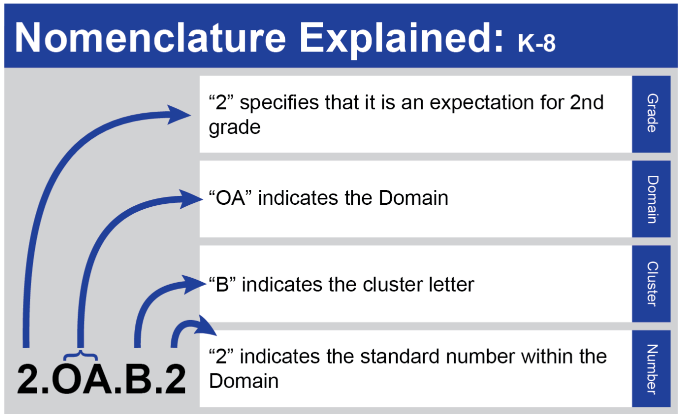
Arkansas Mathematics Standards
Grade 8
2022

Introduction to the Grades K-8 Arkansas Mathematics Standards

When the Division of Elementary and Secondary Education (DESE) began the process of revising math standards, a diverse group of qualified educators from across the state came together to craft Arkansas standards specific to the schools and students in the state. The result of this work, the Arkansas Mathematics Standards, is contained in this document. These standards reflect what educators across the state know to be best for Arkansas students.

Standards Organization: The revision committee maintained the organizational structure and nomenclature of the previous standards. K-8 Arkansas Mathematics Standards are categorized into domains, clusters, and standards.

- **Domains** represent the big ideas to be studied at each grade level and sometimes across grade bands. These big ideas support educators in determining the proper amount of focus and instructional time to be given to each of these topics.
- **Clusters** represent collections of standards grouped to help educators understand the building blocks of rich and meaningful instructional units. These units help students make connections within clusters and avoid seeing mathematics as a discrete list of skills they must master.
- **Standards** represent the foundational building blocks of math instruction. The standards outlined in this document work together to ensure that students are college and career ready and on track for success.



Standards Support: The revision of the Arkansas Mathematics Standards represent the work of the committee to provide greater clarity, strength, and support of the standards. Additionally, the revised mathematics standards are designed to help educators better understand the areas of emphasis and the focus within the standards. Educators should address the bulleted content as more than a checklist of items that they must teach individually. Content is bulleted to provide specificity of learning expectations included within some extensive standards. In some instances, the standard document includes Arkansas examples, teacher notes, specifications, and italicized words to assist educators with planning, teaching, and student learning.

- **Examples** included in the original standards were either changed for clarity or separated from the body of the actual standard. The examples included in the body of the standards document in no way reflect all of the possible examples. Likewise, these examples do not mandate curriculum or problem types. Local districts are free to select the high-quality curricula and instructional methods that best meet the needs of their students.
- **Teacher notes** offer clarification of the standards. These notes are intended to clarify, for teachers, what the expectations are for the learner. Likewise, these notes provide instructional guidance and limitations so that educators can better understand the scope of the standard. This will help with determining what is developmentally appropriate for students when working with specific standards.
- **Standard specifications** are to strengthen standards. The specifications are precise statements highlighting the need for mastery or function-type parameters for specific standards. This will assist educators in pinpointing the best opportunities for students to gain and master the knowledge and skills needed to succeed in a progression.
- **Italicized words** are defined in the glossary.

Finally, the Arkansas Mathematics Standards will be a living document. As these standards are implemented across schools in the state, DESE welcomes further suggestions related to notes of clarification, examples, professional development needs, and future revisions of the standards.

K - 12 Standards for Mathematical Practices	
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.	5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Eighth Grade Standards: Overview

Abbreviations: The following abbreviations are for the domains for the Arkansas Academic Mathematics Standards.

