Classify Quadrilaterals

15.1 Essential Question
How can you use right angles and parallel sides to help you classify quadrilaterals?

Texas Essential Knowledge and Skills

- **TEKS**
  - **Geometry and Measurement—3.6.A**
    - Classify and sort two- and three-dimensional solids, including cones, cylinders, spheres, triangular and rectangular prisms, and cubes, based on attributes using formal geometric language.
  - **3.6.B**
    - Use attributes to recognize rhombuses, parallelograms, trapezoids, rectangles, and squares as examples of quadrilaterals and draw examples of quadrilaterals that do not belong to any of these subcategories.

- **MATHEMATICAL PROCESSES**
  - **3.1.D** Communicate mathematical ideas and reasoning
  - **3.1.F** Analyze mathematical relationships

Are You Ready?
Access Prior Knowledge

Use the Are You Ready? 15.1 in the Assessment Guide to assess students’ understanding of the prerequisite skills for this lesson.

Vocabulary

- angle, vertex, right angle, parallel lines, quadrilateral, trapezoid, parallelogram, rectangle, square, rhombus

Go to Multimedia eGlossary at thinkcentral.com

Lesson Opener

Making Connections

Invite students to tell you what they know about figures.

What figures do you remember learning about? (Triangle, square, circle, etc.)

What do squares, rectangles, rhombuses, and trapezoids have in common? (They have 4 sides and 4 angles.)

Using the Digital Lesson

You may wish to have large pictures of a rectangle, rhombus, square, and trapezoid to use as visual aids when discussing the figures.

Learning Task

What is the problem the students are trying to solve? Connect the story to the problem.

- What do you know about the shape of the sign? (It has 4 sides and 4 angles.)
- Are any of the sides equal in length? (Yes)
- What are other characteristics about the figure that you notice? (Answers may vary.)

Literacy and Mathematics

Choose one or more of the following activities.

- Have students use dot paper to draw 5 to 10 four-sided figures. Have them write about the characteristics that they notice about their figures.
- Have students draw as many road signs as they can. Have students describe the characteristics of each sign.

Resources

For the student:

- Interactive Student Edition provides students with an interactive learning environment!
- Math on the Spot Video Tutor
- iTools Virtual Manipulatives
- Soar to Success Math

For the teacher:

- Digital Management Center organizes program resources by TEKS!
- eTeacher Edition
- Online Assessment System

Lesson 15.1 481A
Unlock the Problem

This lesson lays the foundation for classifying and measuring angles in later grades.

- What do we call a plane figure with straight sides that are line segments? A polygon
- How do you know that two of the angles in Jason’s polygon are right angles? You can compare the angles to the corner of a sheet of paper.
- If you rotate Jason’s figure so the square corners are both on the bottom or both on the top, are they still right angles? Explain. Yes; possible explanation: changing the position of the angle will not change the type of angle.
- How would you describe the other angles in Jason’s polygon? Possible answer: one angle is greater than a right angle and one angle is less than a right angle.

Review with students the meaning of the word parallel.

- Who can give a real-world example of parallel lines? Possible answer: railroad tracks, steps on a ladder, chains on a swingset
- Why can’t parallel lines ever cross? The lines are always the same distance apart.
- Why aren’t the blue and pink sides of Jason’s shape parallel? The lines cross or meet at a right angle.
- How could you change the shape so there would be 2 pairs of parallel sides? Make the blue side as long as the green side and the orange side as long as the pink side.

Differentiated Instruction

ELL Language Support

Strategy: Explore Context

Materials: pairs of things such as shoes, socks, gloves

- Students use prior knowledge to understand expressions.
- Explain that a pair is two of something. Point out things that come in pairs: a pair of shoes, a pair of socks, or a pair of gloves.
- Show two gloves. Here is one pair of gloves. How many gloves are there? 2
- Add two more gloves. Here are two pairs of gloves. How many gloves are there now? 4
- Show students a rectangle and discuss the pairs of parallel sides. Help students see that there are two sides in each pair.
Classify Quadrilaterals

Quadrilaterals are named by their sides and their angles.

### Describe quadrilaterals.

<table>
<thead>
<tr>
<th>Quadrilateral</th>
<th>Sides</th>
<th>Angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezoid</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Parallelogram</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Rectangle</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Square</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Rhombus</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

### COMMON ERRORS

**Error** Students may not identify a square as a rectangle or a rhombus.

**Example** Students may not remember the attributes of a rectangle or a rhombus when identifying possible names for a square.

**Springboard to Learning** Review the properties of a square, a rectangle, and a rhombus. Point out that a square is a special kind of rectangle and a special kind of rhombus.

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**Materials:** ruler, Dot Paper (see eTeacher Resources)

- Write the following directions on the board and have students draw each shape on square dot paper.
  1. Draw a quadrilateral with 2 right angles and exactly 1 pair of opposite sides that are parallel.
  2. Draw a quadrilateral with 2 pairs of opposite sides that are parallel and 2 angles that are greater than a right angle.
- Then have students draw another quadrilateral and write directions for how to draw it. Possible directions: Draw a quadrilateral with 4 right angles and all sides of equal length.

Go to thinkcentral.com for additional enrichment activities in the Enrich Activity Guide.
Share and Show
The first three problems connect to the learning model. Have students use the MathBoard to explain their thinking.
Use the checked exercises for Quick Check.

RtI Quick Check ✓
IF a student misses the checked exercises
THEN Differentiate Instruction with RtI Tier 1 Lesson 72

Problem Solving
H.O.T. Problems
Exercises 6–9 require students to analyze attributes of quadrilaterals.
Problem 11 requires students to visualize which quadrilaterals can be named, given the properties listed.

