



Geometry Level 1 - Unit D - Polygons

Unit Focus

We move from quadrilaterals to this unit which explores triangles and polygons and the measures of their interior and exterior angles, including "regular" polygons. Students are encouraged to see diagrams and shapes as compositions of smaller, often repeated, shapes. Students will learn the concept of "similar" polygons and the ratios of their corresponding sides, perimeters and areas.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. (CCSS.MATH.CONTENT.HSA.CED.A.1) - Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). (CCSS.MATH.CONTENT.HSG.CO.A.2) - Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. (CCSS.MATH.CONTENT.HSG.CO.A.3) - Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. (CCSS.MATH.CONTENT.HSG.CO.A.4) - Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. (CCSS.MATH.CONTENT.HSG.CO.A.5) - The dilation of a line segment is longer or shorter in the ratio given by the scale factor. (CCSS.MATH.CONTENT.HSG.SRT.A.1.B)	<i>Students will be able to independently use their learning to...</i> T1 manipulate equations/expressions or objects to create order and establish relationships. T2 draw conclusions about graphs, shapes, equations, or objects. T3 apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions. U2 Mathematicians examine relationships to discern a pattern, generalizations, or structure. U3 Mathematicians understand that placing a problem in a category gives one a familiar approach to solving it. U4 Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.	<i>Students will keep considering...</i> Q1 How can understanding a pattern help me? Q2 How does classifying bring clarity? Q3 How can constructing and deconstructing help me know what to do? Q4 Does this solution make sense?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 the sum of the measures of the angles of a triangle is 180 K2 the measure of an exterior angle of a triangle is equal to the sum of the remote interior angles K3 the Midline Theorem for triangles	<i>Students will be skilled at...</i> S1 using interior and exterior angles measures of a polygon to solve problems S2 solving regular polygon problems involving angles

Stage 1: Desired Results - Key Understandings

- Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. (CCSS.MATH.CONTENT.HSG.SRT.A.2)
- Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. (CCSS.MATH.CONTENT.HSG.SRT.A.3)
- Prove theorems about triangles. (CCSS.MATH.CONTENT.HSG.SRT.B.4)
- Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. (CCSS.MATH.CONTENT.HSG.SRT.B.5)
- Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)
- Attend to precision. (CCSS.MATH.MP.6)
- Look for and make use of structure. (CCSS.MATH.MP.7)

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- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)
- Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)

K4 the No Choice Theorem for triangles
K5 the sum of the interior angles of a polygon with n sides = $(n-2)180$
K6 the sum of the exterior angles of a polygon with n sides = 360 (regardless of n)
K7 the number of diagonals in a polygon with n sides = $n(n-3)/2$
K8 the corresponding sides of similar polygons are proportional and the corresponding angles are congruent
K9 AA~ for triangles
K10 the ratio of the perimeter of two similar polygons equals the ratio of any pair of corresponding sides
K11 if a line is parallel to one side of a triangle and intersects the other two sides, it divides those sides proportionally
K12 if three or more parallel lines are intersected by two transversals, the parallel lines divide the transversals proportionally
K13 if a ray bisects an angle of a triangle, it divides the opposite side into segments that are proportional to the adjacent sides
K14 Vocabulary: exterior angle, interior angle, pentagon, hexagon, heptagon, octagon, nonagon, decagon, dodecagon, pentadecagon, n -gon, regular polygon, concave, convex, exterior angle, interior angle, diagonal, similar, dilation, reduction, apothem

S3 applying the Midline Theorem
S4 using AAS to find triangles congruent
S5 solving problems involving the number of diagonals in a polygon
S6 identifying whether a pair of polygons is similar
S7 using proportional reasoning and congruent corresponding angles to find missing dimensions of similar polygons and solve proofs
S8 applying theorems involving proportionality to problems and proofs