The Number System – NS
- Know that there are numbers that are not rational, and approximate them by rational numbers

Expressions and Equations – EE
- Work with radicals and integer exponents
- Understand the connections between proportional relationships, lines, and linear equations
- Analyze and solve linear equations, inequalities, and pairs of simultaneous linear equations

Functions – F
- Define, evaluate, and compare functions
- Use functions to model relationships between quantities

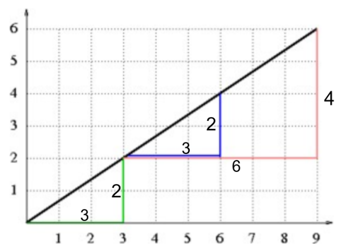
Geometry - G
- Understand congruence and similarity using physical models, transparencies, or geometry software
- Understand and apply the Pythagorean Theorem
- Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres

Statistics and Probability - SP
- Investigate patterns of association in bivariate data

The Number System	
Cluster A: Know that there are numbers that are not rational, and approximate them by rational numbers.	
AR.Math.Content.8.NS.A.1	Know that numbers that are not *rational* are called *irrational*. ● Understand that every number has a decimal expansion. Teacher Note: Understand informally that every number has a decimal expansion. For r*ational numbers,* show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a *rational number*. Examples: ● $2 = 2.0000$ ● Write a fraction $\frac{a}{b}$ as a *repeating decimal.* ● Write a *repeating decimal* as a fraction.
AR.Math.Content.8.NS.A.2	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., Π^2).

Expressions and Equations	
Cluster A: Work with radicals and integer exponents.	
AR.Math.Content.8.EE.A.1	Know and apply the properties of *integer exponents* to generate *equivalent* numerical *expressions* using *product, quotient*, power to a power, or *expanded form.* Teacher Notes: ● Eighth grade is the first time students raise negative numbers to a power. Students should be able to recognize that negative numbers raised to an even power produce different *products* when parentheses are used. ● Students are not expected to know the names of the properties of *exponents.* Example: $-4^2$and $(-4)^2$ have *products* of -16 and 16 respectively.
AR.Math.Content.8.EE.A.2	Use *square root* and cube root symbols to represent *solutions* to *equations*. ● Use *square root* symbols to represent *solutions* to *equations* of the form $x^2 = p$, $x = \pm \sqrt{p}$, where *p* is a positive *rational number.* ● Use cube root symbols to represent *solutions* to *equations* of the form $x^3 = p$, $x = \sqrt[3]{p}$ where *p* is a r*ational number.* ● Evaluate *square roots* of perfect squares of positive numbers less than or equal to 400 and cube roots of perfect *cubes* for positive numbers less than or equal to 1000.

AR.Math.Content.8.EE.A.3	Use *scientific notation* 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. Teacher Note: Example: Estimate the population of the United States as 3×10^8 and the world's population as 7×10^9, and determine that the world population is more than 20 times larger.
AR.Math.Content.8.EE.A.4	Work with *scientific notation* and integer properties *to*: ● Perform operations with numbers expressed in *scientific notation*, including problems where both standard form 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.
Cluster B: Understand the connections between proportional relationships, lines, and linear equations.	
AR.Math.Content.8.EE.B.5	Demonstrate understanding of proportional relationships. ● *Graph* proportional relationships, interpreting the *unit rate* as the *slope* of the graph. ● Compare two different proportional relationships represented in different ways (e.g., graphs, tables, e*quations,* verbal descriptions). Teacher Note: Seventh-grade standards refer to the *unit rate* or *slope* as the *Constant of Proportionality* because everything in that grade goes through the origin. Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

AR.Math.Content.8.EE.B.6	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 $y = mx + b$ or a line intercepting the vertical axis at b. Teacher Note: $y = mx + b$ is a translation of $y = mx$. Example:  $\frac{4}{6}=\frac{2}{3}$ $m=\frac{2}{3}$ $y=\frac{2}{3}x$
Cluster C: Analyze and solve linear equations, linear inequalities, and pairs of simultaneous linear equations.	
AR.Math.Content.8.EE.C.7	Solve *linear equations* and *inequalities* in one *variable.* ● Give examples of *linear equations* in one *variable* with one *solution*, infinitely many solutions, or no solution. Show which of these possibilities is the case by successively transforming the given e*quation* 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). ● Solve *linear equations* and *inequalities* with *rational number coefficients*, including *equations* whose *solutions* require expanding *expressions* using the *distributive property* and collecting *like terms.* ● *Graph* the solution set of an *equation* or *inequality* on a *number line.* Teacher Note: Students should solve *equations* and *inequalities* with *variables* on both sides.

