs of linked numerical observations.<br>• A positive linear association is one that would be modeled using a line with a positive slope.<br>• A negative linear association is one that would be modeled using a line with a negative slope.<br>• A cluster is a group of numerical data values that are close to one another.<br>• An outlier is a value that does not seem to fit the general pattern in a scatter plot. | • A pattern in a scatter plot suggests that there may be a relationship between the two variables used to construct the scatter plot.<br>• A scatter plot may show a linear association, a nonlinear association, or no association.<br>• The variable not changed by other variables or the independent variable is represented on the horizontal axis.<br>• The variable to be predicted by the independent variable or the dependent variable is represented on the vertical axis. | • Plot ordered pairs on a coordinate grid representing the relationship between two data sets.<br>• Describe patterns in the context of the measurement data.<br>• Interpret patterns of association in the context of the data sample. |

| GRADE 8 | | | |
|---|---|---|---|
| **Statistics and Probability** | | | |
| **Investigate patterns of association in bivariate data** | | | **Supporting** |
| **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. | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Scatter plot is a graph in the coordinate plane representing a set of bivariate data.<br>• A line can be used to represent the trend in a scatter plot.<br>• Linear association is when the data on a scatter plot show an upward or downward trend.<br>• Whether or not data plotted on a scatter plot have a linear association. | • A good line for prediction is one that goes through the middle of the points in a scatter plot for which the points tend to fall close to the line.<br>• A trend line on a scatter plot shows the association more clearly.<br>• A line of best fit is the most accurate trend line on a scatter plot showing the relationship between two sets of data. | • Draw a straight trend line to approximate the linear relationship between the plotted points of two data sets.<br>• Make inferences regarding the reliability of the trend line by noting the closeness of the data points to the line. |

# GRADE 8

## Statistics and Probability

| Investigate patterns of association in bivariate data | | | Supporting |
|---|---|---|---|
| **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.** *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.* | **Desired Student Performance** | | |
| | **A student should know** | **A student should understand** | **A student should be able to do** |
| | • Bivariate data are pairs of linked numerical observations.<br>• The y-intercept is the point where the graph crosses the y-axis.<br>• Slope of a line is a constant rate of change between the two variables.<br>• The initial value of a linear function is the value of the *y*-variable when the *x* value is zero.<br>• Model with mathematics.<br>• Reason abstractly and quantitatively. | • A trend line on a scatter plot shows the association more clearly.<br>• A line of best fit is the most accurate trend line on a scatter plot showing the relationship between two sets of data.<br>• The equation of the trend line can be used to summarize the given data and make predictions regarding additional data points.<br>• The slope and y-intercept in relation to the function represented by the equation $y = mx + b$. | • Determine the equation of the trend line that approximates the linear relationship between the plotted points of two data sets.<br>• Use a linear equation to describe the association between two quantities in bivariate data.<br>• Interpret the slope of the equation in the context of the collected data.<br>• Interpret the y-intercept of the equation in the context of the collected data. |

<table>
<tr><td colspan="4">GRADE 8</td></tr>
<tr><td colspan="4">Statistics and Probability</td></tr>
<tr><td colspan="3">Investigate patterns of association in bivariate data</td><td>Supporting</td></tr>
<tr><td rowspan="2"><u>8.SP.4</u><br>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. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home.<br>Is there evidence that those who have a curfew also tend to have chores?</td><td colspan="3">Desired Student Performance</td></tr>
<tr><td>A student should know<br>• Categorical data are non-numerical data sets.<br>• Bivariate data are pairs of linked numerical observations.<br>• A two-way table organizes data about two categorical variables into rows and columns.<br>• Frequency is the number of times a given data value occurs in a data set.<br>• Relative frequency is the ratio of the number of desired results to the total number of trials.</td><td>A student should understand<br>• Rules of probability can lead to more valid and reliable predictions about the likelihood of an event occurring.<br>• Categorical data can have patterns of association.<br>• Venn diagrams can also be used to display data from a two-way table.</td><td>A student should be able to do<br>• Create a two-way table to record the frequencies of bivariate categorical values.<br>• Compute marginal sums or marginal percentages.<br>• Determine the relative frequencies for rows and/or columns of a two-way table.<br>• Use the relative frequencies and context of the problem to describe possible associations between the two sets of data.</td></tr>
</table>