Grade 5 Mathematics Overview

Grade 5 content is organized into six Alabama Content Areas as outlined in the table below: Operations and Algebraic Thinking; Operations with Numbers: Base Ten; Operations with Numbers: Fractions; Data Analysis; Measurement; and Geometry. Related standards are grouped into clusters, which are listed below each content area. Standards indicate what the student should know or be able to do by the end of the grade.

Alabama Content Areas	Operations and Algebraic Thinking	Operations with Numbers: Base Ten	Operations with Numbers: Fractions	Data Analysis	Measurement	Geometry
Clusters	• Write and interpret numerical expressions. • Analyze patterns and relationships.	• Understand the place value system. • Perform operations with multi-digit whole numbers and decimals to hundredths.	• Use equivalent fractions as a strategy to add and subtract fractions. • Apply and extend previous under-standings of multiplication and division to multiply and divide fractions.	• Represent and interpret data.	• Convert like measurement units within a given measurement system. • Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	• Graph points on the coordinate plane to solve real-world and mathematical problems. • Classify two-dimensional figures into categories based on their properties.

The eight Student Mathematical Practices listed in the chart below represent what students are doing as they learn mathematics. Students should regularly engage in these processes and proficiencies at every level throughout their mathematical studies. Proficiency with these practices is critical in using mathematics, both in the classroom and in everyday life. **The Student Mathematical Practices are standards which should be incorporated across all grades.**

Student Mathematical Practices	
1. Make sense of problems and persevere in solving them.	5. Use appropriate tools strategically.
2. Reason abstractly and quantitatively.	6. Attend to precision.
3. Construct viable arguments and critique the reasoning of others.	7. Look for and make use of structure.
4. Model with mathematics.	8. Look for and express regularity in repeated reasoning.

Content Priorities

In Grade 5, instructional time should focus on three critical areas:

1. developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions);
2. extending division to 2-digit divisors, integrating decimals into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and
3. developing understanding of volume.

1. Through their learning in the **Operations with Numbers: Fractions** Alabama Content Area, students
   - apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators;
   - develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them; and
   - use the meaning of fractions, multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense.

2. Through their learning in the **Operations with Numbers: Base Ten** Alabama Content Area, students
   - develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations;
   - apply understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths;
   - develop fluency with decimal computations and make reasonable estimates of their results;
   - use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense; and
   - compute products and quotients of decimals to hundredths efficiently and accurately.

3. Through their learning in the **Measurement** Alabama Content Area, students
   - recognize volume as an attribute of three-dimensional space;
   - understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps;
   - understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume;
   - select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume;
   - decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes; and
   - measure necessary attributes of shapes in order to determine volumes to solve real-world and mathematical problems.

NOTE: Although not all content areas in the grade level have been included in the overview, all standards should be included in instruction.

NOTE: fluency vs. automaticity. Fluency involves a mixture of "just knowing" answers, knowing answers from patterns, and knowing answers from the use of strategies. The word *fluently* is used in the standards to mean accurately, efficiently and flexibly. Automaticity of facts becomes evident when a student no longer uses a pattern or mental algorithm to determine the answer.

Grade 5 Content Standards

Each content standard completes the sentence stem *"Students will…"*

Operations and Algebraic Thinking	
Write and interpret numerical expressions.	1. Write, explain, and evaluate simple numerical expressions involving the four operations to solve up to two-step problems. Include expressions involving parentheses, brackets, or braces, using commutative, associative, and distributive properties.
Analyze patterns and relationships.	2. Generate two numerical patterns using two given rules and complete an input/output table for the data. a. Use data from an input/output table to identify apparent relationships between corresponding terms. b. Form ordered pairs from values in an input/output table. c. Graph ordered pairs from an input/output table on a coordinate plane.

Operations with Numbers: Base Ten	
Understand the place value system.	3. Using models and quantitative reasoning, explain that in a multi-digit number, including decimals, a digit in any place represents ten times what it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left. a. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, using whole-number exponents to denote powers of 10. b. Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10, using whole-number exponents to denote powers of 10.