AR.Math.Content.8.EE.C.8	Analyze and solve pairs of simultaneous *linear equations* (systems of *linear equations)*. ● 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. ● Solve systems of two *linear equations* in two *variables* algebraically and estimate *solutions* by graphing the *equations*. Solve simple cases by inspection. (Refer to the first example.) ● Solve real-world and mathematical problems leading to two *linear equations* in two *variables.* (Refer to the second example.) Teacher Note: Examples: ● $3x + 2y = 5$ and $3x + 2y = 6$ have no *solution* because $3x + 2y$ cannot simultaneously be 5 and 6. ● Given *coordinates* for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Functions	
Cluster A: Define, evaluate, and compare functions.	
AR.Math.Content.8.F.A.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. Teacher Note: An informal discussion of *function notation* is needed. Introduce *domain* and *range* vocabulary to input and output at this time. However, student assessment is not required.
AR.Math.Content.8.F.A.2	Compare properties (e.g., *y-intercept*/initial value, *slope/rate of change*) of two *functions* each represented in a different way (e.g., algebraically, graphically, numerically in tables, or by verbal descriptions).
AR.Math.Content.8.F.A.3	Identify the unique characteristics of *functions* (e.g., linear vs. nonlinear) by comparing their graphs, *equations*, and input/output tables.
Cluster B: Use functions to model relationships between quantities.	
AR.Math.Content.8.F.B.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 verbal description of a relationship. ○ two (*x, y*) values. ○ a table. ○ 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.

AR.Math.Content.8.F.B.5	Describe 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 features of a *function* that has been described verbally. Teacher Note: Functions are not restricted to linear functions.

Geometry	
Cluster A: Understand congruence and similarity using physical models, transparencies, or geometry software.	
AR.Math.Content.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations. ● Lines are taken to line, and line segments to line segments of the same length. ● Angles are taken to angles of the same measure. ● *Parallel lines* are taken to *parallel lines.* Teacher Note: Use tracing paper as one tool to verify experimentally.
AR.Math.Content.8.G.A.2	Understand that a 2D figure(s): ● Is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. ● Describes a sequence that exhibits the congruence between two given *congruent figures*.

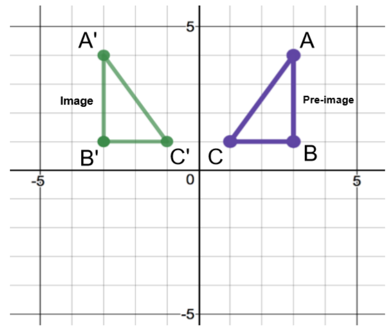
AR.Math.Content.8.G.A.3

Identify and describe the effect (rule or new *coordinates*) of a transformation (dilation, translation, rotation, and reflection), given a 2D figure on a *coordinate plane*.

- Image to pre-image
- Pre-image to image

Teacher Note:

Example:



Triangle ABC is reflected over the y-axis to create Triangle A'B'C'

Type of Transformation	Coordinate Change
Vertical Translation (↑)	$(x, y) \rightarrow (x, y + a)$
Vertical Translation (↓)	$(x, y) \rightarrow ($, $)$
Horizontal Translation (→)	$(x, y) \rightarrow ($, $)$
Horizontal Translation (←)	$(x, y) \rightarrow ($, $)$
Reflection over x-axis	$(x, y) \rightarrow ($, $)$
Reflection over y-axis	$(x, y) \rightarrow ($, $)$
Rotation 90° (clockwise)	$(x, y) \rightarrow ($, $)$
Rotation 90° (counter-clockwise)	$(x, y) \rightarrow ($, $)$
Rotation 180° (clockwise)	$(x, y) \rightarrow ($, $)$
Rotation 180° (counter-clockwise)	$(x, y) \rightarrow ($, $)$
Rotation 270° (clockwise)	$(x, y) \rightarrow ($, $)$
Rotation 270° (counter-clockwise)	$(x, y) \rightarrow ($, $)$
Dilation (Scale up)	$(x, y) \rightarrow ($, $)$
Dilation (Scale down)	$(x, y) \rightarrow ($, $)$

AR.Math.Content.8.G.A.4

Understand that a 2D figure(s):

- Is *similar* to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations.
- Describes a sequence that exhibits the similarity between them, given two *similar 2D* figures.

AR.Math.Content.8.G.A.5

Use informal arguments to establish facts about:

- The angle *sum* and exterior angle of triangles. (Refer to first example).
- The angles created when *parallel lines* are cut by a *transversal.* (Refer to second example)
- The angle-angle criterion for similarity of triangles.

