# Geometry

This course is designed for students who have successfully completed the standards for Algebra I. All students are expected to achieve the Geometry standards. The course includes, among other things, properties of geometric figures, trigonometric relationships, and reasoning to justify conclusions. Methods of justification will include paragraph proofs, two-column proofs, indirect proofs, coordinate proofs, algebraic methods, and verbal arguments. A gradual development of formal proof will be encouraged. Inductive and intuitive approaches to proof as well as deductive axiomatic methods should be used.

This set of standards includes emphasis on two- and three-dimensional reasoning skills, coordinate and transformational geometry, and the use of geometric models to solve problems. A variety of applications and some general problem-solving techniques, including algebraic skills, should be used to implement these standards. Calculators, computers, graphing utilities (graphing calculators or computer graphing simulators), dynamic geometry software, and other appropriate technology tools will be used to assist in teaching and learning. Any technology that will enhance student learning should be used.

## Reasoning, Lines, and Transformations

G.1 The student will construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include
- a) identifying the converse, inverse, and contrapositive of a conditional statement;
- b) translating a short verbal argument into symbolic form;
- c) using Venn diagrams to represent set relationships; and
- d) using deductive reasoning.

G.2 The student will use the relationships between angles formed by two lines cut by a transversal to
- a) determine whether two lines are parallel;
- b) verify the parallelism, using algebraic and coordinate methods as well as deductive proofs; and
- c) solve real-world problems involving angles formed when parallel lines are cut by a transversal.

G.3 The student will use pictorial representations, including computer software, constructions, and coordinate methods, to solve problems involving symmetry and transformation. This will include
- a) investigating and using formulas for finding distance, midpoint, and slope;
- b) applying slope to verify and determine whether lines are parallel or perpendicular;
- c) investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and
- d) determining whether a figure has been translated, reflected, rotated, or dilated, using coordinate methods.

G.4 The student will construct and justify the constructions of
- a) a line segment congruent to a given line segment;
- b) the perpendicular bisector of a line segment;
- c) a perpendicular to a given line from a point not on the line;
- d) a perpendicular to a given line at a given point on the line;
- e) the bisector of a given angle,
- f) an angle congruent to a given angle; and
- g) a line parallel to a given line through a point not on the given line.

## Triangles

G.5 The student, given information concerning the lengths of sides and/or measures of angles in triangles, will
- a) order the sides by length, given the angle measures;
- b) order the angles by degree measure, given the side lengths;
- c) determine whether a triangle exists; and
- d) determine the range in which the length of the third side must lie.

These concepts will be considered in the context of real-world situations.

G.6 The student, given information in the form of a figure or statement, will prove two triangles are congruent, using algebraic and coordinate methods as well as deductive proofs.

G.7 The student, given information in the form of a figure or statement, will prove two triangles are similar, using algebraic and coordinate methods as well as deductive proofs.

G.8 The student will solve real-world problems involving right triangles by using the Pythagorean Theorem and its converse, properties of special right triangles, and right triangle trigonometry.

## Polygons and Circles

G.9 The student will verify characteristics of quadrilaterals and use properties of quadrilaterals to solve real-world problems.

G.10 The student will solve real-world problems involving angles of polygons.

G.11 The student will use angles, arcs, chords, tangents, and secants to
- a) investigate, verify, and apply properties of circles;
- b) solve real-world problems involving properties of circles; and
- c) find arc lengths and areas of sectors in circles.

G.12 The student, given the coordinates of the center of a circle and a point on the circle, will write the equation of the circle.

## Three-Dimensional Figures

G.13 The student will use formulas for surface area and volume of three-dimensional objects to solve real-world problems.

G.14 The student will use similar geometric objects in two- or three-dimensions to
- a) compare ratios between side lengths, perimeters, areas, and volumes;
- b) determine how changes in one or more dimensions of an object affect area and/or volume of the object;
- c) determine how changes in area and/or volume of an object affect one or more dimensions of the object; and
- d) solve real-world problems about similar geometric objects.