I Spy A . . . Four-Sided Polygon:
Quadrilaterals and Their Role in the Real World

This unit will enable students to distinguish between the different types of quadrilaterals, allowing them to classify them based on appearances and other properties. Students will be able to find similarities and differences between various quadrilaterals and their respective properties. Being able to compare and contrast these polygons will allow students to better create associations between other concepts and ideas, both mathematical and real-world ideas. Students will use the properties of quadrilaterals to verify other assertions through proofs and reasoning processes, allowing them to explore how to make decisions and draw conclusions about other situations, both in mathematics and in the real world. Students will understand that mathematical concepts, ideas, and processes can be used outside of the classroom throughout their entire lives.

Big Ideas
- Reasoning Skills
- Characteristics, Similarities, and Differences
- Geometry in the Real-World

Enduring Understandings
- We use reasoning processes every day in order to make decisions and draw conclusions, and there is no one right way to solve a problem.
- Every object has unique and defining characteristics that allow us to describe it.
- Finding similarities and differences between objects and concepts helps us to understand each concept individually and draw conclusions.
- Geometry is found throughout the real-world.

Objectives
- Observe quadrilaterals and make conclusions about their distinguishing characteristics.
- Classify quadrilaterals based on discovered properties, and explain similarities and differences.
- Find area, perimeter, and other dimensions and measurements of quadrilaterals.
- Construct proofs of theorems that describe quadrilateral properties.
- Identify instances and purposes of quadrilaterals in the real world.
- Work as a team to create and present a design using quadrilaterals.

Culminating Assessments
- Performance Task: Students will work in teams to create either a quilt design or a tile floor design using different quadrilaterals. Students will use area formulas to determine total areas needs for each material and pitch their design, including costs, to a team of executives.
- Unit Test: Students will demonstrate proficiency in identifying quadrilaterals and determining perimeter, area, and other features on a unit test.

Know's

Vocabulary

- Polygon
- Quadrilateral
- Parallelogram
- Rhombus
- Square
- Rectangle
- Kite
- Trapezoid
- Isosceles trapezoid
- Consecutive angles
- Diagonal
- Base angles

Theorems

- Opposite sides of a parallelogram are congruent.
- Opposite angles of a parallelogram are congruent.
- The diagonals of a parallelogram bisect each other.
- Each diagonal of a rhombus bisects two angles of the rhombus.
- The diagonals of a rhombus are perpendicular.
- The diagonals of a rectangle are congruent.
- The base angles of an isosceles trapezoid are congruent.
- The diagonals of an isosceles trapezoid are congruent.
- The diagonals of a kite are perpendicular.

Formulas

- Area of a rectangle: $A = bh$
- Area of a parallelogram: $A = bh$
- Area of a rhombus: $A = (1/2)(d_1)(d_2)$
- Area of a kite: $A = (1/2)(d_1)(d_2)$
- Area of a trapezoid: $A = (1/2)(h)(b_1 + b_2)$

This unit plan was developed by Jessica Thomas.

Do's

- Classify quadrilaterals using properties and definitions (parallelism, congruencies).
- Find dimensions and angle measurements of a quadrilateral using its properties and definitions.
- Find areas of quadrilaterals using formulas.
- Use different proof methods to draw and prove conclusions.
- Incorporate theorems and definitions when working with quadrilaterals and proofs.
- Identify geometric shapes in the real-world and see their practical applications.
- Discover properties of quadrilaterals by finding dimensions and measurements of several and drawing conclusions.
- Use rulers and protractors to take measurements with accuracy and precision.
- Understand and explain the similarities and differences between quadrilaterals.
- Use the properties of parallel lines, transversals, and triangles to prove theorems about quadrilaterals.
- Combine quadrilaterals to make a visually appealing design.
- Use spreadsheet software and other technology to calculate costs.
- Present projects with enthusiasm and professionalism.
- Work cooperatively with partners and in a group.
- Take adequate notes in an orderly fashion.

Culminating Assessment

You are a tile mason, and your contracting company has been asked to design a pattern for the floor in the entrance hall of a new school. Your floor design must contain at least three different quadrilaterals, but other polygons may be included as well; you must create a colorful representation of your design (using whatever materials you desire) so that the principal of the school has an understanding of what the finished floor will look like. You must calculate the area of each of the polygons you use in order to determine how many tiles of each color or design will be used in the floor design; use this information to determine how much the floor will cost in total. This information should be displayed in a spreadsheet for presentation to the school principal. Your final presentation, which will be presented to the class, should include a partial or full depiction of the design, accurate dimensions and areas of each quadrilateral or other polygons, and accurate material costs. Your floor design can include tiles of any dimension and must cover an area of at least 100 square feet.

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