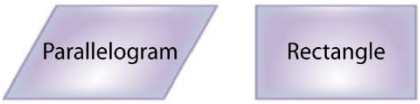
SCAFFOLDING TASK: Rectangles & Parallelograms

Adapted from Illuminations& Ohio Department of Ed.
http://illuminations.nctm.org/LessonDetail.aspx?id=L350



In this task, students classify two-dimensional shapes into a hierarchy based on properties. Details learned in earlier grades need to be used in the descriptions of the attributes of shapes. The more ways that students can classify and discriminate shapes, the better they can understand them. The shapes are not limited to quadrilaterals.

STANDARDS FOR MATHEMATICAL CONTENT

MCC5.G.3 Understanding that attributes belonging to a category of two-dimensional figures also belong to all subcategories.

MCC5.G.4 Classify two-dimensional figures in a hierarchy based on properties

STANDARDS FOR MATHEMATICAL PRACTICE

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

BACKGROUND KNOWLEDGE

This standard builds on what was done in 4th grade. Figures from previous grades: polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, cube, and trapezoid.

COMMON MISCONCEPTIONS

Students think that when describing geometric shapes and placing them in subcategories, the last category is the only classification that can be used.

ESSENTIAL QUESTIONS

- What characteristics do parallelograms and rectangles share?
- How do rectangles differ from other parallelograms?
- Why is a square always a rectangle?
- Why is a rectangle not always a square?

MATERIALS:

- Computer per student (Lab)

- Rectangle vs Parallelogram Activity Sheet
- Things are Shaping Up Activity Sheet
- Rectangles and Parallelograms Applet

GROUPING

whole/individual/small group task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

This task builds on lessons from the third grade when students described, analyzed, and compared properties of two-dimensional shapes. They compared and classified shapes by their sides and angles, and connected these with definitions of shapes. In Grade 4 students built, drew and analyzed two dimensional shapes to deepen their understanding of the properties. They looked at the presence or absence of parallel and perpendicular lines or the presence or absence of angles of a specified size to classify two dimensional shapes. Now, students classify two-dimensional shapes into a hierarchy based on properties. Details learned in earlier grades need to be used in the descriptions of the attributes of shapes. The more ways that students can classify and discriminate shapes, the better they can understand them. The shapes are not limited to quadrilaterals.

TASK

Students use dynamic software to examine the properties of rectangles and parallelograms, and identify what distinguishes a rectangle from a more general parallelogram. Using spatial relationships, they will examine the properties of two-and three-dimensional shapes.

Introduction
Distribute the Rectangle & Parallelogram activity sheet to each member of the class. Ask students to carefully examine the two shapes on the handout and brainstorm their similarities and differences. Elicit oral responses about the attributes unique to both the rectangle and parallelogram. While the class-wide discussion is occurring, students should record the information in the corresponding boxes on the activity sheet.

After the students have recorded the similarities and differences brainstormed by the entire class, divide them into pairs or teams of three. They should work together to categorize the attributes listed on the activity handout into groups. For example: can they categorize or group the shapes' attributes according to length of sides, number of sides, number of angles, measure of angles, etc?

Once the teams have categorized the information, distribute the Things are Shaping Up activity sheet to each student.

Explain that the students will manipulate the dynamic rectangles and parallelograms in the interactive applet by dragging the corners (vertices) and sides (edges). They should look at the

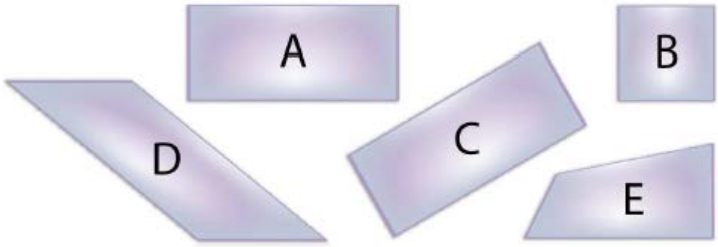
shapes on the handout and mentally manipulate them before trying the activity online. In small groups, they should share their ideas surrounding this mental exercise.

Questions

- Do you think it will be possible to transform the shape?
- Will the rectangle retain its attributes?
- Will the parallelogram retain its attributes?