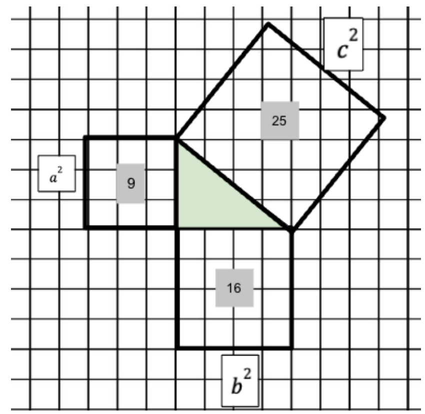
Teacher Note:

Examples:

- Arrange three copies of the same triangle so that the *sum* of the three angles appears to form a line.
- Give an argument in terms of translations about the angle relationships.

<table>
<tr><th colspan="2">Cluster B: Understand and apply the Pythagorean Theorem.</th></tr>
<tr><td>AR.Math.Content.8.G.B.6</td><td>Model or explain an informal proof of the Pythagorean Theorem and its converse.

Teacher Note: The converse of the Pythagorean Theorem says that if a triangle has sides of length a, b, and c and if $a^2 + b^2 = c^2$ then the angle opposite the side of length c is a right angle.


</td></tr>
<tr><td>AR.Math.Content.8.G.B.7</td><td>Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.</td></tr>
<tr><td>AR.Math.Content.8.G.B.8</td><td>Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.</td></tr>
<tr><th colspan="2">Cluster C: Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</th></tr>
<tr><td>AR.Math.Content.8.G.C.9</td><td>Develop and apply the formulas for the volumes and surface areas of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Teacher Note: This standard focuses on the volume formulas for 3D shapes related to circles (cones, cylinders, and spheres). Students have already worked with volume of cubes and rectangular prisms. They apply these same understandings beginning with cylinders.</td></tr>
</table>

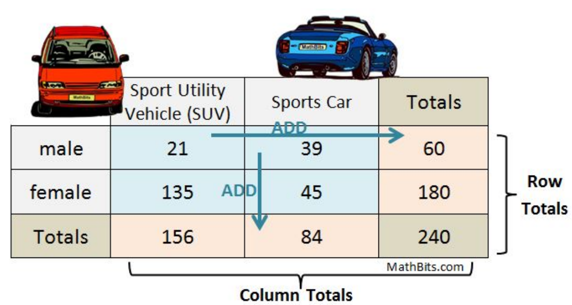
<table>
<tr><th colspan="2">Statistics and Probability</th></tr>
<tr><th colspan="2">Cluster A: Investigate patterns of association in bivariate data</th></tr>
<tr><td>AR.Math.Content.8.SP.A.1</td><td>Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.</td></tr>
<tr><td>AR.Math.Content.8.SP.A.2</td><td>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.

Teacher Note:

Example: Identify the correlations as weak, strong, or no.</td></tr>
<tr><td>AR.Math.Content.8.SP.A.3</td><td>Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercepts.</td></tr>
<tr><td>AR.Math.Content.8.SP.A.4</td><td>Demonstrate an understanding of two-way tables.

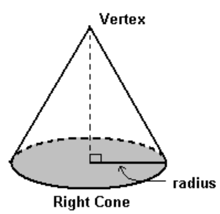
Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.
Construct and interpret a two-way table on two categorical variables collected from the same subjects.
Use relative frequencies calculated for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

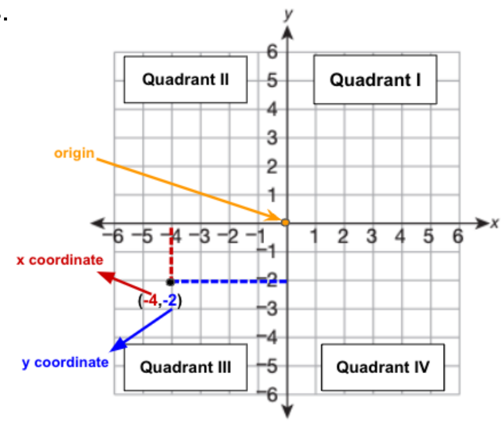
Teacher Note:

Example:


