

CONSTRUCTING TASK: PROPERTIES OF QUADRILATERALS

Adapted from Property Lists for Quadrilaterals Van de Walle Activity 8.8

STANDARDS FOR MATHEMATICAL CONTENT

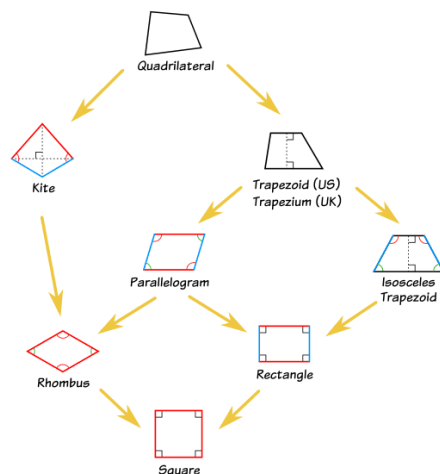
MCC3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Throughout this unit, the goal for third grade students is to begin to understand that quadrilaterals are all four sided closed polygons. While angles and lines have not been studied yet (this will be addressed in 4th grade standard CCM4.G.1), it is important for students to begin to see that the angles can be square (right), skinny (acute) or fatter than a square (obtuse). Use index cards, set squares, or corners of paper to compare angles. Accept terms students use as a teachable moment, when appropriate. The same applies with talking about the sides. Students may say opposite sides or the sides that run into each other. Within the broad category of quadrilaterals are trapezoids, parallelograms, rhombuses, rectangles, and squares. Through many activities, students need to begin to understand the categories of two-dimensional shapes (see Van de Walle page 221 for descriptions).



For Teacher Reference ONLY – Taken from

<http://www.regentsprep.org/regents/math/geometry/GP9/LQuad.htm>

Quadrilateral: A quadrilateral is any four sided figure. Do not assume any additional properties for a quadrilateral unless you are given additional information.

Trapezoid: A trapezoid has **ONLY ONE** set of parallel sides. When proving a figure is a trapezoid, it is necessary to prove that two sides are parallel and two sides are not parallel

Parallelogram: A parallelogram has 2 sets of parallel sides, 2 sets of congruent sides, opposite angles congruent, consecutive angles supplementary, diagonals bisect each other and the diagonals form 2 congruent triangles

Rectangle: The rectangle has all of the properties of the parallelogram, **PLUS** 4 right angles, and diagonals congruent

Rhombus: The rhombus has all of the properties of the parallelogram, **PLUS** 4 congruent sides, diagonals bisect angles, diagonals perpendicular

Square: The square has all of the properties of the parallelogram **AND** the rectangle **AND** the rhombus.

ESSENTIAL QUESTIONS

- Is it possible for a square to be a rectangle?
- Why do some quadrilaterals look so much alike?
- Is a rectangle a rhombus?
- Can some shapes be called other names?

MATERIALS

- Student Recording Sheet
- Index Cards (used to compare angles and sides)

GROUPING

Partner or Group

TASK DESCRIPTION, DEVELOPMENT , AND DISCUSSION

In this task, students will look at examples of rhombuses, rectangles, and squares to make property lists of quadrilaterals. Students will use the index card to check angles, compare side lengths and draw lines if needed. Encourage students to use “at least” when describing how many of something the shape has. For example, a rectangle has at least 4 square corners. Have students compare sides (length), and angles (square, smaller than square, larger than square). Some students may begin to see diagonals and symmetries of the shapes. Have groups share what they discovered together (remember that defending arguments and critiquing the reasoning of others is a major part of mathematic instruction!) and create a class list for each shape.

FORMATIVE ASSESSMENT QUESTIONS

- Did you notice anything particular about squares?
- How do you know that a quadrilateral is a rhombus or a rectangle?
- Why do you think that a rectangle, rhombus, and a square are all parallelograms?
- Is a trapezoid also a parallelogram?

