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 6 Alabama Course of Study Standard	NAEP Objective(s) Grade 4	NAEP Objective(s) Grade 8
6	**1. [6.RP.1]** Understand the concept of a ratio, and use ratio language to describe a ratio relationship between two quantities. Examples: "The ratio of wings to beaks in the bird house at the zoo was 2:1 because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."	**4NPO4a** Use simple ratios to describe problem situations.	**8NPO3a** Perform computations with rational numbers. **8NPO4a** Use ratios to describe problem situations. **8NPO4b** Use fractions to represent and express ratios and proportions. **8NPO4d** Solve problems involving percentages (including percent increase and decrease, interest rates, tax, discount, tips, or part/whole relationships).
6	**2. [6.RP.2]** Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. Examples: "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." (Expectations for unit rates in this grade are limited to non-complex fractions.)		**8NPO3a** Perform computations with rational numbers. **8NPO4a** Use ratios to describe problem situations. **8NPO4b** Use fractions to represent and express ratios and proportions. **8NPO4d** Solve problems involving percentages (including percent increase and decrease, interest rates, tax, discount, tips, or part/whole relationships).

6	**3. [6.RP.3]** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Solve unit rate problems including those involving unit pricing and constant speed. Example: If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.		**8NPO3a** Perform computations with rational numbers. **8NPO4a** Use ratios to describe problem situations. **8NPO4b** Use fractions to represent and express ratios and proportions. **8NPO4d** Solve problems involving percentages (including percent increase and decrease, interest rates, tax, discount, tips, or part/whole relationships). **8M2b** Solve problems involving conversions within the same measurement system, such as conversions involving square inches and square feet. **8M2c** Estimate the measure of an object in one system given the measure of that object in another system and the approximate conversion factor. For example: • Distance conversion: 1 kilometer is approximately 5/8 of a mile. • Money conversion: U.S. dollars to Canadian dollars. • Temperature conversion: Fahrenheit to Celsius.

6	**4. [6.NS.1]** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. Example: Create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (*a*/*b*) ÷ (*c*/*d*) = *ad*/*bc*.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi? Compute fluently with multi-digit numbers and find common factors and multiples.		**8NPO1b** Model or describe rational numbers or numerical relationships using number lines and diagrams. **8NPO3d** Describe the effect of multiplying and dividing by numbers, including the effect of multiplying or dividing a rational number by: • Zero, or • A number less than zero, or • A number between zero and one, • One, or • A number greater than one. **8NPO6b** Provide a mathematical argument to explain operations with two or more fractions.
6	**5. [6.NS.2]** Fluently divide multi-digit numbers using the standard algorithm.		**8NPO3a** Perform computations with rational numbers.
6	**6. [6.NS.3]** Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.		**8NPO3a** Perform computations with rational numbers.
6	**7. [6.NS.4]** Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. - Example: Express 36 + 8 as 4 (9 + 2).		**8NPO5b** Recognize, find, or use factors, multiples, or prime factorization. **8NPO5e** Apply basic properties of operations.

6	**8. [6.NS.5]** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts explaining the meaning of 0 in each situation		**8NPO1d** Write or rename rational numbers. **8NPO1e** Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts. **8NPO1h** Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line). **8NPO5e** Apply basic properties of operations.
6	**9. [6.NS.6]** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.		**8NPO1d** Write or rename rational numbers. **8NPO1e** Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts. **8NPO1g** Find or model absolute value or apply to problem situations. **8NPO1h** Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line). **8NPO5e** Apply basic properties of operations. **8A2c** Graph or interpret points represented by ordered pairs of numbers on a rectangular coordinate system.

6	**10. [6.NS.7]** Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. Example: Interpret -3 > -7 as a statement that -3 is located to the right of -7 on a number line oriented from left to right. b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. Example: Write -3ºC > -7ºC to express the fact that -3ºC is warmer than -7ºC. c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. Example: For an account balance of -30 dollars, write |-30| = 30 to describe the size of the debt in dollars. d. Distinguish comparisons of absolute value from statements about order. Example: Recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.		**8NPO1d** Write or rename rational numbers. **8NPO1e** Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts. **8NPO1g** Find or model absolute value or apply to problem situations. **8NPO1h** Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line). **8NPO5e** Apply basic properties of operations.
6	**11. [6.NS.8]** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.		**8NPO1d** Write or rename rational numbers. **8NPO1e** Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts. **8NPO1h** Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line). **8A2d** Solve problems involving coordinate pairs on the rectangular coordinate system.
6	**12. [6.EE.1]** Write and evaluate numerical expressions involving whole-number exponents.		

6	**13. [6.EE.2]** Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. Example: Express the calculation, "Subtract *y* from 5," as 5 - *y*. b. Identify parts of an expression using mathematical terms (*sum, term, product, factor, quotient, coefficient*); view one or more parts of an expression as a single entity. Example: Describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms. c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). Example: Use the formulas $V = s^3$ and $A = 6\mathbf{s}^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.	**4A3a** Use letters and symbols to represent an unknown quantity in a simple mathematical expression. **4A3b** Express simple mathematical relationships using number sentences.	
6	**14. [6.EE.3]** Apply the properties of operations to generate equivalent expressions. Example: Apply the distributive property to the expression 3 (2 + *x*) to produce the equivalent expression 6 + 3*x*; apply the distributive property to the expression 24*x* + 18*y* to produce the equivalent expression 6 (4*x* + 3y); apply properties of operations to *y* + *y* + *y* to produce the equivalent expression 3*y*.		

