

High School Essential Curriculum

Introduction to Geometry

UNIT I: Fundamental Concepts and Patterns in Geometry

Goal. The student will demonstrate the ability to use fundamental concepts of geometry, including definitions, basic constructions, and tools of geometry.

Objectives - The student will be able to:

- a. Explore and recognize geometric patterns using inductive reasoning.
- b. Recognize examples of deductive reasoning.
- c. Distinguish between inductive and deductive reasoning.
- d. Identify and apply basic definitions of geometry.
- e. Identify and apply postulates.
- f. Write statements in if-then form and write their converses.
- g. Construct a segment congruent to a given segment.
- h. Use a number line to calculate distance.
- i. Graph points and lines in the coordinate plane.
- j. Find the midpoint of a given segment.

UNIT II: Angles, Parallel and Perpendicular Lines

Goal. The student will demonstrate the ability to apply the properties of angles, parallel and perpendicular lines.

Objectives - The student will be able to:

- a. Identify parts of an angle.
- b. Classify angles by their measure.
- c. Apply the Angle Addition Postulate.
- d. Identify and apply angle relationships (e.g. complementary, vertical, congruent).
- e. Define and apply perpendicular lines.
- f. Construct the bisector of a given angle and an angle congruent to a given angle.
- g. Construct a line perpendicular to a line at a given point, a line perpendicular from a given point to a line, and the perpendicular bisector of a given segment.
- h. Identify and recognize parallel lines and parallel planes.
- i. Identify and determine the measures of angles formed by parallel lines and transversals.
- j. Identify and apply the definition of slope.
- k. Determine the slope of a line parallel or perpendicular to a given line.

UNIT III. Triangle Relationships

Goal. The student will demonstrate the ability to apply definitions and theorems of triangles.

Objectives - The student will be able to:

- a. Classify triangles by their sides and angles.
- b. Apply the Triangle-Angle Sum Theorem, the Isosceles Triangle Theorem and its converse, and the Exterior Angle Theorem.
- c. Identify congruent polygons.
- d. Name corresponding parts of congruent polygons.
- e. Differentiate and identify triangle congruence theorems.
- f. Prove triangles congruent using SAS, SSS, ASA, AAS Theorems.
- g. Identify the median and the altitude of a triangle.
- h. State and apply the Pythagorean Theorem and its converse.
- i. Find the distance between two points by using the distance formula.

UNIT IV: Exploring Polygons

Goal. The student will demonstrate the ability to explore and verify properties of polygons.

Objectives - The student will be able to:

- a. Describe the characteristics of quadrilaterals (parallelograms, rectangles, rhombi, squares, trapezoids).
- b. Investigate the family hierarchy of quadrilaterals using a Venn Diagram.
- c. Identify regular and nonregular polygons.
- d. Determine the measure of interior and exterior angles of both regular and nonregular polygons.
- e. Determine the perimeter and area of triangles and quadrilaterals using the appropriate formulas.
- f. Apply formulas for perimeter and area to real-world situations.

UNIT V: Similarity, Ratios, and Proportions

Goal. The student will demonstrate the ability to identify similar triangles and solve problems using ratios and proportions.

Objectives - The student will be able to:

- a. Identify similar polygons.
- b. Identify corresponding parts of similar polygons.
- c. Apply proportions to problems using similar figures and scale drawings.
- d. Prove triangles similar using AA, SAS, SSS Similarity Theorems.
- e. State and apply the relationship between parallel lines and proportional segments in triangles.

UNIT VI: Similarity, Ratios, and Proportions

Goal. The student will demonstrate the ability to analyze the effects of transformations.

Objectives - The student will be able to:

- a. Describe how transformations affect the properties of geometric figures.
- b. Identify line and rotational symmetry.
- c. Identify and construct geometric transformations including reflections, rotations, translations, and dilations.
- d. Construct transformations of figures on a coordinate plane.

UNIT VII: Circles and Inscribed Polygons

Goal. The student will demonstrate the ability to find one- and two- dimensional measurements relating to circles and polygons.

Objectives - The student will be able to:

- a. Identify parts of a circle.
- b. Apply relationships among inscribed angles, central angles, and arcs of circles.
- c. Calculate circumference, arc length, and area of a circle and a sector.
- d. Solve problems involving inscribed and circumscribed polygons.
- e. Identify and apply properties of tangents and secants to circles.

UNIT VIII: Surface area and Volume

Goal. The student will demonstrate the ability to find two- and three- dimensional measurements related to geometric solids.

Objectives - The student will be able to:

- a. Identify and classify solid figures.
- b. Calculate the volumes and surface areas of solid figures including composite figures.
- c. Compare linear dimensions, perimeters, surface areas, and volumes of similar figures.
- d. Apply formulas for surface area and volume to real-world situations.
- e. Explore nets of three-dimensional figures (optional).

UNIT IX: Right Triangles and Trigonometry

Goal. The student will demonstrate the ability to solve problems using properties of right triangles, including trigonometric ratios.

Objectives - The student will be able to:

- a. Simplify radicals.
- b. Solve problems involving right triangles and special right triangles (30-60-90 and 45-45-90).
- c. Describe and apply the relationships between the sides of special right triangles.
- d. Find the missing parts of a right triangle using trigonometric and inverse trigonometric functions.