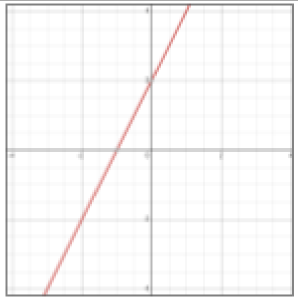
</td></tr>
</table>

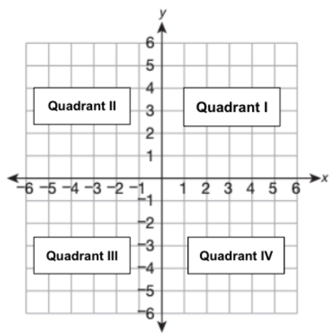
6-8 Glossary

Absolute Value	A number’s distance from 0 on the number line.
Additive Inverses	Two numbers whose sum is 0 are additive inverses of one another
Area	The measure of the size of the interior of a figure, expressed in square units
Associative Property	A property of real numbers that states that the sum or product of a set of numbers is the same, regardless of how the numbers are grouped. Example: (4 + 8) + 3 = 4 + (8 + 3) or $(4 \bullet 8) \bullet 3 = 4 \bullet (8 \bullet 3)$
Base-Ten Strategy	A strategy based on place value and properties of operations.
Bivariate Data	Data with two variables
Circle	A two-dimensional figure for which all points are the same distance from its center. A circle is identified by its center point.
Circumference	The perimeter of a circle, which is the distance around a circle
Cluster	A grouping within a set of data where the items are similar to or the same as each other.
Coefficient	A constant number or variable by which a variable is multiplied. Examples: $3x + 7$, 3 is the coefficient; $y = mx + b$, m is the coefficient
Commutative Property	A property of real numbers that states that the sum or product of two terms is unaffected by the order in which the terms are added; i.e., the sum remains the same. Example: $5 + 9 = 9 + 5$ or $5 \bullet 9 = 9 \bullet 5$
Complex Fraction	A fraction in which the numerator, denominator, or both are fractions themselves. For example: $\frac{\frac{1}{2}}{\frac{2}{3}}$ or $\frac{2}{\frac{3}{4}}$
Complementary Angles	Two angles (adjacent or nonadjacent) whose sum is 90 degrees.
Computational Fluency	To have efficient and accurate methods for computing. Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand, and can explain these methods as well as produce accurate answers efficiently.
Cone	A three-dimensional figure that has a circular base and one vertex. A cone has two faces, the circular base and the lateral face. 
Congruent Figures	Geometric figures that have the same size and the same shape. Congruent figures may have different orientations. Examples: Congruent angles have the same degree measure. Congruent line segments have the same length.
Constant of Proportionality	The value of the ratio of two proportional quantities, equivalent to unit rate.

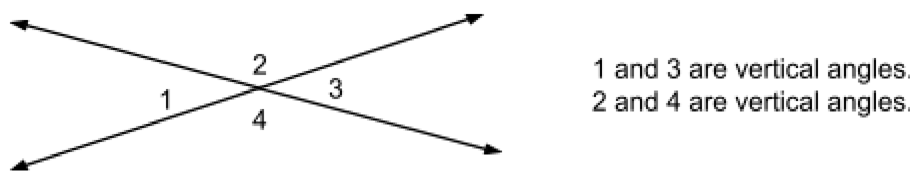
	Represented as k in the formula $k = \frac{y}{x}$
Constraint	A limiting condition.
Conversion Factor	A number used to change one set of units to another by multiplying or dividing.
Coordinate Plane	A plane divided by perpendicular number lines creating four quadrants. The perpendicular number lines represent the axes and where they intersect represents the origin (0,0). Points can be identified using coordinates (x,y) found within the quadrants. 
Coordinates	An ordered pair of numbers that identifies a point on a grid, coordinate plane, or map written as (x,y).
Correlation	The relationship between two variables.
Cube	A three-dimensional figure with exactly six congruent, square faces.
Cylinder	A three-dimensional figure with two circular bases that are parallel and congruent. It has three faces, the two circular bases and the lateral face.
Data	Information collected and used to analyze a specific concept or situation.
Dependent Variable	The output variable in a function; the variable whose value depends on the input or independent variable.
Distributive Property	When a single-term expression is being multiplied by a sum or difference, the single-term expression can be multiplied by each term before finding the sum or difference. Examples: $3(7 + 5) = 3 \bullet 7 + 3 \bullet 5$; $w(5 - 2) = 5w - 2w$
Domain	The set of input (x) values for a function.
Double Number Line Diagram	Two number lines used when quantities have different units to easily see there are numerous pairs of numbers in the same ratio.
Edge	The line segment where a base and a lateral face, a base and lateral surface(s), two lateral faces, or two lateral surfaces of a three-dimensional figure intersect.
Equation	A statement that has one number or expression equal to another number or expression, such as 8 + 3 = 11 or 2x- 3 = 7.
Equivalent	Equal in value.
Expanded Form (Exponents)	Expressing exponential expressions using multiplication without an exponent. Example: $x^5 = x \bullet x \bullet x \bullet x \bullet x$

