Focus Area—Topic D
Module 5: Addition and Multiplication with Volume and Area

Defining Quadrilaterals Based on Their Attributes

Words to Know:

<table>
<thead>
<tr>
<th>Word</th>
<th>Attribute/Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezoid</td>
<td>a quadrilateral with only one pair of opposite sides parallel</td>
</tr>
<tr>
<td>Parallelogram</td>
<td>a quadrilateral with at least one pair of opposite sides parallel</td>
</tr>
</tbody>
</table>

Most mathematicians and the Common Core Progression Document define a trapezoid using the second description which is the characteristics the student will use in this module when talking about the attributes of a trapezoid.

**Example Questions with Answers:**

1. When can a quadrilateral be called a parallelogram? A quadrilateral can be called a parallelogram when both pairs of opposite sides are parallel.

2. When can a trapezoid also be called a parallelogram? A trapezoid can be called a parallelogram when it has more than one pair of parallel sides.

**Things to Know!**

<table>
<thead>
<tr>
<th>Attribute/Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plane</td>
<td>flat surface that extends infinitely in all directions</td>
</tr>
<tr>
<td>Polygon</td>
<td>closed two-dimensional figure made up of line segments</td>
</tr>
<tr>
<td>Line Segment</td>
<td>a straight path that connect two points</td>
</tr>
<tr>
<td>Quadrilateral</td>
<td>a polygon with four sides</td>
</tr>
<tr>
<td>Parallel</td>
<td>two lines in a plane that will never intersect</td>
</tr>
<tr>
<td>Perpendicular</td>
<td>two lines are perpendicular if they intersect, and any of the angles formed are 90° angles</td>
</tr>
<tr>
<td>Diagonals</td>
<td>straight line joining two opposite corners (vertices) of a shape</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>series of ordered grouping of shapes</td>
</tr>
</tbody>
</table>

**OBJECTIVES OF TOPIC D**

- Draw trapezoids to clarify their attributes, and define trapezoids based on those attributes.
- Draw parallelograms to clarify their attributes, and define parallelograms based on those attributes.
- Draw rectangles and rhombuses to clarify their attributes, and define rectangles and rhombuses based on those attributes.
- Draw kites and squares to clarify their attributes, and define kites and squares based on those attributes.
- Classify two-dimensional figures in a hierarchy based on properties.
- Draw and identify varied two-dimensional figures from given attributes.
Rhombus

Attributes/Properties: a quadrilateral, all sides are equal in length, and opposite sides are parallel.

The attributes indicate that a rhombus can also be classified as a parallelogram and all parallelograms are also classified as a trapezoid.

Rectangle

Attributes/Properties: a quadrilateral, 4 right angles, and opposite sides are parallel.

Since opposite side are parallel, we can classify the rectangle as a parallelogram and a trapezoid.

Square

Attributes/Properties: a quadrilateral, 4 right angles, 4 sides of equal length, and opposite sides are parallel.

Since a square has 4 right angles, it can also be classified as a rectangle.
Since a square has 4 sides of equal length, it can also be classified as a rhombus.
The opposite sides are parallel so a square can also be classified as a parallelogram. If it is classified as a parallelogram then it is also classified as a trapezoid.

Kite

Attributes/Properties: a quadrilateral and adjacent sides or sides next to each other are equal.

Example Questions/Problem with Answers:
1. When can a trapezoid also be called a rhombus?
   A trapezoid can be called a rhombus when all sides are equal in length.

2. When can a parallelogram also be called a rectangle?
   A parallelogram can be called a rectangle when all angles measure 90°.

3. A rhombus has a perimeter of 100 cm. What is the length of each side?
   Since all sides of a rhombus are equal in length, I divided 100 by 4 sides which gives me a length of 25 cm. So the length of each side of the rhombus is 25 centimeters.

Problems: Look at the two shapes. Can these shapes be classified as a kite?
The specific name for each shape is a square and a rhombus. Both have 4 equal sides. Therefore the adjacent sides are equal. So they can be classified as a kite.

Can a kite ever be a parallelogram? Yes, since a square and a rhombus can be classified as a kite and these shapes do have opposite sides that are parallel, then a kite at times can be classified as a parallelogram.