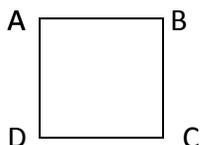


## Classifying Quadrilaterals

### Student Probe

In quadrilateral ABCD,  $AB=BC=CD=DA$  and  $m\angle A = m\angle B = m\angle C = m\angle D = 90^\circ$ .

Is Quadrilateral ABCD a rectangle? How do you know?



Answer: Yes, because it is a quadrilateral with 4 right angles.

### Lesson Description

This lesson is intended to help students develop an understanding that attributes of a category also belong to all members of a subcategory. This lesson uses the attributes of quadrilaterals to develop this concept.

### Rationale

The study of geometry is dependent upon deductive reasoning and syllogism. Student success in geometry, evidenced by van Hiele's work, is dependent upon students' understanding of spatial ideas. Before students can be successful in a rigorous geometry course, they must be able to make use of informal deduction, and make sense of the relationships among geometric objects. This lesson provides students with opportunities to make sense of quadrilaterals and their properties.

### Preparation

Prepare a set of standard quadrilateral shapes for each student. The shapes are found in the Guess My Rule Cards handout.

### At a Glance

What: Identifying attributes of quadrilaterals

Common Core Standard: CC.5.G.3.

Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

Mathematical Practices:

Construct viable arguments and critique the reasoning of others.

Look for and make use of structure.

Who: Students who do not recognize defining attributes of geometric figures

Grade Level: 5

Prerequisite Vocabulary: rectangle, square, trapezoid, parallelogram, rhombus, quadrilateral, attribute, right angle, parallel, congruent

Delivery Format: Small Groups of 2 to 3

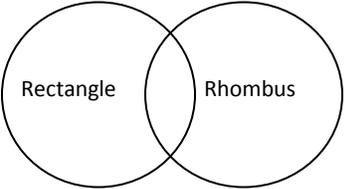
Lesson Length: 30 Minutes

Materials, Resources, Technology: Pre-cut shapes

Student Worksheets: [Guess My Rule Cards](#) (.pdf)

## Lesson

The teacher says or does...	Expect students to say or do...	If students do not, then the teacher says or does...
1. We are going to work with quadrilaterals today. Sort all of the quadrilaterals out of your set and put the rest away. What are quadrilaterals?	Polygons with exactly four sides.	We will only be using cards numbered 13-27. Put the rest of the cards away for now.
2. Do all these figures look the same? How are they alike? How are they different?	No Answers may vary.	
3. Look at cards 18, 21 and 24. How are they alike? How are they different?	They have 4 right angles. 18 and 21 have 4 congruent sides, but 24 does not have 4 congruent sides.	Prompt students.
4. We call these quadrilaterals rectangles. Rectangles must have 4 right angles. They may have 4 congruent sides, but they do not have to.		
5. Look at cards 18, 21, 23, 26 and 27. How are they alike? How are they different?	They have 4 congruent sides, but 23, 26 and 27 do not have 4 right angles.	
6. Are these rectangles? How do you know?	No Rectangles must have 4 right angles.	
7. We call these rhombuses. A rhombus is a quadrilateral that has 4 congruent sides. They may have 4 right angles, but they don't have to.		
8. Cards 18 and 21 belong to both categories. What do we know about them?	They have 4 right angles and they have 4 congruent sides.	Prompt students.
9. So they belong to what categories?	Rectangles and rhombuses	Prompt students.

The teacher says or does...	Expect students to say or do...	If students do not, then the teacher says or does...
10. In fact, these are very special quadrilaterals. They are called squares.		
11. Complete the following statements: All rectangles ____. All rhombuses ____. All squares ____.	...have 4 right angles. ...have 4 congruent sides. ...have 4 right angles AND 4 congruent sides.	Prompt students.
12. If we make a stack of all the rectangle cards, do the squares belong in the stack? How do you know?	Yes  All squares are rectangles.	Do squares have four right angles?
13. If we make a stack of all the rhombus cards, do the squares belong in the stack? How do you know?	Yes  All squares are rhombuses.	Do squares have four congruent sides?
14. Draw a Venn diagram on the board and have students place the card numbers in the appropriate areas.    So squares are both rectangles and rhombuses.	Cards 22 and 24 are rectangles only. Cards 23, 26, and 27 are rhombuses only. Cards 18 and 21 are both rectangles and rhombuses (squares) and should be placed in the intersection.	Think about our stacks of cards. Which cards go in both stacks?
15. If we make a stack of all the squares, do all of the rectangle cards belong in the stack? How do you know?	No.  Card 22 (or 24) is a rectangle, but it is not a square.	What about Card 22?
16. If we make a stack of all the squares, do all of the rhombuses belong in the stack? How do you know?	No.  Card 18 (or 23 or 27) is a rhombus, but not a square.	What about Card 18?

The teacher says or does...	Expect students to say or do...	If students do not, then the teacher says or does...
17. Let's make a group of all the parallelograms. What are parallelograms?	Quadrilaterals with opposite sides parallel.	We will only be using cards numbered 13, 18, and 21-27 now. Put the rest of the cards away for now.
18. Does your new group contain all of the rectangles? Does it contain all of the rhombuses? Does it contain all of the squares?	Yes. Yes. Yes.	
19. Are all rectangles parallelograms? Are all rhombuses parallelograms? Are all squares parallelograms?	Yes. Yes. Yes.	
20. What does that tell us about rectangles, rhombuses, and squares?	Their opposite sides are parallel.	Prompt students if necessary.
21. Repeat groupings using combinations of parallelograms, trapezoids, kites, etc.		

### Teacher Notes

None

### **Variations**

Classifications of triangles or other polygons can be used.

### **Formative Assessment**

Marcus said that his card showed a polygon that was a rectangle and a rhombus. What other names can we call his polygon?

Answer: quadrilateral, parallelogram, square

## References

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