Experimental Probability	The ratio of the number of times an event occurs to the total number of trials or times the activity is performed
Exponent	the power *p* in an expression of the form a^p used to show repeated multiplication
Expression	A mathematical phrase consisting of numbers, variables, and operations
Factor	1. One or more numbers (or variables) that are multiplied together to get a product (5 and 2 are both factors because 5 • 2 =10 2. To break down into the terms that multiply to make the quantity to be factored.
Function	A rule or relationship in which there is exactly one output value for each input value
Function notation	$f(x)$ is a way to represent a function, named f, where the input is represented by x and the output (y-value) is represented by $f(x)$. Example $f(x) = 3x$ is the same as $y = 3x$
Graph (verb)	To show or plot information on a coordinate plan.
Greatest Common Factor	The greatest factor that divides two numbers
Additive Identity Property of 0	The property that asserts the sum of an original addend plus zero is equal to the original addend. Example: $58 + 0 = 58$
Multiplicative Identity Property of 1	The property that asserts the product of an original factor times one is equal to the original factor. Example: $58 \bullet 1 = 58$
Independent Variable	A variable whose values don't depend on changes in other variables
Inequality	A numerical sentence containing one of the symbols: >,<,≥,≤ or ≠ to indicate the relationship between two quantities. Examples: $8 - 2 > 6 \div 3$; $7v \leq 49$; $5 \neq 2 + 2$
Inference (Statistical)	Deriving logical conclusions about a statistical population based on samples.
Integer	A number expressible in the form of *a* or – *a* for some whole number *a*
Interquartile Range	A measure of variation in a set of numerical data; the interquartile range is the distance between the first and third quartiles of the data set
Irrational Number	A number that cannot be expressed as a fraction $\frac{p}{q}$ for any integers *p* and *q*; have decimal expansions that neither terminate nor become periodic.
Least Common Multiple	The smallest number that is exactly divisible by each member of a set of numbers
Like Terms	Two or more terms within an expression or equation that contain the same variables with each of those variables raised to the same power, the numerical coefficients may be different.
Likely Events	A chance event with a probability between 0.5 and 1; the closer the probability is to being 1, the more likely the event is to occur.
Linear Equation	An algebraic equation in which the variables are of the first degree (raised only to the first power). The graph of such an equation is a straight line.

	 $y = 2x+2$
Linear Expression	An algebraic statement where each term is either a constant or a variable raised to the first power.
Mean	A measure of center in a set of numerical data, computed by adding the values in a slit then dividing by the number of values in the list
Mean Absolute Deviation	A measure of variation in a set of numerical data, computed by adding the distances between each data value and the mean, then dividing by the number of data values
Measure of Center	Statistical measures that are intended to provide numerical representations of the center of a set of numerical data, also called measure of central tendency.
Measure of Variability	Statistical measures that are intended to provide numerical representations of the variability of a set of numerical data.
Median	A measure of center in a set of numerical data; the median of a list of values is the value appearing at the center of a sorted version of the list – or the mean of the two central values, if the list contains an even number of values
Mode	A measure of center in a set of numerical data; the most common value in list of values
Net	Two-dimensional representation of a three-dimensional figure that can be folded up into the three-dimensional figure.
Number Line	A graph that represents the real numbers as ordered points on a line. A number line may be either horizontal (left and right) or vertical (up and down). Starting at zero, the positive numbers progress to the right (or up) and the negative numbers progress to the left (or down).
Order of Operations	A set of rules that define which procedures to perform first in order to evaluate a given expression
Ordered Pairs	A set of two numbers named in an order that matters; represented by (x,y) such that the first number, x, represents the x-coordinate and the second number, y, represents the y-coordinate when the ordered pair is graphed on the coordinate plane; each point on the coordinate plane has a unique ordered pair associated with it.
Outlier	An observation or data point that lies an unusual distance from other values in the data.
Parallel Lines	Two or more distinct lines in the same plane that never intersect, these lines are always equidistant. In the coordinate plane, non-vertical parallel lines have equal slopes.
Percent	A number expressed in relation to 100; represented by the symbol %.
Plot	To place a point(s) on a coordinate plane.
Polygons	A closed two-dimensional figure made up of straight sides.
Population	A group of people, objects, or events that fit a particular description; in statistics, the set from which a sample of data is selected.
Prime	A number greater than 1 with only two factors. The factors of a prime number are 1 and the number itself.

