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 7 Alabama Course of Study Standard	NAEP Objective(s) Grade 4	NAEP Objective(s) Grade 8
7	**1. [7.RP.1]** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. Example: If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour.		**8NPO4c** Use proportional reasoning to model and solve problems (including rates and scaling). **8NPO1b** Model or describe rational numbers or numerical relationships using number lines and diagrams. **8NPO1d** Write or rename rational numbers. **8NPO1e** Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts. **8NPO3a** Perform computations with rational numbers. **8NPO3f** Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate. **8NPO4a** Use ratios to describe problem situations. **8NPO4b** Use fractions to represent and express ratios and proportions.

7	**2. [7.RP.2]** Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. Example: If total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$. d. Explain what a point (x,y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0,0)$ and $(1,r)$ where r is the unit rate.	**4A1e** Recognize or describe a relationship in which quantities change proportionally.	**8NPO4c** Use proportional reasoning to model and solve problems (including rates and scaling). **8NPO1b** Model or describe rational numbers or numerical relationships using number lines and diagrams. **8NPO1d** Write or rename rational numbers. **8NPO1e** Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts. **8NPO3a** Perform computations with rational numbers. **8NPO3f** Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate. **8NPO4a** Use ratios to describe problem situations. **8NPO4b** Use fractions to represent and express ratios and proportions. **8A2c** Solve linear equations or inequalities (e.g., ax + b = c or ax + b = cx + d or ax + b > c). **8M1i** Solve problems involving rates such as speed or population density.

| 7 | 3. [7.RP.3] Use proportional relationships to solve multistep ratio and percent problems. - Examples: Sample problems may involve simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. | | 8NPO4c Use proportional reasoning to model and solve problems (including rates and scaling). 8NPO1b Model or describe rational numbers or numerical relationships using number lines and diagrams. 8NPO1d Write or rename rational numbers. 8NPO1e Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts. 8NPO3a Perform computations with rational numbers. 8NPO3f Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate. 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). |

| 7 | **4. [7.NS.1]** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
a. Describe situations in which opposite quantities combine to make 0. - Example: A hydrogen atom has 0 charge because its two constituents are oppositely charged.
b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
d. Apply properties of operations as strategies to add and subtract rational numbers. | | **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.
8NPO3a Perform computations with rational numbers.
8NPO3f Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate.
8NPO3e Interpret rational number operations and the relationships between them.
8NPO5e Apply basic properties of operations. |

| 7 | **5. [7.NS.2]** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with nonzero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
c. Apply properties of operations as strategies to multiply and divide rational numbers.
d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. | | **8NPO1d** Write or rename rational numbers.
8NPO1e Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts.
8NPO3a Perform computations with rational numbers.
8NPO3f Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate.
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.
8NPO3e Interpret rational number operations and the relationships between them.
8NPO5e Apply basic properties of operations. |
| 7 | **6. [7.NS.3]** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) | | **8NPO1d** Write or rename rational numbers.
8NPO1e Recognize, translate, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts.
8NPO3a Perform computations with rational numbers.
8NPO3f Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate.
8NPO3e Interpret rational number operations and the relationships between them.
8NPO5e Apply basic properties of operations. |

7	**7. [7.EE.1]** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.		**8NPO3a** Perform computations with rational numbers. **8NPO4d** Solve problems involving percentages (including percent increase and decrease, interest rates, tax, discount, tips, or part/whole relationships). **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).
7	**8. [7.EE.2]** Understand that rewriting an expression in different forms in a problem context can shed light on the problem, and how the quantities in it are related. Example: $a + 0.05 = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."		**8NPO3a** Perform computations with rational numbers. **8NPO4d** Solve problems involving percentages (including percent increase and decrease, interest rates, tax, discount, tips, or part/whole relationships). **8A3b** Write algebraic expressions, equations, or inequalities to represent a situation. **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).
7	**9. [7.EE.3]** Solve multistep real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computation and estimation strategies. Examples: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.		**8NPO3f** Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate. **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.

| 7 | **10. [7.EE.4]** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
a. Solve word problems leading to equations of the form $px + q =$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. Example: The perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?
b. Solve word problems leading to inequalities of the form $px + q =$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality, and interpret it in the context of the problem. Example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions. | | **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 $ax + b = cx + d$). |

7	**11. [7.G.1]** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.		**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. **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. **8G3f** Describe or analyze simple properties of, or relationships between, triangles, quadrilaterals, and other polygonal plane figures.
7	**12. [7.G.2]** Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	**4G3c** Recognize two-dimensional faces of three-dimensional shapes.	**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. **8G3f** Describe or analyze simple properties of, or relationships between, triangles, quadrilaterals, and other polygonal plane figures.

