GRADE 8
MATH STANDARDS

A. **Know that there are numbers that are not rational and approximate them by rational numbers.**
   - **8.NS.A.1.** Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers that are not rational are called Irrational.
   - **8.NS.A.2.** Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.

B. **Work with radicals and integer exponents.**
   - **8.EE.A.1**. Know and apply the properties of integer exponents to generate equivalent numerical expressions.
   - **8.EE.A.2.** Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Know square roots of perfect squares up to 225 and cube roots of perfect cubes up to 125. Know that the square root of a non-perfect square is irrational.
   - **8.EE.A.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.
   - **8.EE.A.4**. Perform multiplication and division with numbers expressed in scientific notation, including problems where both Standard decimal form and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by Technology.

C. **Understand the connections between proportional relationships, lines, and linear equations.**
   - **8.EE.B.5.** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different Proportional relationships represented in different ways.
   - **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 equations y=mx+b for a line intercepting the vertical axis at b.

D. **Analyze and solve linear equations and pairs of simultaneous linear equations.**
   - **8.EE.C.7** Solve linear equations in one variable.
     - **8.EE.C.7a**. Recognize when linear equations in one variable have one solution, infinitely many solutions, or no solutions. Give examples and show which of these possibilities the case is by successively transforming the given equation into simpler forms.
     - **8.EE.C.7b.** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms.
       - Note: This includes equations that contain variables on both sides of the equation.

- **8.EE.C.8 8.** Analyze and solve pairs of simultaneous linear equations.
    - **8.EE.C.8a** 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. Recognize when the system has one solution, no solution, or infinitely many solutions.
    - **8.EE.C.8b.** Solve systems of two linear equations in two variables with integer coefficients: graphically, numerically using a table, and algebraically. Solve simple cases by inspection.
        - Notes: Solving systems algebraically will be limited to at least one equation containing at least one variable whose coefficient is 1. Algebraic solution methods include elimination and substitution. This standard is a fluency expectation for grade 8.
    - **8.EE.C.8c** Solve real-world and mathematical problems involving systems of two linear equations in two variables with integer coefficients.
        - Note: Solving systems algebraically will be limited to at least one equation containing at least one variable whose coefficient is 1.

E. Define, evaluate, and compare functions.

- **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.
    - **Notes:** The use of function notation is not required at this level. The terms domain and range may be introduced at this level; however, these terms are formally introduced in Algebra I (F-IF.A.1).
- **8.F.A.2** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- **8.F.A.3** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line. Recognize examples of functions that are linear and nonlinear.

F. Use functions to model relationships between quantities.

- **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 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.
- **8.F.B.5** Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that Exhibits the qualitative features of a function that has been described in a real-world context.

G. Understand congruence and similarity using physical models, transparencies, or geometry software.

- **8.G.A.1** Verify experimentally the properties of rotations, reflections, and translations.
    - **Note:** As an extension, the fourth type of rigid motion, a glide reflection, may be introduced as well. Glide reflections connect to 8.G.A.2 and students' work with compositions (describing a sequence) of transformations. That standard allows for students to investigate compositions of transformations and the single transformation that is equivalent. A translation displaces every point in the plane by the same distance (in the same direction) and can be described using a vector. The definition of a rotation requires knowing the center (point) and the

measure/direction of the angle of rotation. The definition of a reflection requires a line and the knowledge of perpendicular bisectors.
    - **8.G.A.1a** Verify experimentally lines are mapped to lines, and line segments to line segments of the same length.
    - **8.G.A.1b** Verify experimentally angles are mapped to angles of the same measure.
    - **8.G.A.1c**. Verify experimentally parallel lines are mapped to parallel lines.
- **8.G.A.2.** Know that a two-dimensional figure is congruent to another if the corresponding angles are congruent and the corresponding sides are congruent. Equivalently, two two-dimensional figures are congruent if one is the image of the other after a sequence of rotations, reflections, and translations. Given two congruent figures, describe a sequence that maps the congruence between them on the coordinate plane.
    - **Note:** With the inclusion of the glide reflection (8.G.A.1), understand that the image can be obtained from the pre-image by exactly one rigid motion.
- **8.G.A.3.** Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.
    - Note: Lines of reflection include both axes and lines of the form y=k, and x=k, where k is a constant. Rotations by 90 and 180 degrees.
- **8.G.A.4.** Know that a two-dimensional figure is similar to another if the corresponding angles are congruent and the corresponding sides are in proportion. Equivalently, two two-dimensional figures are similar if one is the image of the other after a sequence of rotations, reflections, translations, and dilations. Given two similar two-dimensional figures, describe a sequence that maps the similarity between them on the coordinate plane.
    - **Note:** The center and scale factor of the dilation must be specified with dilation.
- **8.G.A.5**. 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.
    - **Note:** This standard does not include formal geometric proof. Multiple representations may be used to demonstrate understanding.

H. Understand and apply the Pythagorean Theorem.

- **8.G.B.6.** Understand a proof of the Pythagorean Theorem and its converse.
- **8.G.B.7.** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- **8.G.B.8** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

I. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

- **8.G.C.9.** Solve problems, mathematical and real world, which use the formulas for the volume of cones, cylinders, and spheres.

J. Investigate patterns of association in bivariate data.

- **8.SP.A.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.
- **8.SP.A.2.** Understand 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.

- **8.SP.A.3.** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.