Unit D - *Polygons*

Overview

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. Formal proofs are not done in this unit.

21st Century Capacities: Analyzing, Presentation

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP6 Attend to precision
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSA.CED.A.1
Create equations and inequalities in one variable and use them to solve problems.
CCSS.MATH.CONTENT.HSG.SRT.A.1.B
The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
CCSS.MATH.CONTENT.HSG.SRT.A.2
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.

Transfer:

Students will be able to independently use their learning in new situations to...

1. Manipulate equations/expressions or objects to create order and establish relationships. (Analyzing)
2. Draw conclusions about shapes and diagram s (Analyzing) (Presentation)
3. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem.

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.
2. Mathematicians examine relationships to discern a pattern, generalizations, or structure.
3. Mathematicians understand that placing a problem in a category gives one a familiar approach to solving it.
4. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can understanding a pattern help me?
B. How does classifying bring clarity?
C. How can constructing and deconstructing help me?
D. What do you see?

CCSS.MATH.CONTENT.HSG.SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. CCSS.MATH.CONTENT.HSG.SRT.B.4 Prove theorems about triangles. *CCSS.MATH.CONTENT.HSG.SRT.B.5* Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. CCSS.MATH.CONTENT.HSG.CO.A.2 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.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. CCSS.MATH.CONTENT.HSG.CO.A.4 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.5 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.	***Acquisition:***	
	Students will know… 1. The sum of the measures of the angles of a triangle is 180 2. The measure of an exterior angle of a triangle is equal to the sum of the remote interior angles 3. The Midline Theorem for triangles 4. The No Choice Theorem for triangles 5. The sum of the interior angles of a polygon with n sides = (n-2)180 6. The sum of the exterior angles of a polygon with n sides = 360 (regardless of n) 7. The number of diagonals in a polygon with n sides = n(n-3)/2 8. The corresponding sides of similar polygons are proportional and the corresponding angles are congruent 9. AA~ for triangles 10. The ratio of the perimeter of two similar polygons equals the ratio of any pair of corresponding sides 11. If a lines is parallel to one side oa a triangle and intersects the other two sides, it divides those sides proportionally 12. If three or more parallel lines are intersected by two transversals, the parallel lines divide the transversals proportionally 13. If a ray bisects an angle of a triangle, it divides the opposite side into segments that are proportional to the adjacent sides 14. 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	*Students will be skilled at…* 1. Using interior and exterior angles measures of a polygon to solve problems 2. Solving regular polygon problems involving angles 3. Applying the Midline Theorem 4. Using AAS to find triangles congruent 5. Solving problems involving the number of diagonals in a polygon 6. Identifying whether a pair of polygons is similar 7. Using proportional reasoning and congruent corresponding angles to find missing dimensions of similar polygons 8. Applying theorems involving proportionality