Grade 6 Overview

Grade 6 content is organized into five Alabama Content Areas as outlined below: Proportional Reasoning; Number Systems and Operations; Algebra and Functions; Data Analysis, Statistics, and Probability; and Geometry and Measurement. Related standards are grouped into clusters, which are listed below each content area. Resources to support the Grades 6-8 standards are in Appendix D. Standards indicate what students should know and be able to do by the end of the course.

Alabama Content Areas	Proportional Reasoning	Number Systems and Operations	Algebra and Functions	Data Analysis, Statistics, and Probability	Geometry and Measurement
Clusters	• Develop an understanding of ratio concepts and use reasoning about ratios to solve problems.	• Use prior knowledge of multiplication and division to divide fractions. • Compute multi-digit numbers fluently and determine common factors and multiples. • Apply knowledge of the number system to represent and use rational numbers in a variety of forms.	• Apply knowledge of arithmetic to read, write, and evaluate algebraic expressions. • Use equations and inequalities to represent and solve real-world or mathematical problems. • Identify and analyze relationships between independent and dependent variables.	• Use real-world and mathematical problems to analyze data and demonstrate an understanding of statistical variability and measures of center.	• Graph polygons in the coordinate plane to solve real-world and mathematical problems. • Solve real-world and mathematical problems to determine area, surface area, and volume.

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 to 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 6, instructional time should focus on five essential areas:

1. **Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems.**
   Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from and extending pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope and variety of problems in which they use proportional reasoning to connect ratios and fractions.

2. **Completing understanding of division of fractions and extending the understanding of number sense to the system of rational numbers, including signed numbers.**
   Students connect the meaning of fractions, multiplication and division, and the relationship between multiplication and division to understand and explain procedures for dividing fractions. Students use these operations to solve problems. Students extend previous understanding of the magnitude and ordering of numbers to the rational number system, including signed rational numbers, and particularly integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. **Writing, interpreting, and using expressions and equations.**
   Students use variables in mathematical expressions to represent quantities. They write expressions and equations that correspond to real-world situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know the solutions of an equation are the values of the variables that make the equation true. They use properties of operations and the idea of maintaining the equality of both sides of an equation to solve one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between dependent and independent variables.

4. **Developing understanding of statistical thinking.**
   Students build on and reinforce their number sense to develop the ability to think about statistical measures. They recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in that it is roughly the middle value. The mean measures center in that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in that it is a balance point. Students recognize that a measure of variability (range and interquartile range) can also be useful for summarizing data because two very different sets of data may have the same mean and median

yet be distinguished by their variability. Students create and use a variety of graphs to represent and interpret data. They learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

5. **Developing understanding of geometrical reasoning and thinking.**
   Students apply previous understanding about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students use nets to find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms to extend formulas for the volume of a right rectangular prism to those with fractional side lengths. As students develop an understanding of formulas in mathematical and real-world contexts, the goal is not simply to memorize but to have a deep understanding of why each formula works and how it relates to the measure of various figures. Students draw polygons in the coordinate plane to prepare for work on scale drawings and constructions in Grade 7.

Grade 6 Content Standards

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

Proportional Reasoning	
Develop an understanding of ratio concepts and use reasoning about ratios to solve problems.	1. Use appropriate notations [*a/b, a to b, a:b*] to represent a proportional relationship between quantities and use ratio language to describe the relationship between quantities. 2. Use unit rates to represent and describe ratio relationships. 3. Use ratio and rate reasoning to solve mathematical and real-world problems (including but not limited to percent, measurement conversion, and equivalent ratios) using a variety of models, including tables of equivalent ratios, tape diagrams, double number lines, and equations.

Number Systems and Operations	
Use prior knowledge of multiplication and division to divide fractions.	4. Interpret and compute quotients of fractions using visual models and equations to represent problems. a. Use quotients of fractions to analyze and solve problems.
Compute multi-digit numbers fluently and determine common factors and multiples.	5. Fluently divide multi-digit whole numbers using a standard algorithm to solve real-world and mathematical problems. 6. Add, subtract, multiply, and divide decimals using a standard algorithm. 7. Use the distributive property to express the sum of two whole numbers with a common factor as a multiple of a sum of two whole numbers with no common factor. 8. Find the greatest common factor (GCF) and least common multiple (LCM) of two or more whole numbers. a. Use factors and multiples to determine prime factorization.
Apply knowledge of the number system to represent and use rational numbers in a variety of forms.	9. Use signed numbers to describe quantities that have opposite directions or values and to represent quantities in real-world contexts. 10. Locate integers and other rational numbers on a horizontal or vertical line diagram. a. Define *opposites* as numbers located on opposite sides of 0 and the same distance from 0 on a number line. b. Use rational numbers in real-world and mathematical situations, explaining the meaning of 0 in each situation. 11. Find the position of pairs of integers and other rational numbers on the coordinate plane. a. Identify quadrant locations of ordered pairs on the coordinate plane based on the signs of the x and y coordinates. b. Identify (a,b) and $(a,-b)$ as reflections across the x-axis. c. Identify (a,b) and $(-a,b)$ as reflections across the y-axis. d. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane, including finding distances between points with the same first or second coordinate. 12. Explain the meaning of absolute value and determine the absolute value of rational numbers in real-world contexts.

