

C2.0 Geometry Unit 1: Constructions, Congruence, and Transformations

Topic	Course Overview
Topic 1: Foundations of Euclidean Geometry	<p>Students begin formalizing definitions of basic geometric figures while applying reasoning to complete geometric constructions. Emphasis is placed on the use of multiple tools to build understanding of why each construction works. These constructions, along with precise definitions and vocabulary, are precursors to work with proof later in this course.</p> <p><u>Concepts:</u></p> <ul style="list-style-type: none"> • Define, recognize, and describe the fundamental terms of Euclidean Geometry. • Copy a segment and copy an angle. • Construct a perpendicular bisector. • Bisect a segment and bisect an angle. • Construct a line parallel to a given line through a point not on the line.
Topic 2: Rigid Transformations	<p>Students apply their understanding of constructions and precise knowledge of basic geometric figures to experiment with rigid transformations in the coordinate plane. As students explore transformations with a variety of tools, they build a deep understanding of each rigid transformation and its relationship with functions from Algebra 1. Special relationships among transformations in the coordinate plane are examined and constructions of regular polygons drive the exploration of rotational and reflectional symmetries.</p> <p><u>Concepts:</u></p> <ul style="list-style-type: none"> • Define and identify examples and non-examples of rotations, reflections, and translations. • Describe and draw horizontal and vertical translations and write the associated function with inputs and outputs. • Describe and draw reflections. • Draw a reflection when given a rule and write a rule given a reflection. • Describe and draw rotations of multiples of 90 degrees clockwise and counterclockwise. • Draw a rotation when given a rule with inputs and outputs and write a rule for a given rotation. • Identify the degree of rotational symmetry and the number of lines of reflectional symmetry of polygons (rectangle, parallelogram, trapezoid, and other regular polygons). • Specify a sequence of transformations that will carry a given figure onto another. • Combine transformations and write the associated function. • Construct an equilateral triangle and describe its rotational and reflectional symmetry. • Construct a square and describe its rotational and reflectional symmetry. • Construct a regular hexagon and describe its rotational and reflectional symmetry.

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Topic 3: Congruence and Triangle	<p>Students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They begin by comparing examples of rigid and non-rigid transformations to establish that rigid transformations maintain congruency, but the congruency discussion quickly focuses to triangle congruence so that students have a familiar foundation for the development of formal proof. Development of formal proof is the emphasis of this learning sequence so that students can later apply understanding of proof to other geometric theorems.</p> <p><u>Concepts:</u></p> <ul style="list-style-type: none"> • Use the definition of congruence to explain why two figures are congruent. • Use the definition of congruence in terms of rigid transformations to determine if two figures are congruent. • Explore and apply Side Side Side (SSS), Side Angle Side (SAS), Angle Side Angle (ASA) and Angle Angle Side (AAS) criteria to prove triangle congruence. • Demonstrate why Side Side Angle (SSA) and Angle Angle (AA) are not sufficient criteria to prove triangles congruent. • Use triangle congruence criteria to determine if there is sufficient information to classify two triangles as congruent.
Topic 4: Proofs and Applications	<p>Students prove theorems using a variety of formats and solve problems about triangles, quadrilaterals, and other polygons. Precise geometric vocabulary and student knowledge of constructions, rigid transformations, and congruence are applied to prove geometric theorems.</p> <p><u>Concepts:</u></p> <ul style="list-style-type: none"> • Define, recognize and describe special angle relationships formed when lines are cut by a transversal. • Use special angle relationships to solve for missing angle measures. • Use angle relationships to solve for missing angle measures when parallel lines are cut by a transversal. • Construct a logical argument to develop a formal proof. • Create proofs in multiple ways to prove triangles are congruent. • Create formal proofs for triangle congruencies and corresponding parts. • Prove and apply points on a perpendicular bisector are equidistant from the segment's endpoints. • Prove and apply interior angles of a triangle have a sum of 180°. • Prove and apply opposite sides and opposite angles of a parallelogram are congruent. • Prove and apply the diagonals of a parallelogram bisect each other and its converse. • Prove and apply rectangles have congruent diagonals. • Prove and apply the medians of a triangle meet at a point. • Prove and apply the segment joining the midpoint of two sides of a triangle is parallel to the third side and half the length. • Prove and apply base angles of isosceles triangles are congruent and its converse (relationship between side lengths and angle measures).