

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 4 Alabama Course of Study Standard	NAEP Objective(s) Grade 4	NAEP Objective(s) Grade 8
4	1. [4.OA.1] Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.		8NPO3a Perform computations with rational numbers. 8NPO5b Recognize, find, or use factors, multiples, or prime factorization.
4	2. [4.OA.2] Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. (See Appendix A, Table 2.)	4NPO3f Solve application problems involving numbers and operations.	8NPO3a Perform computations with rational numbers.
4	3. [4.OA.3] Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	4NPO2c Verify solutions or determine the reasonableness of results in meaningful contexts. 4NPO3f Solve application problems involving numbers and operations.	8NPO2c Verify solutions or determine the reasonableness of results in a variety of situations, including calculator and computer results. 8NPO3a Perform computations with rational numbers. 8NPO5d Use divisibility or remainders in problem settings.

4	<p>4. [4.OA.4] Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.</p>	<p>4NPO5b Identify factors of whole numbers.</p> <p>4NPO5e Apply basic properties of operations.</p>	<p>8NPO3a Perform computations with rational numbers.</p> <p>8NPO5b Recognize, find, or use factors, multiples, or prime factorization.</p> <p>8NPO5c Recognize or use prime and composite numbers to solve problems.</p>
4	<p>5. [4.OA.5] Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. - Example: Given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence, and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.</p>	<p>4A1b Given a pattern or sequence, construct or explain a rule that can generate the terms of the pattern or sequence.</p>	<p>8NPO3a Perform computations with rational numbers.</p> <p>8NPO5a Describe odd and even integers and how they behave under different operations.</p> <p>8A1a Recognize, describe, or extend numerical and geometric patterns using tables, graphs, words, or symbols.</p> <p>8A1b Generalize a pattern appearing in a numerical sequence, table, or graph using words or symbols.</p>
4	<p>6. [4.NBT.1] Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. - Example: Recognize that $700 \div 70 = 10$ by applying concepts of place value and division.</p>	<p>4NPO1a Identify place value and actual value of digits in whole numbers.</p>	<p>8NPO3a Perform computations with rational numbers.</p>

4	<p>7. [4.NBT.2] Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.</p>	<p>4NPO1c Compose or decompose whole quantities by place value (e.g., write whole numbers in expanded notation using place value: $342 = 300 + 40 + 2$).</p> <p>4NPO1e Connect model, number word, or number using various models and representations for whole numbers, fractions, and decimals.</p> <p>4NPO1i Order or compare whole numbers, decimals, or fractions.</p>	<p>8NPO3a Perform computations with rational numbers.</p>
4	<p>8. [4.NBT.3] Use place value understanding to round multi-digit whole numbers to any place.</p>	<p>4NPO2b Make estimates appropriate to a given situation with whole numbers, fractions, or decimals by</p> <ul style="list-style-type: none"> • Knowing when to estimate, • Selecting the appropriate type of estimate, including overestimate, underestimate, and range of estimate, or • Selecting the appropriate method of estimation (e.g., rounding). 	<p>8NPO3a Perform computations with rational numbers.</p>
4	<p>9. [4.NBT.4] Fluently add and subtract multi-digit whole numbers using the standard algorithm.</p>		<p>8NPO3a Perform computations with rational numbers.</p>
4	<p>10. [4.NBT.5] Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p>		<p>8NPO3a Perform computations with rational numbers.</p>

4	<p>11. [4.NBT.6] Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p>	<p>4NPO3c Divide whole numbers: • Up to three digits by one digit with paper-and-pencil computation, or • Up to five digits by two digits with use of calculator.</p>	<p>8NPO3a Perform computations with rational numbers.</p>
4	<p>12. [4.NF.1] Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.</p>	<p>4NPO6a Explain or justify a mathematical concept or relationship (e.g., explain why 15 is an odd number or why $7-3$ is not the same as $3-7$).</p>	<p>8NPO1d Write or rename rational numbers.</p> <p>8NPO1h Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).</p> <p>8NPO3a Perform computations with rational numbers.</p> <p>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.</p>

