Unit 09 - Quadrilaterals & Other Polygons

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 3**
Length: **2-3 weeks**
Status: **Published**

Brief Summary of Unit

Students should be able to recall some information about quadrilaterals and polygons from middle school. This chapter will focus on more specific shapes within the quadrilateral family and investigate special properties of these shapes. Students will prove these properties through proofs and apply algebraic equations to solve real-life problems.

Revision Date: July 2024

Standards

ELA.L.KL.9–10.2.A	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
MATH.9-12.G.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.
MATH.9-12.G.GPE.B.4	Use coordinates to prove simple geometric theorems algebraically.
ELA.SL.PE.11–12.1.A	Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.

Enduring Questions

- How can you identify a trapezoid and an isosceles trapezoid?
- How do you calculate the sum of exterior angles of a polygon? Or just one exterior angle of a regular polygon?
- How do you calculate the sum of interior angles of a polygon? Or just one interior angle of a regular polygon?
- How do you determine the most specific name of a quadrilateral given four points on a coordinate plane?
- How do you determine the most specific name of a quadrilateral given markings on a diagram?
- How is a kite similar to a rhombus?

- How is a rhombus, rectangle, and square related to a parallelogram?
- What are the five characteristics of a parallelogram?
- What does the Trapezoid Midsegment Theorem state?
- What information is needed to prove a prallelogram?
- What is a diagonal in a polygon?

Essential Understandings

- Explain the properties of special parallelograms to solve for unknown sides and angles.
- Find angle measures of polygons using various properties and theorems.
- Prove and use properties of parallelograms to solve for unknown sides and angles.
- Prove that a quadrilateral is a parallelogram.
- Use properties of trapezoids and kites to find measures.

Students Will Know

- How to describe properties of parallelograms.
- How to find angles of polygons.
- How to identify special quadrilaterals.
- How to use properties of parallelograms.

Students Will Be Skilled At

- Explaining how special parallelograms are related.
- Explaining the hierarchy of quadrilaterals.
- Finding interior angle and exterior angle measures of a polygon.
- Finding missing lengths that make a quadrilateral a parallelogram.
- Finding missing measures of special parallelograms.
- Finding the length of the midsegment of a trapezoid.
- Finding the sum of the interior angle measures of a polygon.
- Identifying features of a parallelogram.
- Identifying special parallelograms in a coordinate plane.
- Identifying special parallelograms.
- Identifying trapezoids and kites.
- Proving and using properties of parallelograms.
- Proving that a quadrilateral is a parallelogram.
- Showing that a quadrilateral in the coordinate plane is a parallelogram.
- Solving problems involving parallelograms in the coordinate plane.
- Using properties of trapezoids and kites to solve problems.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Begin by defining a diagonal and drawing them for a polygon. Discover the Polygon Interior Angles Theorem. Also, use this theorem to determine the number of sides based on the sum of the interior angles. Define a regular polygon, and find individual interior angles. Discover the Polygon Exterior Angles Theorem, and again use this theorem to determine he number of sides based on the sum of the exterior angles. Relate interior angles and exterior angles of a polygon.
- Recall the definition of a parallelogram, and ask students for other distinguishing characteristics (there should be four, in addition to the definition). Fill in any gaps of knowledge. Begin using these properties in proofs.
- Identify that all the properties of a parallelogram can also prove itself, therefore there are converses for the four characteristics and the definition. Use these in proofs to prove a quadrilateral is a parallelogram.
- Students will likely need additional time to practice using parallelogram properties and their converse in proofs. Also, weave in word problems and algebraic equations.
- Recall other special quadrilaterals, beginning with the rest of the ones related to parallelogram: rhombus, rectangle, and square. Identify their distinguishing characteristics. Use these properties in

proofs and algebraic problems.

- Recall trapezoid and kite, now noticing the difference from the rest of the shapes. Be sure to point of the similarities of rhombi and kites. Also mention that a trapezoid could be an isosceles trapezoid. Discuss the properties of these new shapes, and how to use them algebraically and in proofs. Introduce the Trapezoid Midsegment Theorem, and apply this algebraically.
- There should be a day to place four points on a coordinate plane for students to determine what type of quadrilateral it is. You may need to briefly review distance formula and slope formula. Also on this day, give students a generalized quadrilateral with various markings and the goal is to determine the most specific name based on the given information.

Materials

Core instructional materials: Core Book List including Big Ideas Math Common Core Geometry

Supplemental materials: Khan Academy, Edia, DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activiites
- Teacher created notes
- Whiteboard tables

Suggested Strategies for Modifications

Possible accommodations/modification for Geometry