Go Deeper
To extend students’ thinking, have students write the name of a quadrilateral and then write a description of it in their own words. Tell them to be sure to write enough information so that if anyone draws it using the description, they will draw the correct figure. Then have volunteers read their descriptions while other volunteers identify the figures.

Math on the Spot Video Tutor
Through the Math on the Spot Video Tutor, students will be guided through an interactive solving of this type of H.O.T. problem. Use this video to also help students solve the H.O.T. problem in the Interactive Student Edition. With these videos and the H.O.T. problems, students will build skills needed in the TEXAS assessment.
Math on the Spot videos are in the Interactive Student Edition and at thinkcentral.com.

Differentiated Instruction
RtI RtI Tier 1 Lesson 72
Enrich 69

Share and Show
Look at the quadrilateral at the right.
1. How many right angles are in the quadrilateral? __________ right angles
2. Which sides appear to be parallel? a and c, b and d
3. Name the quadrilateral. __________

Circle all the words that describe the quadrilateral.
4. __________
5. __________

Problem Solving
R.O.T. Analyze Write all or some to complete the sentence for 6–9.
6. The opposite sides of __________ rectangles are parallel.
7. __________ sides of a rhombus are the same length.
8. Some __________ are squares.
9. All __________ have 1 pair of opposite sides that are parallel.
10. Communicate I am a quadrilateral that has no right angles and 4 sides that are of equal length. What figure am I?
   __________

R.O.T. Multi-Step I am a polygon that has 4 sides and 4 angles. All of my angles are right angles. Circle all the figures that I could be.
   __________
   __________
   __________

Quadrilateral Riddles
Read the riddles and name the plane figure that is being described.
1. I am a quadrilateral with exactly 1 pair of opposite sides that are parallel. What shape am I? __________
2. I am a quadrilateral with 2 pairs of opposite sides that are parallel. What shape am I? __________
3. I am a quadrilateral with 2 pairs of opposite sides that are parallel. What shape am I? __________
4. I am a quadrilateral with 4 sides that are of equal length and 4 right angles. What shape am I? __________
   Possible answers: square, rhombus
5. I am a quadrilateral with 4 sides and 4 angles. All of my angles are of equal length and 2 pairs of opposite sides are parallel. What shape am I? __________
   Possible answers: rectangle, square
6. I am a polygon with 6 sides and 6 angles. I have 2 pairs of opposite sides that are parallel. What is the shape? __________
   Possible answers: parallelogram, trapezoid

Enrich 69

Name __________

Classify Quadrilaterals
You can classify quadrilaterals by their sides and by their angles.

- 2 pairs of opposite sides that are parallel
- 4 sides that are of equal length
- 4 right angles

How can you classify the quadrilateral?
If having 1 pair of sides that are parallel. The lengths of all sides are not equal, so, the quadrilateral is trapezoid.
Circle all the words that describe the quadrilateral.
1. square
2. rhombus
3. rectangle
4. parallelogram

Quadrilateral Riddles
Read the riddles and name the plane figure that is being described.
1. I am a quadrilateral with exactly 1 pair of opposite sides that are parallel. What shape am I? __________
2. I am a quadrilateral with 2 pairs of opposite sides that are parallel. What shape am I? __________
3. I am a quadrilateral with 2 pairs of opposite sides that are parallel. What shape am I? __________
4. I am a quadrilateral with 4 sides that are of equal length and 4 right angles. What shape am I? __________
5. I am a quadrilateral with 4 sides and 4 angles. All of my angles are of equal length and 2 pairs of opposite sides are parallel. What shape am I? __________
6. I am a polygon with 6 sides and 6 angles. I have 2 pairs of opposite sides that are parallel. What is the shape? __________
   Possible answers: rectangle, square
7. I am a quadrilateral with 4 sides that are of equal length. A square is also a rectangle because it has 2 pairs of opposite sides that are parallel and 2 pairs of sides that are of equal length. __________
12. While playing football after school, Jesse notices that the distance marker contains a quadrilateral with one pair of opposite sides that are parallel. What type of quadrilateral is it?
- A rectangle
- B trapezoid
- C square
- D rhombus

13. Dean makes a pattern using 10 square tiles. How many pairs of opposite sides are parallel in the 10 square tiles?
- A 20
- B 10
- C 40
- D 0

14. Multi-Step Carina is using scraps of fabric to make a quilt. How many of the fabric scraps are in the shape of rhombuses?
- A 1
- B 2
- C 0
- D 3

15. What is a true statement about the quadrilateral at the right?
- A There is 1 right angle.
- B There are 4 right angles.
- C There are no right angles.
- D There are 2 right angles.
Lesson Check

9. Lily makes an art poster that has exactly one pair of opposite sides that are parallel and 2 sides that are the same length. What figure is Lily’s poster?
   - A trapezoid
   - B rectangle
   - C rhombus
   - D parallelogram

10. Desmond draws a polygon that has 4 sides that are the same length and no right angles. How can Desmond classify the polygon he drew?
    - A square
    - B rhombus
    - C rectangle
    - D parallelogram

11. Kara makes the kite shown at the right from 4 triangles. What is the shape of Kara’s kite?
    - A square
    - B parallelogram
    - C rhombus
    - D quadrilateral

12. Multi-Step Ben is making cutouts to use in an art design. How many of the cutouts have the shape of a rectangle?
    - A 5
    - B 2
    - C 4
    - D 3

Homework and Practice

Use the Homework and Practice pages to provide students with more practice on the concepts and skills of this lesson.