Correlation: 2016 Alabama Course of Study, Mathematics standards and NAEP Objectives

When teaching Alabama Course of Study content, NAEP objectives and items are useful for identifying a level of rigor which matches proficient student performance nationwide. The NAEP objectives identify content that could be included in lessons building toward master of the correlating standards from the *2016 Alabama Course of Study: Mathematics*.

Grade	Grade 8 Alabama Course of Study Standard	NAEP Objective(s) Grade 4	NAEP Objective(s) Grade 8
8	**1. [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.		**8NPO1d** Write or rename rational numbers. **8NPO1e** Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts.
8	**2. [8.NS.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). 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.		
8	**3. [8.EE.1]** Know and apply the properties of integer exponents to generate equivalent numerical expressions. - Example: $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.		

8	**4. [8.EE.2]** 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 $\sqrt{2}$ is irrational.		**8NPO2a** Establish or apply benchmarks for rational numbers and common irrational numbers (e.g., π) in contexts. **8NPO2d** Estimate square or cube roots of numbers less than 1,000 between two whole numbers. **8A3c** Perform basic operations, using appropriate tools, on linear algebraic expressions (including grouping and order of multiple operations involving basic operations, exponents, roots, simplifying, and expanding).
8	**5. [8.EE.3]** Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. 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.		**8NPO1f** Express or interpret numbers using scientific notation from real-life contexts. **8A3c** Perform basic operations, using appropriate tools, on linear algebraic expressions (including grouping and order of multiple operations involving basic operations, exponents, roots, simplifying, and expanding).
8	**6. [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.		**8NPO1f** Express or interpret numbers using scientific notation from real-life contexts. **8NPO3a** Perform computations with rational numbers. **8A3c** Perform basic operations, using appropriate tools, on linear algebraic expressions (including grouping and order of multiple operations involving basic operations, exponents, roots, simplifying, and expanding).

8	**7. [8.EE.5]** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. - Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.		**8NPO4c** Use proportional reasoning to model and solve problems (including rates and scaling). **8A1f** Interpret the meaning of slope or intercepts in linear functions. **8A2f** Identify or represent functional relationships in meaningful contexts, including proportional, linear, and common nonlinear (e.g., compound interest, bacterial growth) in tables, graphs, words, or symbols. **8A4d** Interpret relationships between symbolic linear expressions and graphs of lines by identifying and computing slope and intercepts (e.g., know in y = ax + b, that a is the rate of change and b is the vertical intercept of the graph). **8A5a** Make, validate, and justify conclusions and generalizations about linear relationships.
8	**8. [8.EE.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 $y = mx + b$ for a line intercepting the vertical axis at b.		**8A4d** Interpret relationships between symbolic linear expressions and graphs of lines by identifying and computing slope and intercepts (e.g., know in y = ax + b, that a is the rate of change and b is the vertical intercept of the graph). **8A5a** Make, validate, and justify conclusions and generalizations about linear relationships.

8	**9. [8.EE.7]** Solve linear equations in one variable. 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). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions, using the distributive property and collecting like terms.		**8A4a** Solve linear equations or inequalities (e.g., ax + b = c or ax + b = cx + d or ax + b > c).
8	**10. [8.EE.8]** Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. Example: $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables. 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.		**8A4a** Solve linear equations or inequalities (e.g., ax + b = c or ax + b = cx + d or ax + b > c). **8A4c** Analyze situations or solve problems using linear equations and inequalities with rational coefficients symbolically or graphically (e.g., ax + b = c or ax + b = cx + d).

8	**11. [8.F.1]** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)		
8	**12. [8.F.2]** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). - 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.	**4A2a** Translate between the different forms of representations (symbolic, numerical, verbal, or pictorial) of whole-number relationships (such as from a written description to an equation or from a function table to a written description).	**8A1e** Identify functions as linear or nonlinear or contrast distinguishing properties of functions from tables, graphs, or equations. **8A2a** Translate between different representations of linear expressions using symbols, graphs, tables, diagrams, or written descriptions.
8	**13. [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. 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.		**8A1f** Interpret the meaning of slope or intercepts in linear functions. **8A2b** Analyze or interpret linear relationships expressed in symbols, graphs, tables, diagrams, or written descriptions.
8	**14. [8.F.4]** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.		**8A1c** Analyze or create patterns, sequences, or linear functions given a rule.

