

Geometry Essential Curriculum

Unit I: Fundamental Concepts and Patterns in Geometry

Goal: The student will demonstrate the ability to use the fundamental concepts of geometry including the definitions and coordinate geometry.

Objectives: The student will be able to:

- a. Explore and recognize geometric patterns.
- b. Identify and apply basic definitions of geometry.
- c. Identify and apply segment relationships including segment addition, midpoint of a segment, and the concept of betweenness.
- d. Graph points and lines in the coordinate plane.
- e. Calculate the distance between two points in the coordinate plane.
- f. Find the midpoint of a given segment in the coordinate plane.
- g. Identify and apply angle relationships including complementary, supplementary, vertical, and adjacent angles.

Unit II: Geometric Reasoning and Proof

Goal: The student will demonstrate the ability to apply geometric properties and relationships through inductive and deductive reasoning.

Objectives: The student will be able to:

- a. Use inductive reasoning to arrive at a valid conclusion.
- b. Analyze and rewrite conditional and biconditional statements.
- c. Find a counterexample to disprove a conjecture.
- d. Write the inverse, converse, and contrapositive of a conditional statement.
- e. Use point, line, and plane postulates to solve problems and prove theorems about segments and angles.
- f. Use deductive reasoning to prove a conjecture.
- g. Use the properties of equality in a geometric situation.
- h. Present valid arguments in the form of a two-column proof.
- i. Identify errors in mathematical and logical reasoning.

Unit III: Parallel and Perpendicular Lines

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

- Objectives: The student will be able to:
- a. Identify parallel and perpendicular lines and planes.
 - b. Draw and graph parallel lines, intersecting lines, and perpendicular bisectors.
 - c. Determine the measures of angles formed by parallel lines, perpendicular lines, and transversals.
 - d. Determine the slope and equation of a line parallel or perpendicular to a given line.
 - e. Prove statements and theorems using parallel and perpendicular lines and their converses.

Unit IV: Triangle Relationships and Triangle Congruence

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

- Objectives: The student will be able to:
- a. Classify triangles by their sides and by their angles.
 - b. Apply the Triangle-Angle Sum Theorem, the Isosceles Triangle Theorem and its converse, and the Exterior Angle Theorem.
 - c. Name corresponding parts of congruent polygons.
 - d. Prove triangles congruent using SSS, SAS, ASA, AAS, and HL Theorems.
 - e. Use congruent triangle to prove statements and theorems.
 - f. Use the Perpendicular Bisector Theorem and its converse.
 - g. Use the Angle Bisector Theorem and its converse.
 - h. Identify and apply the properties of the median, the altitude, and the perpendicular bisector of the sides of a triangle.
 - i. Identify and apply the properties of the midsegments of a triangle.
 - j. Use the Triangle Inequality Theorem and compare the side and angle measure in a triangle.

Unit V: Constructions

Goal: The student will demonstrate the ability to perform geometric constructions.

Objectives: The student will be able to:

- a. Construct a segment bisector, angle bisector, and perpendicular bisector.
- b. Construct a segment congruent to a given segment and an angle congruent to a given angle.
- c. Construct a line parallel to a given line through a given point.
- d. Construct a line perpendicular to a line at a given point and a line perpendicular from a given point to a line.
- e. Use the properties of construction to identify the center of a triangle or a circle.

Unit VI: Exploring Quadrilaterals

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

Objectives: The student will be able to:

- a. Identify regular and non-regular polygons.
- b. Describe the characteristics of a quadrilateral.
- c. Apply the properties of parallelograms.
- d. Justify that a quadrilateral is a parallelogram including coordinate proofs.
- e. Use the properties of special quadrilaterals.
- f. Investigate the family hierarchy of quadrilaterals.
- g. Calculate the area of triangles and quadrilaterals.

Unit VII: Transformation and Similarity

Goal: The student will demonstrate the ability to analyze the effects of transformations and identify and use similar polygons.

Objectives: The student will be able to:

- a. Perform geometric transformations including reflections, rotations, translations, and dilations.
- b. Describe how transformations affect the properties of geometric figures.
- c. Name the corresponding parts of similar figures.
- d. Apply the proportions to similar figures in real-world problems.
- e. Prove triangles similar using AA, SSS, and SAS Similarity Theorems.

Unit VIII: Investigating Right Triangles

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. State and apply the theorem involving the altitude to the hypotenuse as the geometric mean in right triangles.
- b. Define and apply the Pythagorean Theorem and its converse.
- c. Use the Pythagorean Theorem to develop and solve problems involving right triangles and special right triangles $(30-60-90)^\circ$ and $(45-45-90)^\circ$.
- d. Define sine, cosine, and tangent ratios in right triangles.
- e. Use the appropriate keystrokes on a graphing calculator to find the trigonometric ratios and measures of angles.
- f. Find the missing parts of a right triangle using the trigonometric ratios and inverse trigonometric ratios.
- g. Apply right triangle trigonometry to real-world situations.

Unit IX: Polygons and Circles

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

Objectives: The student will be able to:

- a. Find the measures of interior and exterior angles of polygons.
- b. Determine the perimeter and area of polygons.
- c. Determine the circumference, arc length and area of a circle and a sector.
- d. Find the area of similar figures.
- e. Compare the perimeter and area of congruent and similar figures.
- f. Apply the relationships among central angles, inscribed angles, and arcs of circles.
- g. Solve problems involving inscribed and circumscribed polygons.
- h. Apply the properties of tangency to a circle.

Unit X: Surface Area and Volume

Goal: The student will demonstrate the

Objectives: The student will be able to:

- a. Explore nets of three-dimensional figures.
- b. Calculate the volume and surface area of solid figures including composite figures.
- c. Compare linear dimensions, surface area, and volume of similar figures using ratios.
- d. Apply formulas for surface area and volume to real-world situations.

Unit XI: Algebra Review

Goal: The student will demonstrate the ability to apply algebraic skills necessary for success in Algebra II.

Objectives: The student will be able to:

- a. Solve linear equations.
- b. Solve quadratic equations by graphing, factoring, or the use of the quadratic formula.
- c. Solve systems of equations and inequalities.
- d. Simplify rational expressions.
- e. Simplify expressions using the laws of exponents.
- f. Solve equations involving the absolute value function.
- g. Simplify radical expressions.
- h. Write equations using function notation.