Once they have had the opportunity to think about the manipulation, students will go to Web site and use the applet to recreate the shapes listed on the Things are Shaping Up activity sheet. Website: http://www.nctm.org/standards/content.aspx?id=25040

As the students successfully re-create each shape, they should record a brief description describing the process they used to attain the goal. The teams can share their solutions and model their problem solving strategies throughout the activity. If students are having difficulty with specific shapes, they can also record the challenges being faced. The key element to this activity is for students to clearly describe the process they use to manipulate the shapes.



FORMATIVE ASSESSMENT QUESTIONS

- Explain how you categorized or grouped the figures based on their attributes.
- What was the first attribute you noticed that was similar between the two shapes?
- What was the first attribute you noticed that was different between the two shapes?
- What attributes stayed true to each shape even through the manipulation process?

DIFFERENTIATION

Extension

- Students use graphic organizers such as flow charts or T-charts to compare and contrast the attributes of geometric figures. Have students create a T-chart with a shape on each side. Have them list attributes of the shapes, such as number of sides, number of angles, types of lines, etc. They need to determine what's alike or different about the two shapes to get a larger classification for the shape.

Intervention

- Students will classify figures by only one attribute (ie. The figure does have two pair of parallel sides, or it does not)
- The students may use a teacher-generated list of attributes found in rectangles and parallelograms, and they will match the attributes to the figure. Then, create a Venn Diagram to compare and contrast the attributes of the figures.

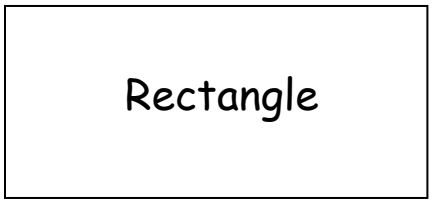
TECHNOLOGY CONNECTION

- http://teams.lacoe.edu/documentation/classrooms/amy/geometry/6-8/activities/quad_quest/quad_quest.html Quadrilateral Quest

Name_____

Rectangles & Parallelograms

Use the table below to compare and contrast Rectangles and Parallelograms

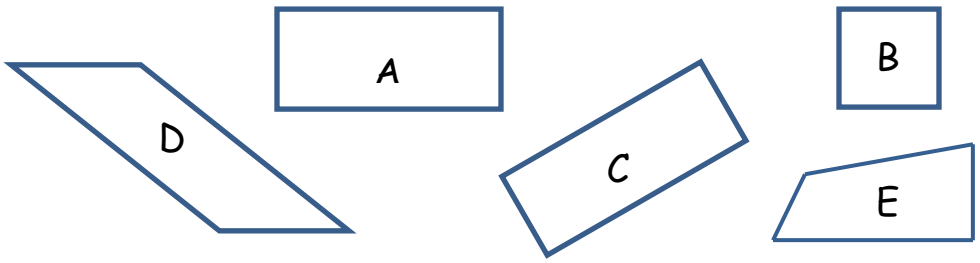


How are these shapes similar?	How are these shapes different?

Name_____

Things are Shaping Up

Use this applet to complete this task: http://www.nctm.org/standards/content.aspx?id=25040



A. Predict whether or not the rectangle tool can make each of the figures above. Record your predictions in the prediction space provided below. Then, use the rectangle tool to check your predictions (try to duplicate the shape). Record your work in the spaces below.

A. Prediction _____

Here is the process I used to try to create shape A:

B. Prediction _____

Here is the process I used to try to create shape B:

C. Prediction _____

Here is the process I used to try to create shape C:

D. Prediction _____

Here is the process I used to try to create shape D:

E. Prediction _____

Here is the process I used to try to create shape E:

B. Predict whether or not the parallelogram tool can make each of the figures above. Record your predictions in the prediction space provided below. Then, use the parallelogram tool to check your predictions (try to duplicate the shape). Record your work in the spaces below.

A. Prediction _____

Here is the process I used to try to create shape A:

B. Prediction _____

Here is the process I used to try to create shape B:

C. Prediction _____

Here is the process I used to try to create shape C:

D. Prediction _____

Here is the process I used to try to create shape D:

E. Prediction _____

Here is the process I used to try to create shape E:

T-Chart