8	**15. [8.F.5]** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.		**8A2f** Identify or represent functional relationships in meaningful contexts, including proportional, linear, and common nonlinear (e.g., compound interest, bacterial growth) in tables, graphs, words, or symbols.
8	**16. [8.G.1]** Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments are taken to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.	**4G4a** Describe relative positions of points and lines using the geometric ideas of parallelism or perpendicularity.	**8G3c** Represent problem situations with simple geometric models to solve mathematical or real-world problems. **8G3g** Describe or analyze properties and relationships of parallel or intersecting lines.
8	**17. [8.G.2]** 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.	**4G2e** Match or draw congruent figures in a given collection.	**8G2e** Justify relationships of congruence and similarity, and apply these relationships using scaling and proportional reasoning. **8G3c** Represent problem situations with simple geometric models to solve mathematical or real-world problems. **8G3f** Describe or analyze simple properties of, or relationships between, triangles, quadrilaterals, and other polygonal plane figures.

8	**18. [8.G.3]** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	**4G2c** Identify the images resulting from flips (reflections), slides (translations), or turns (rotations).	**8G2c** Recognize or informally describe the effect of a transformation on two-dimensional geometric shapes (reflections across lines of symmetry, rotations, translations, magnifications, and contractions). **8G3c** Represent problem situations with simple geometric models to solve mathematical or real-world problems. **8G3f** Describe or analyze simple properties of, or relationships between, triangles, quadrilaterals, and other polygonal plane figures. **8G4d** Represent geometric figures using rectangular coordinates on a plane.
8	**19. [8.G.4]** 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.	**4G2c** Identify the images resulting from flips (reflections), slides (translations), or turns (rotations).	**8M3a** Solve problems involving indirect measurement, such as finding the height of a building by comparing its shadow with the height and shadow of a known object. **8G2e** Justify relationships of congruence and similarity, and apply these relationships using scaling and proportional reasoning. **8G2f** For similar figures, identify and use the relationships of conservation of angle and proportionality of side length and perimeter. **8G3c** Represent problem situations with simple geometric models to solve mathematical or real-world problems. **8G3f** Describe or analyze simple properties of, or relationships between, triangles, quadrilaterals, and other polygonal plane figures.

8	**20. [8.G.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. 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.		**8G3c** Represent problem situations with simple geometric models to solve mathematical or real-world problems.
8	**21. [8.G.6]** Explain a proof of the Pythagorean Theorem and its converse.		
8	**22. [8.G.7]** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.		**8G3d** Use the Pythagorean Theorem to solve problems.
8	**23. [8.G.8]** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.		**8G1a** Draw or describe a path of shortest length between points to solve problems in context. **8G3d** Use the Pythagorean Theorem to solve problems.
8	**24. [8.G.9]** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.		
8	**25. [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.		**8DASP1b** For a given set of data, complete a graph and then solve a problem using the data in the graph (histograms, line graphs, scatterplots, circle graphs, and bar graphs). **8DASP2c** Identify outliers and determine their effect on mean, median, mode, or range.

8	**26. [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.		**8DASP1b** For a given set of data, complete a graph and then solve a problem using the data in the graph (histograms, line graphs, scatterplots, circle graphs, and bar graphs). **8DASP2e** Visually choose the line that best fits given a scatterplot and informally explain the meaning of the line. Use the line to make predictions.
8	**27. [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. - 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.		8DASP1b For a given set of data, complete a graph and then solve a problem using the data in the graph (histograms, line graphs, scatterplots, circle graphs, and bar graphs).
8	**28. [8.SP.4]** Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. 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. Is there evidence that those who have a curfew also tend to have chores?		**8A1a** Recognize, describe, or extend numerical and geometric patterns using tables, graphs, words, or symbols. **8A1b** Generalize a pattern appearing in a numerical sequence, table, or graph using words or symbols.