	4. Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form. *Example*: 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × $(\frac{1}{10})$ + 9 × $(\frac{1}{100})$ + 2 × $(\frac{1}{1000})$. b. Compare two decimals to thousandths based on the meaning of the digits in each place, using >, =, and < to record the results of comparisons. 5. Use place value understanding to round decimals to thousandths.
Perform operations with multi-digit whole numbers and decimals to hundredths.	6. Fluently multiply multi-digit whole numbers using the standard algorithm. 7. Use strategies based on place value, properties of operations, and/or the relationship between multiplication and division to find whole-number quotients and remainders with up to four-digit dividends and two-digit divisors. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. 8. Add, subtract, multiply, and divide decimals to hundredths using strategies based on place value, properties of operations, and/or the relationships between addition/subtraction and multiplication/division; relate the strategy to a written method, and explain the reasoning used. a. Use concrete models and drawings to solve problems with decimals to hundredths. b. Solve problems in a real-world context with decimals to hundredths.

Operations with Numbers: Fractions	
Use equivalent fractions as a strategy to add and subtract fractions.	9. Model and solve real-word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally, and assess the reasonableness of answers. *Example: Recognize an incorrect result* $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$ *by observing that* $\frac{3}{7} < \frac{1}{2}$. 10. Add and subtract fractions and mixed numbers with unlike denominators, using fraction equivalence to calculate a sum or difference of fractions or mixed numbers with like denominators.

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	11. Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers. a. Model and interpret a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$) b. Use visual fraction models, drawings, or equations to represent word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers 12. Apply and extend previous understandings of multiplication to find the product of a fraction times a whole number or a fraction times a fraction. a. Use a visual fraction model (area model, set model, or linear model) to show $(\frac{a}{b}) \times q$ and create a story context for this equation to interpret the product as *a* parts of a partition of *q* into *b* equal parts. b. Use a visual fraction model (area model, set model, or linear model) to show $(\frac{a}{b}) \times (\frac{c}{d})$ and create a story context for this equation to interpret the product. c. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. d. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths to show that the area is the same as would be found by multiplying the side lengths. 13. Interpret multiplication as scaling (resizing). a. Compare the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. *Example: Use reasoning to determine which expression is greater? 225 or* $\frac{3}{4} \times 225$; $\frac{11}{50}$ *or* $\frac{3}{2} \times \frac{11}{50}$ b. Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and relate the principle of fraction equivalence. c. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number and relate the principle of fraction equivalence. 14. Model and solve real-world problems involving multiplication of fractions and mixed numbers using visual fraction models, drawings, or equations to represent the problem.

	15. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions and illustrate using visual fraction models, drawings, and equations to represent the problem. b. Create a story context for a unit fraction divided by a whole number, and use a visual fraction model to show the quotient. c. Create a story context for a whole number divided by a unit fraction, and use a visual fraction model to show the quotient.

Data Analysis	
Represent and interpret data.	16. Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$). a. Add, subtract, multiply, and divide fractions to solve problems involving information presented in line plots. *Note: Division is limited to unit fractions by whole numbers and whole numbers by unit fractions.*

Measurement	
Convert like measurement units within a given measurement system.	17. Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real-world problems.
Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	18. Identify volume as an attribute of solid figures, and measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised (non-standard) units. a. Pack a solid figure without gaps or overlaps using *n* unit cubes to demonstrate volume as *n* cubic units.

	19. Relate volume to the operations of multiplication and addition, and solve real-world and mathematical problems involving volume. a. Use the associative property of multiplication to find the volume of a right rectangular prism and relate it to packing the prism with unit cubes. Show that the volume can be determined by multiplying the three edge lengths or by multiplying the height by the area of the base. b. Apply the formulas $V = l \times w \times h$ and $V = B \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems. c. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the two parts, applying this technique to solve real-world problems.

Geometry	
Graph points on the coordinate plane to solve real-world and mathematical problems.	20. Graph points in the first quadrant of the coordinate plane, and interpret coordinate values of points to represent real-world and mathematical problems.
Classify two-dimensional figures into categories based on their properties.	21. Classify triangles according to side length (isosceles, equilateral, scalene) and angle measure (acute, obtuse, right, equiangular). 22. Classify quadrilaterals in a hierarchy based on properties. 23. Explain that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *Example: All rectangles have four right angles, and squares have four right angles, so squares are rectangles.*