7	13. [7.G.3] Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.		8G1e Represent or describe a three- dimensional situation in a two- dimensional drawing from different views. 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. 8G4c Visualize or describe the cross-section of a solid.
7	14. [7.G.4] Know the formulas for the area and circumference of a circle, and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.		8A4e Use and evaluate common formulas (e.g., relationship between a circle's circumference and diameter [C=], distance, and time under constant speed). 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).
7	15. [7.G.5] Use facts about supplementary, complementary, vertical, and adjacent angles in a multistep problem to write and solve simple equations for an unknown angle in a figure.		
7	16. [7.G.6] Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.		8M1h Solve problems involving volume or surface area of rectangular solids, cylinders, prisms, or composite shapes. 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. 8G2d Predict results of combining, subdividing, and changing shapes of plane figures and solids (e.g., paper folding, tiling, cutting up, and rearranging pieces).

7	**17. [7.SP.1]** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.		**8DASP1a** Read or interpret data, including interpolating or extrapolating from data. **8DASP3b** Distinguish between a random and nonrandom sample.
7	**18. [7.SP.2]** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. - Example: Estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.		**8DASP1c** Solve problems by estimating and computing with data from a single set or across sets of data. **8DASP2a** Calculate, use, or interpret mean, median, mode, or range. **8DASP3a** Given a sample, identify possible sources of bias in sampling. **8DASP4e** Determine the sample space for a given situation.
7	**19. [7.SP.3]** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. - Example: The mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.	**4DASP2d** Compare two sets of related data.	**8DASP1c** Solve problems by estimating and computing with data from a single set or across sets of data. **8DASP1e** Compare and contrast the effectiveness of different representations of the same data. **8DASP2a** Calculate, use, or interpret mean, median, mode, or range.

7	20. [7.SP.4] Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. - Example: Decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.	4DASP2d Compare two sets of related data.	8DASP1a Read or interpret data, including interpolating or extrapolating from data. 8DASP1c Solve problems by estimating and computing with data from a single set or across sets of data. 8DASP2a Calculate, use, or interpret mean, median, mode, or range. 8DASP2b Describe how mean, median, mode, range, or interquartile ranges relate to distribution shape. 8DASP2d Using appropriate statistical measures, compare two or more data sets describing the same characteristic for two different populations or subsets of the same population.
7	21. [7.SP.5] Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	4DASP4a Use informal probabilistic thinking to describe chance events (i.e., likely and unlikely, certain and impossible).	8DASP4a Analyze a situation that involves probability of an independent event. 8DASP4g Represent the probability of a given outcome using fractions, decimals, and percent.
7	22. [7.SP.6] Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. - Example: When rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.	4DASP4b Determine a simple probability from a context that includes a picture. 4DASP4g Represent the probability of a given outcome using a picture or other graphic.	8DASP4b Determine the theoretical probability of simple and compound events in familiar contexts. 8DASP4f Use a sample space to determine the probability of possible outcomes for an event. 8DASP4j Interpret probabilities within a given context.

| 7 | **23. [7.SP.7]** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. Example: If a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.
b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. Example: Find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies? | **4DASP4b** Determine a simple probability from a context that includes a picture.
4DASP4e List all possible outcomes of a given situation or event. | **8DASP4d** Use theoretical probability to evaluate or predict experimental outcomes. |

| 7 | **24. [7.SP.8]** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.
c. Design and use a simulation to generate frequencies for compound events. Example: Use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood? | | **8DASP4c** Estimate the probability of simple and compound events through experimentation or simulation.
8DASP4f Use a sample space to determine the probability of possible outcomes for an event. |