DIFFERENTIATION

Extension

- As this task exists currently, it is considered to be at level 1 of the van Hiele geometric thinking, which is appropriate for third grade. According to Van de Walle, most fourth and fifth graders will still be at a level 0 or 1. Students that need an extension might consider doing Activity 8.11 called Minimal Defining Lists on page 230 or Activity 8.12 called True or False? On page 231 in the 3-5 Van de Walle resource book.

Intervention

- This task will be difficult for the majority of your students. By working with a partner, the struggling learner can begin to understand that some shapes fit into several categories because of the properties that they share. For instance, a square is a rectangle, a rhombus, a parallelogram and a quadrilateral because it shares properties. Many examples may need to be provided for the struggling learner. Technology can provide many opportunities for the student. See Technology Connections.

TECHNOLOGY CONNECTIONS

- <http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html> - allows students to move corners to make sizes.
- <http://www.interactivestuff.org/match/maker.phtml?featured=1&id=24> – matching game
- http://www.mathplayground.com/matching_shapes.html - matching games (includes kite)

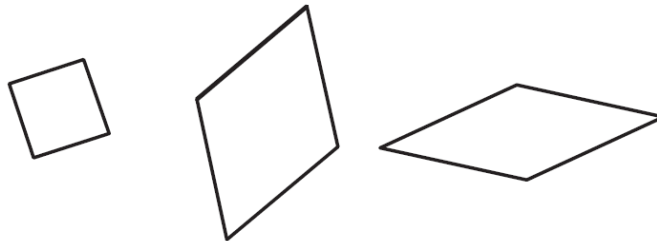
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Quadrilaterals

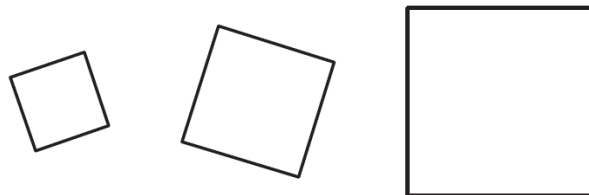
Directions: Look at of the different shapes. Write down anything you notice about the type of shape. Look at the corners (angles) and the sides. Use an index card corner (square corner) to write down what you notice about the corners. Also use the index card to help you measure the length of the sides. Begin to define rhombus, square, rectangle and parallelogram.

These are all rhombuses.



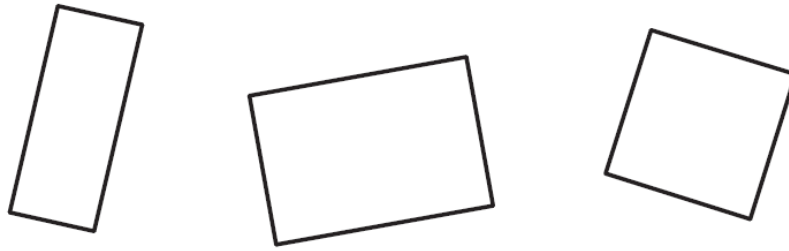
Observations about rhombuses

These are all squares.



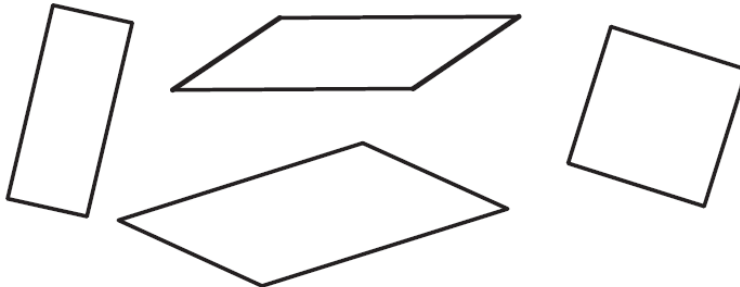
Observations about squares

These are all rectangles.



Observations about rectangles.

These are all parallelograms.



Observations about parallelograms.