	13. Compare and order rational numbers and absolute value of rational numbers with and without a number line in order to solve real-world and mathematical problems.

Algebra and Functions	
Apply knowledge of arithmetic to read, write, and evaluate algebraic expressions.	14. Write, evaluate, and compare expressions involving whole number exponents. 15. Write, read, and evaluate expressions in which letters represent numbers in real-world contexts. a. Interpret a variable as an unknown value for any number in a specified set, depending on the context. b. Write expressions to represent verbal statements and real-world scenarios. c. Identify parts of an expression using mathematical terms such as *sum, term, product, factor, quotient,* and *coefficient.* d. Evaluate expressions (which may include absolute value and whole number exponents) with respect to order of operations. 16. Generate equivalent algebraic expressions using the properties of operations, including inverse, identity, commutative, associative, and distributive. 17. Determine whether two expressions are equivalent and justify the reasoning.
Use equations and inequalities to represent and solve real-world or mathematical problems.	18. Determine whether a value is a solution to an equation or inequality by using substitution to conclude whether a given value makes the equation or inequality true. 19. Write and solve an equation in the form of $x+p=q$ or $px=q$ for cases in which p, q, and x are all non-negative rational numbers to solve real-world and mathematical problems. a. Interpret the solution of an equation in the context of the problem. 20. Write and solve inequalities in the form of $x>c$, $x<c$, $x\geq c$, or $x \leq c$ to represent a constraint or condition in a real-world or mathematical problem. a. Interpret the solution of an inequality in the context of a problem. b. Represent the solutions of inequalities on a number line and explain that the solution set may contain infinitely many solutions.

Identify and analyze relationships between independent and dependent variables.	21. Identify, represent, and analyze two quantities that change in relationship to one another in real-world or mathematical situations. a. Use tables, graphs, and equations to represent the relationship between independent and dependent variables.

Data Analysis, Statistics, and Probability	
Use real-world and mathematical problems to analyze data and demonstrate an understanding of statistical variability and measures of center.	22. Write examples and non-examples of statistical questions, explaining that a statistical question anticipates variability in the data related to the question. 23. Calculate, interpret, and compare measures of center (mean, median, mode) and variability (range and interquartile range) in real-world data sets. a. Determine which measure of center best represents a real-world data set. b. Interpret the measures of center and variability in the context of a problem. 24. Represent numerical data graphically, using dot plots, line plots, histograms, stem and leaf plots, and box plots. a. Analyze the graphical representation of data by describing the center, spread, shape (including approximately symmetric or skewed), and unusual features (including gaps, peaks, clusters, and extreme values). b. Use graphical representations of real-world data to describe the context from which they were collected.

Geometry and Measurement	
Graph polygons in the coordinate plane to solve real-world and mathematical problems.	25. Graph polygons in the coordinate plane given coordinates of the vertices to solve real-world and mathematical problems. a. Determine missing vertices of a rectangle with the same *x*-coordinate or the same *y*-coordinate when graphed in the coordinate plane. b. Use coordinates to find the length of a side between points having the same *x*-coordinate or the same *y*-coordinate. c. Calculate perimeter and area of a polygon graphed in the coordinate plane (limiting to polygons in which consecutive vertices have the same *x*-coordinate or the same *y*-coordinate).

Solve real-world and mathematical problems to determine area, surface area, and volume. *Note: Students must select and use the appropriate unit for the attribute being measured when determining length, area, angle, time, or volume.*	26. Calculate the area of triangles, special quadrilaterals, and other polygons by composing and decomposing them into known shapes. a. Apply the techniques of composing and decomposing polygons to find area in the context of solving real-world and mathematical problems. 27. Determine the surface area of three-dimensional figures by representing them with nets composed of rectangles and triangles to solve real-world and mathematical problems. 28. Apply previous understanding of volume of right rectangular prisms to those with fractional edge lengths to solve real-world and mathematical problems. a. Use models (cubes or drawings) and the volume formulas ($V = lwh$ and $V = Bh$) to find and compare volumes of right rectangular prisms.