4	<p>13. [4.NF.2] Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators or by comparing to a benchmark fraction such as $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.</p>		<p>8NPO1d Write or rename rational numbers.</p> <p>8NPO1h Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).</p> <p>8NPO3a Perform computations with rational numbers.</p> <p>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.</p>
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4	<p>14. [4.NF.3] Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.</p> <p>a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.</p> <p>b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: $3/8 = 1/8 + 1/8 + 1/8$; $3/8 = 1/8 + 2/8$; $2\ 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8$.</p> <p>c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.</p> <p>d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.</p>	<p>4NPO3a Add and subtract: • Whole numbers, or • Fractions with like denominators, or • Decimals through hundredths.</p>	<p>8NPO1d Write or rename rational numbers.</p> <p>8NPO1h Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).</p> <p>8NPO3a Perform computations with rational numbers.</p> <p>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.</p>
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4	<p>15. [4.NF.4] Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.</p> <p>a. Understand a fraction a/b as a multiple of $1/b$. Example: Use a visual fraction model to represent $5/4$ as the product $5 \times (1/4)$, recording the conclusion by the equation $5/4 = 5 \times (1/4)$.</p> <p>b. Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. Example: Use a visual fraction model to express $3 \times (2/5)$ as $6 \times (1/5)$, recognizing this product as $6/5$. (In general, $n \times (a/b) = (n \times a) / b$.)</p> <p>c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. Example: If each person at a party will eat $3/8$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?</p>	<p>4NPO3f Solve application problems involving numbers and operations.</p>	<p>8NPO1b Model or describe rational numbers or numerical relationships using number lines and diagrams.</p> <p>8NPO1d Write or rename rational numbers.</p> <p>8NPO1h Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).</p> <p>8NPO5b Recognize, find, or use factors, multiples, or prime factorization.</p> <p>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.</p>
4	<p>16. [4.NF.5] Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.) Example: Express $3/10$ as $30/100$, and add $3/10 + 4/100 = 34/100$.</p>		<p>8NPO1h Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).</p> <p>8NPO3a Perform computations with rational numbers.</p>

4	<p>17. [4.NF.6] Use decimal notation for fractions with denominators 10 or 100. - Example: Rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</p>		<p>8NPO1h Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).</p> <p>8NPO3a Perform computations with rational numbers.</p>
4	<p>18. [4.NF.7] Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual model.</p>		<p>8NPO1h Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).</p> <p>8NPO3a Perform computations with rational numbers.</p>
4	<p>19. [4.MD.1] Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; and hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. - Example: Know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...</p>	<p>4M2b Solve problems involving conversions within the same measurement system, such as conversions involving inches and feet or hours and minutes.</p> <p>4M2d Determine appropriate size of unit of measurement in problem situation involving such attributes as length, time, capacity, or weight.</p>	<p>8M2a Select or use an appropriate type of unit for the attribute being measured, such as length, area, angle, time, or volume.</p> <p>8M2b Solve problems involving conversions within the same measurement system, such as conversions involving square inches and square feet.</p> <p>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 $\frac{5}{8}$ of a mile. • Money conversion: U.S. dollars to Canadian dollars. • Temperature conversion: Fahrenheit to Celsius.</p>

4	<p>20. [4.MD.2] Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.</p>	<p>4NPO3f Solve application problems involving numbers and operations.</p>	
4	<p>21. [4.MD.3] Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. - Example: Find the width of a rectangular room given the area of the flooring and the length by viewing the area formula as a multiplication equation with an unknown factor.</p>	<p>4M1f Solve problems involving perimeter of plane figures.</p> <p>4M1g Solve problems involving area of squares and rectangles.</p>	<p>8M1f Solve mathematical or real-world problems involving perimeter or area of plane figures, such as triangles, rectangles, circles, or composite figures.</p>
4	<p>22. [4.MD.4] Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. Example: From a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.</p>		

4	<p>23. [4.MD.5] Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:</p> <p>a. An angle is measured with reference to a circle with its center at the common endpoint of the rays by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle" and can be used to measure angles.</p> <p>b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.</p>		
4	<p>24. [4.MD.6] Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.</p>		
4	<p>25. [4.MD.7] Recognize angle measure as additive. When an angle is decomposed into nonoverlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world or mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.</p>	<p>4NPO3f Solve application problems involving numbers and operations.</p>	

4	<p>26. [4.G.1] Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p>	<p>4G1a Explore properties of paths between points.</p> <p>4G1c Identify or draw angles and other geometric figures in the plane.</p> <p>4G4a Describe relative positions of points and lines using the geometric ideas of parallelism or perpendicularity.</p>	<p>8G3g Describe or analyze properties and relationships of parallel or intersecting lines.</p>
4	<p>27. [4.G.2] Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.</p>	<p>4G3f Describe and compare properties of simple and compound figures composed of triangles, squares, and rectangles.</p> <p>4G4a Describe relative positions of points and lines using the geometric ideas of parallelism or perpendicularity.</p>	<p>8G1b Identify a geometric object given a written description of its properties.</p> <p>8G3g Describe or analyze properties and relationships of parallel or intersecting lines.</p>
4	<p>28. [4.G.3] Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.</p>	<p>4G2a Identify whether a figure is symmetrical or draw lines of symmetry.</p> <p>4G2d Recognize which attributes (such as shape and area) change or do not change when plane figures are cut up or rearranged.</p>	<p>8G2a Identify lines of symmetry in plane figures or recognize and classify types of symmetries of plane figures.</p>