GEOMETRY

Geometry-based applications are observable in many aspects of life. Because of its importance, this Euclidean Geometry course is required of all students receiving an Alabama High School Diploma.

Geometry builds on Algebra I concepts and increases students' knowledge of shapes and their properties. This knowledge helps develop visual and spatial sense and strong reasoning skills. The Geometry course requires students to make conjectures and to use reasoning to validate or negate these conjectures. The use of proofs and constructions is a valuable tool that enhance reasoning skills and enables students to better understand more complex mathematical concepts. Technology should be used to enhance the students' mathematical experience, not replace their reasoning abilities.

School systems may offer Geometry and Geometry A and Geometry B. Content standards 1, 2, 3, 5, 9, 10, 13, and 14 must be taught in the Geometry A course. Content standards 4, 6, 7, 8, 11, 12, 15, 16, 17, and 18 must be taught in the Geometry B course.

Algebra

Students will:

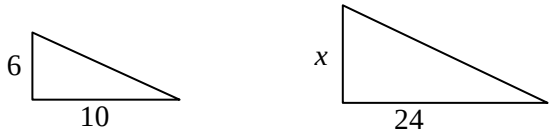
1. Determine the equation of a line given two points, a point and a slope, a table of values, a graph, ordered pairs, or the equation of a line parallel or perpendicular to another line through a given point.

Geometry

2. Prove theorems related to pairs of angles, including vertical**,** adjacent, complementary, and supplementary, as well as those formed by parallel lines cut by a transversal and perpendicular lines.
   Example: proving vertical angles congruent

3. Justify relationships among different classes of polygons by using their properties.
   Example: showing that a square has all the properties of both a rectangle and a rhombus

4. Apply proportional reasoning to determine missing lengths of sides, measures of angles, and ratios of perimeters and areas of similar polygons.
   Example: *Determine from the following similar triangles the missing length of side x.*
   Answer: 14.4.



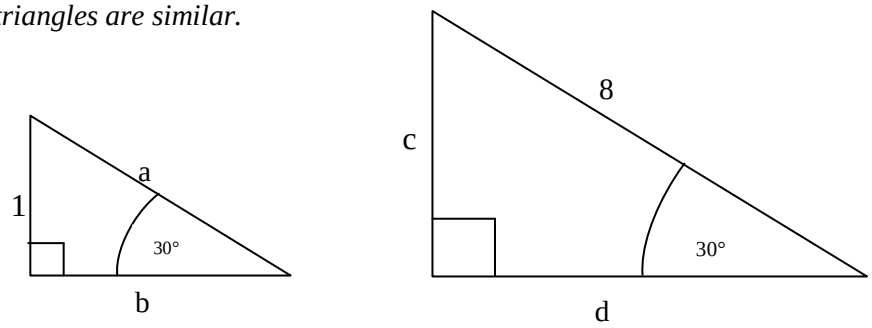
5. Determine the measure of interior and exterior angles associated with polygons.
   - Verifying formulas for measures of interior and exterior angles of polygons inductively and deductively

6. Solve problems, including application-based problems, using properties and theorems related to circles, quadrilaterals, and other geometric shapes.
   Example: finding the center of a solid wooden wheel using the perpendicular bisectors of two chords

   - Determining the center and radius of a circle given its equation
   - Determining the equation of a circle given its center and radius

7. Apply the Pythagorean Theorem and its converse to solve application problems, including expressing answers in simplified radical form or as decimal approximations and using Pythagorean triples where applicable.
   - Proving the Pythagorean Theorem

8. Apply properties of special right triangles, including 30-60-90 and 45-45-90 triangles, to find missing side lengths.
   Example: *Determine from the two triangles below the missing side lengths a, b, c, and d, and the relationship between the two triangles.*
   Answer: a = 2, b = -$\sqrt{3}$, c = 4, and d = 4$\sqrt{3}$; relationship: the two triangles are similar.



9. Determine relationships between two triangles, including proving congruence or similarity of the triangles from given information, using the relationships to solve problems and to establish other relationships.
   - Calculating the geometric mean to find missing lengths in right triangles

10. Use inductive reasoning to make conjectures and deductive reasoning to justify conclusions.
    - Recognizing limitations of a conclusion through inductive reasoning
    - Using deductive reasoning to prove theorems
    - Using proof by negation to prove theorems
    - Writing conditional statements of a given conjecture

11. Solve for missing measures of sides and angles in right triangles by applying the right triangle ratios of sine, cosine, and tangent.

12. Determine areas and perimeters of regular polygons, including inscribed or circumscribed polygons, given the coordinates of vertices or other characteristics.

13. Apply distance, midpoint, and slope formulas to solve problems and to confirm properties of polygons.
    Examples: finding the area of a rectangle given the coordinates of its vertices, showing the median of a trapezoid is half the sum of the bases

14. Identify coordinates of vertices of the image of a given polygon that is translated, rotated, reflected, or dilated.
    Example: rotating a triangle a given number of degrees around a specific point and comparing vertices of the image and pre-image

15. Classify polyhedra according to properties, including the number of faces.
    Example: identifying a figure having six vertices and twelve edges as a form of polyhedron

    - Identifying Euclidean solids

Measurement

16. Calculate measures of arcs and sectors of a circle from given information.
    Examples: finding the area of a sector given its arc length and radius, finding the arc length of a sector given its area and radius, finding the area or arc length given the measure of the central angle and the radius

17. Calculate surface areas and volumes of solid figures, including spheres, cones, and pyramids.
    - Deriving formulas for surface area and volume of spheres, cones, and pyramids
    - Calculating specific missing dimensions of solid figures from surface area or volume
    - Determining the relationship between surface areas of similar figures and volumes of similar figures
        Example: *Determine the scale factor for the surface areas of two similar rectangular solids whose volumes are 8 and 216.*
        Answer: $\frac{1}{9}$ *or 1 to 9 or 1:9.*

Data Analysis and Probability

18. Calculate probabilities arising in geometric contexts.
    Example: finding the probability of hitting a particular ring on a dartboard where the rings are formed by equally spaced concentric circles