6	**15. [6.EE.4]** Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). Example: The expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for. Reason about and solve one-variable equations and inequalities.		
6	**16. [6.EE.5]** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	**4NPO2c** Verify solutions or determine the reasonableness of results in meaningful contexts.	**8NPO2c** Verify solutions or determine the reasonableness of results in a variety of situations, including calculator and computer results. **8A4a** Solve linear equations or inequalities (e.g., ax + b = c or ax + b = cx + d or ax + b > c). **8A4b** Interpret "=" as an equivalence between two expressions and use this interpretation to solve problems. **8A5a** Make, validate, and justify conclusions and generalizations about linear relationships.
6	**17. [6.EE.6]** Use variables to represent numbers, and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.		**8A4a** Solve linear equations or inequalities (e.g., ax + b = c or ax + b = cx + d or ax + b > c). **8A4b** Interpret "=" as an equivalence between two expressions and use this interpretation to solve problems.
6	**18. [6.EE.7]** Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.		**8A4a** Solve linear equations or inequalities (e.g., ax + b = c or ax + b = cx + d or ax + b > c). **8A4b** Interpret "=" as an equivalence between two expressions and use this interpretation to solve problems. **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).
6	**19. [6.EE.8]** Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.		**8A4a** Solve linear equations or inequalities (e.g., ax + b = c or ax + b = cx + d or ax + b > c). **8A4b** Interpret "=" as an equivalence between two expressions and use this interpretation to solve problems. **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).

6	**20. [6.EE.9]** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. - Example: In a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.	**4A3a** Use letters and symbols to represent an unknown quantity in a simple mathematical expression.	**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). **8A4e** Use and evaluate common formulas (e.g., relationship between a circle's circumference and diameter [C=], distance, and time under constant speed).
6	**21. [6.G.1]** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.		**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). **8M1f** Solve mathematical or real-world problems involving perimeter or area of plane figures, such as triangles, rectangles, circles, or composite figures. **8G2d** Predict results of combining, subdividing, and changing shapes of plane figures and solids (e.g., paper folding, tiling, cutting up, and rearranging pieces). **8G3b** Apply geometric properties and relationships in solving simple problems in two and three dimensions. **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.

6	**22. [6.G.2]** Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.		**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). **8A4e** Use and evaluate common formulas (e.g., relationship between a circle's circumference and diameter [C=], distance, and time under constant speed). **8M1h** Solve problems involving volume or surface area of rectangular solids, cylinders, prisms, or composite shapes. **8M1i** Solve problems involving rates such as speed or population density. **8G3b** Apply geometric properties and relationships in solving simple problems in two and three dimensions. **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.
6	**23. [6.G.3]** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	**4G4d** Construct geometric figures with vertices at points on a coordinate grid.	**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). **8M1i** Solve problems involving rates such as speed or population density. **8G1d** Draw or sketch from a written description polygons, circles, or semicircles. **8G1f** Demonstrate an understanding about the two- and three-dimensional shapes in our world through identifying, drawing, modeling, building, or taking apart. **8G3b** Apply geometric properties and relationships in solving simple problems in two and three dimensions. **8G3c** Represent problem situations with simple geometric models to solve mathematical or real-world problems. **8G4d** Represent geometric figures using rectangular coordinates on a plane. **8G3f** Describe or analyze simple properties of, or relationships between, triangles, quadrilaterals, and other polygonal plane figures.

6	**24. [6.G.4]** Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.		**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). **8G1c** Identify, define, or describe geometric shapes in the plane and in three-dimensional space given a visual representation. **8G3b** Apply geometric properties and relationships in solving simple problems in two and three dimensions. **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.
6	**25. [6.SP.1]** Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. - Example: "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.		
6	**26. [6.SP.2]** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	**4DASP1a** Read or interpret a single set of data. **4DASP2b** Given a set of data or a graph, describe the distribution of data using median, range, or mode.	**8DASP1a** Read or interpret data, including interpolating or extrapolating from data.
6	**27. [6.SP.3]** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.		**8DASP2a** Calculate, use, or interpret mean, median, mode, or range.
6	**28. [6.SP.4]** Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	**4DASP1b** For a given set of data, complete a graph (limits of time make it difficult to construct graphs completely).	**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).

6	**29. [6.SP.5]** Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation) as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	**4DASP1c** Solve problems by estimating and computing within a single set of data. **4DASP2b** Given a set of data or a graph, describe the distribution of data using median, range, or mode.	**8DASP2a** Calculate, use, or interpret mean, median, mode, or range. **8DASP2b** Describe how mean, median, mode, range, or interquartile ranges relate to distribution shape. **8DASP2c** Identify outliers and determine their effect on mean, median, mode, or range.