Prime Factorization	A method of writing a composite number as a product of its prime factors.
Prism	A three-dimensional (solid) figure that has two congruent and parallel faces that are polygons called bases. The remaining faces, called lateral faces, are parallelograms (often rectangles). Prisms are named by the shape of their bases.
Probability	A number between 0 and 1 used to quantify likelihood for processes that have uncertain outcomes (tossing a coin, selecting a person at random from a group of people, tossing a ball at a target, or testing for a medical condition)
Product	The resulting quantity when two or more factors are multiplied. (The answer to a multiplication problem.)
Pyramid	A three-dimensional figure whose base is a polygon and the lateral faces are triangles that share a common vertex.
Pythagorean Theorem	The mathematical relationship stating that in any right triangle the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the two legs. ($a^2+b^2=c^2$)
Quadrants	One of the four sections of a coordinate plane separated by horizontal and vertical axes; they are numbered I, II, III, and IV, counterclockwise from the upper right. 
Quadrilaterals	A polygon with four sides and four angles.
Quotient	The resulting quantity when one quantity (dividend) is divided by another quantity (divisor). The answer to a division problem.
Radius	A line segment with endpoints at the center of a circle and any point on the circle. The length of the radius is equal to one-half the length of the diameter.
Random Sampling	A sample obtained by a selection from a population, in which each element of the population has an equal chance of being selected.
Range	The set of output (y) values for a function.
Rate	A ratio that relates quantities of different units. Examples: miles per hour, price per pound, students per class, heartbeats per minute.
Rate of change/Slope	The ratio of the vertical change compared to the horizontal change between two points on a coordinate plane. Slope is often expressed as $\frac{rise}{run}$ or $\frac{change\ in\ y}{change\ in\ x}$.
Ratio	A comparison of two quantities, *r* and *s,* which can be written:

	• $\frac{r}{s}$, where *r* is the numerator and *s* is the denominator • *r* : *s* • *r* to *s*
Rational Number	A number that can be written as a ratio of two integers $\frac{a}{b}$, where $b \neq 0$.
Rectangular Prism	A three-dimensional figure whose six faces are rectangles.
Relative Frequency	The ratio of the observed frequency of some outcome to the total frequency of the random experiment.
Repeating Decimal	A decimal in which, after a certain point, one digit or a set of digits repeat themselves an infinite number of times. Repeating digits are designated with an ellipsis or a bar above them. Example: 0.3333... or $0.\overline{3}$
Right Rectangular Pyramid	A three-dimensional figure with a rectangle for a base and four triangular faces whose apex is aligned right above the center of the base.
Sample Space	The set of all possible outcomes for a probability experiment. Sample spaces can be displayed as diagrams, lists, and tables.
Scale Drawing	A drawing with dimensions at a specific ratio relative to the actual size of the object
Scatter Plot	A two-variable data display where points are plotted to show the relationship (correlation) between two variables.
Scientific Notation	A form of writing a number as the product of a power of 10 and a decimal number such that the absolute value of the decimal number is greater than or equal to one and less than ten.
Similar	Two figures are similar if and only if all corresponding angles are congruent and lengths of all corresponding sides are proportional
Simulation	A probability experiment that imitates a real-life activity to find the probability of an event.
Slope/rate of change	The ratio of the vertical change compared to the horizontal change between two points on a coordinate plane. Slope is often expressed as $\frac{rise}{run}$ or $\frac{change\ in\ y}{change\ in\ x}$.
Solution	Any value(s) that make an equation, inequality, or open sentence true.
Sphere	A three-dimensional figure that consists of a set of points in space that are equidistant from a fixed point called the center.
Square Root	The square root of a number is the factor that we can multiply by itself to get that number. The symbol for square root is $\sqrt{\ }$. Finding the square root of a number is the opposite of squaring a number. For example $\sqrt{25} = \pm\ 5$, since $5 \bullet 5 = 25$ and $-5 \bullet -5 = 25$.
Standard Algorithm	Denotes any valid base-ten strategy
Statistical Question	A question that anticipates variability in the data.
Substitution	Use of a numerical value to replace a variable.
Sum	The resulting quantity when two or more addends are combined. The answer to an addition problem.
Supplementary Angles	Two angles(adjacent or nonadjacent) for which the sum of their measures is 180°.
Surface Area	The sum of the areas of all the faces of a three-dimensional (solid) figure or object.
Tape Diagram	A rectangular model that looks like a segment of tape used to illustrate number relationships. Also known as a strip

