ALGEBRA I

The Algebra I course provides students with mathematical experiences that are useful in everyday life. The reasoning and problem-solving skills used in Algebra I may be applied to life situations beyond the classroom. Algebra I is also the cornerstone of high school mathematics. Every course beyond Algebra I requires the knowledge of these content standards. Therefore, it is of utmost importance that each standard be mastered. Algebra I builds on foundational content learned by students in Grades K-8 by expanding mathematics understanding to provide students with a strong mathematics education.

Algebra I is the basis for the majority of the mathematics content included on the *Alabama High School Graduation Exam* (AHSGE). Therefore, it is one of the courses required for all students. School systems may offer Algebra I and Algebra IA and Algebra IB. Content standards 1, 2, 3, 4, 12, 13, 14, 15, and linear equations and inequalities from content standard 7 must be taught in the Algebra IA course. Content standards 5, 6, 8, 9, 10, 11, and the remainder of content standard 7 must be taught in the Algebra IB course. Systems offering Algebra I in the eighth grade have the responsibility of ensuring that all Algebra I course content standards are included in instruction.

Number and Operations

Students will:

1. Simplify numerical expressions, including those involving square roots, radical form, and decimal approximations using properties of real numbers and order of operations.
   Example: *Express* $\sqrt{27} + \sqrt{75}$ *in simplified form. Answer:* $8\sqrt{3}$.

   - Applying laws of exponents to simplify expressions, including those containing zero and negative integral exponents

     Examples: *Simplify* $\frac{x^3y^4}{x^3y^{-2}}$. *Answer:* y^6.

     Multiply 2.4×10^5 *by* 3.1×10^3. *Answer:* 7.44×10^8.

     Divide $\frac{2.4 \times 10^5}{1.2 \times 10^7}$. *Answer:* 2×10^{-2}.

Algebra

2. Analyze linear functions from their equations for their characteristics, including slopes and intercepts.
   Example: *Evaluate f (0) for f (x) = 3x + 4. Answer: f (0) = 4.*

   - Determining the slope of a line from its equation or by applying the slope formula
   - Determining equations of linear functions given two points, a point and the slope, tables of values, graphs, or ordered pairs
   - Graphing two-variable linear equations and inequalities on the Cartesian plane

3. Determine properties of a relation, including domain, range, and whether it is a function, when given graphs, tables of values, mappings, or sets of ordered pairs.
   - Finding the range of a function when given its domain

     Example: *Find the range of* $f(x) = -x^2 + 2x - 3$ *when given the domain* $\{-4, -2, 0, 2, 4\}$. *Answer:* $\{-27, -11, -3\}$.

4. Construct graphs of common relations, including x = constant, y = constant, $y = x$, $y = \sqrt{x}$, $y = x^2$, and $y = |x|$.
   - Identifying applications modeled by common relations, including x = constant, y = constant, $y = x$, $y = \sqrt{x}$, $y = x^2$, and $y = |x|$

7. Solve multistep equations and inequalities, including linear, radical, absolute value, and literal equations.

   Example: solving for x in problems, including $\sqrt{x} - 4 = 0$, $\sqrt{x-4} < 2$, $|x| = 6$, $|x+3| \geq 10$, $y = mx + b$, and $ax + by + c = 0$

   - Writing the solution of an equation or inequality in set notation

     Example: *Find the solution of* $|x+3| \geq 10$. *Answer:* $\{x \mid x \geq 7 \text{ or } x \leq -13\}$.
   - Formulating the design of application-based problems by developing and solving equations and inequalities, including those involving direct and inverse variation, distance, uniform motion, and mixture

Geometry

10. Calculate length, midpoint, and slope of a line segment when given coordinates of its endpoints on the Cartesian plane.
    - Deriving distance, midpoint, and slope formulas for line segments
    - Utilizing the Pythagorean Theorem to solve application-based problems

Measurement

11. Solve problems algebraically involving area and perimeter of a polygon, area and circumference of a circle, and volume and surface area of right circular cylinders or right rectangular prisms.
    - Applying area and volume formulas to solve application-based problems
        Example: *Find the radius of a circle with an area of 75 square inches.*
        Answer: $\sqrt{\frac{75}{\pi}}$ *or* $5\sqrt{\frac{3}{\pi}}$.

Data Analysis and Probability

12. Compare various methods of data reporting, including scatterplots, stem-and-leaf plots, histograms, box-and-whisker plots, and line graphs, to make inferences or predictions.
    - Determining effects of linear transformations of data
        Example: concluding that if the teacher adds 5 points to each student's grade on an algebra test with mean score of 78, the new mean score will be 83
    - Determining effects of outliers
    - Critiquing the design of a survey

13. Identify characteristics of a data set, including numerical or categorical and univariate or bivariate.
    Example: conducting a survey of 100 students to determine whether boys and girls prefer to watch the same genres of movies to get a bivariate, categorical data set

14. Use a scatterplot and its line of best fit or a specific line graph to determine the correlation existing between two sets of data, including positive, negative, or no correlation.

15. Calculate probabilities given data in lists or graphs.
    - Comparing theoretical and experimental probabilities for data in lists or graphs