Unit D - *Polygons and Quadrilaterals*

Overview

In this unit, students learn first about polygons and then focus on quadrilaterals. Properties of quadrilaterals are introduced through various discovery activities in order to build a quadrilateral tree and to be able to classify the special quadrilaterals. Parallelograms are explored in further detail as students learn about sufficient conditions for parallelograms. Areas of quadrilaterals are examined, and coordinate plane geometry is used to classify quadrilaterals.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS	Transfer:
MP 1 Make sense of problems and persevere in solving them **MP6** Attend to precision **MP7** Look for and make use of structure	*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. 2. Draw conclusions about shapes and diagrams (Analyzing) 3. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem.

	Meaning:
CCSS.MATH.CONTENT.HSA.CED.A.1 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.*	

UNDERSTANDINGS: *Students will understand that:*	ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*
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.	A. How can understanding a pattern help me? B. How does classifying bring clarity? C. How can constructing and deconstructing help me know what to do?

CCSS.MATH.CONTENT.HSA.REI.B.3
Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

CCSS.MATH.CONTENT.HSA.REI.B.4
Solve quadratic equations in one variable.

CCSS.MATH.CONTENT.HSA.REI.B.4.B
Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the

quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

CCSS.MATH.CONTENT.HSF.TF.A.3
(+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for x, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.

CCSS.MATH.CONTENT.HSG.CO.C.11
Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*

Use coordinates to prove simple geometric theorems algebraically

CCSS.MATH.CONTENT.HSG.GPE.B.4
Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*

CCSS.MATH.CONTENT.HSG.GPE.B.5
Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Acquisition:	
Students will know…	*Students will be skilled at…*
1. The sum of the interior angles of a polygon with n sides = (n-2)180 2. The sum of the exterior angles of a polygon with n sides = 360 (regardless of n) 3. The definition of each quadrilateral 4. Properties of special quadrilaterals and applications of those properties 5. The properties of parallelograms in depth 6. All area formulas are based on length times width (with some modifications) 7. Vocabulary: regular polygon, concave, convex, exterior angle, interior angle, diagonal, quadrilateral, parallelogram, rectangle, rhombus, square, trapezoid, isosceles trapezoid, kite	1. Finding interior and exterior angles measures of a polygon 2. Solving regular polygon problems involving angles 3. Determining the most descriptive name for a polygon 4. Applying the properties of parallelograms 5. Writing formal proofs for properties of parallelogram 6. Applying the properties of special quadrilaterals 7. Determining measurements of segments and angles in quadrilaterals based on definitions and properties 8. Proving info about special quadrilaterals on the coordinate plane