	diagram, bar model, fraction strip, or length model.
Term	Terms are constants, variables, or the product or quotient of constant(s) and variable(s).
Theoretical Probability	The number of ways that the event can occur, divided by the total number of outcomes
Three-Dimensional (3D)	An object that has length, width, and height.
Tree Diagram	A diagram that shows the possible outcomes of an event by means of a connected, branching graph.
Transversal	A line that intersect two or more other coplanar lines
Triangular Prism	A three-dimensional figure made up of two triangular bases and three rectangular sides or faces.
Two-Dimensional (2D)	An object that has length and width.
Uniform Probability Model	A probability model which assigns equal probability to all outcomes.
Unit Rate	A comparison of two measurements in which one of the terms has a value of 1
Unlikely	A chance event with a probability between 0 and 0.5; the closer the probability is to being 0, the less likely the event is to occur.
Variable	A symbol used to represent an unknown or undetermined value in an expression or equation
Variation	Any change in some quantity due to change in another.
Vertical angles	Nonadjacent, nonoverlapping congruent angles formed by two intersecting lines; share a common vertex 
Vertices	A point where two or more line segments meet. Plural of vertex.
Volume	The amount of space contained in a three-dimensional figure; measured in cubic units.
X Coordinate	The first number in an ordered pair representing the point’s distance from the origin along the x-axis.
Y Coordinate	The second number in an ordered pair representing the point’s distance from the origin along the y-axis.
Y Intercept	A point where a graph of an equation intersects the y-axis

Appendix

Table 1: Properties of Operations

Associative property of addition	(a + b) + c = a + (b + c)
Commutative property of addition	a + b = b + a
Additive identity property of 0	a + 0 = 0 + a = a
Existence of additive inverses	For every a there exists –a so that *a* + *(-a)* = *(-a)* + a = *0*
Associative property of multiplication	(a • b) • c = a • (b • c)
Commutative property of multiplication	a • b = b • a
Multiplicative identity property 1	a • 1 = 1a = a
Existence of multiplication inverses	For every a ≠ 0 there exists 1/*a* so that a • 1/a = 1/a • a = 1
Distributive property of multiplication over addition	a • (b + c) = a • b + a • c

Table 2: Properties of Equality

Reflexive property of equality	a = a
Symmetric property of equality	If a = b, then b = a.
Transitive property of equality	If a = b and b = c, then a = c.
Addition property of equality	If a = b, then a + c = b + c.
Subtraction property of equality	If a = b, then a – c = b – c.
Multiplication property of equality	If a = b, then a • c = b • c.
Division property of equality	If a = b and c ≠ 0, then a ÷ c = b ÷ c.
Substitution property of equality	If a = b, then b may be substituted for a in any expression containing a.

Table 3: Properties of Inequality

Exactly one of the following is true: a < b, a = b, a > b.
If a > b and b > c, then a > c.
If a > b, b < a.
If a > b, then a ± c > b ± c.
If a > b and c > 0, then a • c > b • c.
If a > b and c < 0, then a • c < b • c.
If a > b and c > 0, then a ÷ c > b ÷ c.
If a > b and c < 0, then a ÷ c < b ÷ c.

Table 4: Inequalities

>	greater than
<	less than
=	equal
≈	approximately
≠	not equal to
≥	greater than or equal to
≤	less than or equal to
Used when graphing inequalities	
○	not included (Example: *x* > 7 or *x* < 4)
●	included (Example: *x* ≥ 5 or *x* ≤ 3)