Practice Task: Greedy Shapes

Approximately 2 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.G.1 Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

STANDARDS FOR MATHEMATICAL PRACTICE

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.

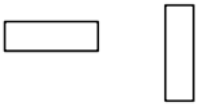
*****Mathematical Practices 1 and 6 should be evident in EVERY lesson. *****

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with plane figures from first grade and kindergarten. Students should be familiar with identifying sides (edges), vertices (corners), angles, circles, triangles, quadrilaterals (squares, rectangles,) and pentagons. Students should have been exposed to these terms since as early as Kindergarten.

Teachers may want to spend some time watching this video to assist in teaching the necessary vocabulary.
http://gadoe.georgiastandards.org/mathframework.aspx?PageReq=MathName

Some students may think that a shape is changed by its orientation. They may see a rectangle with the longer side as the base, but claim that the same rectangle with the shorter side as the base is a different shape. This is why is it so important to have young students handle shapes and physically feel that the shape does not change regardless of the orientation, as illustrated below.



This task requires students to classify shapes. “As young students work at classification of shapes, be prepared for some of them to notice features that you do not consider to be “real” geometric attributes, such as “curvy” or “looks like a rocket.” Children at this level will also attribute to shapes ideas that are not part of the shape, such as “points up” or “has a side that is

the same as the edge of the board. **In any sorting activity, the students should decide how to sort, not the teacher.** This allows the students to do the activity using ideas they own and understand. By listening to the kinds of attributes that they use in their sorting, you will be able to tell what properties they know and use and how they think about their shapes."
(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades 3-5, pages 212-213)

ESSENTIAL QUESTIONS

- How do we use the terms: angle, vertices, faces, sides, and edges to describe geometric figures?
- How do we describe geometric figures?

MATERIALS

- *The Greedy Triangle* by Marilyn Burns or similar book
- Geoboards
- Rubber bands
- (optional) Virtual Manipulative Geoboard: http://nlvm.usu.edu/en/nav/vlibrary.html
- Describing Plane Shapes Class Chart
- Describing Plane Shapes Student Chart
- "What's my rule" task sheet

GROUPING

Large Group, Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Read students the book, *The Greedy Triangle* by Marilyn Burns. Before reading, discuss the terms side, angle, and vertex. Draw a triangle on the board and have students determine the number of sides and vertices. As you read the book, have the students predict the shape which the greedy triangle will become next.

Ask questions as you read, such as:

- How many sides did the shape have to begin with? (3) How did you figure that out? (Counted them, or recognized the shape as a triangle and I know triangles have three sides)
- How many vertices did the shape have to begin with? How are these different from sides?
- How many sides did the shape have when it became a (quadrilateral, a pentagon, etc.)?

Part II

Introduce the term quadrilateral to the students. This word is an important term for the students to use and understand. Use a word web to deconstruct the meaning of the word polygon. Break apart the word using prior knowledge of shapes.

Tell students that they will now use geo-boards to recreate the story of *The Greedy Triangle*. Each student should have his or her own geoboard. However, students can sit in partner groups as they create shapes. This will encourage dialogue about the geometry and allow students to comment on each other's work.

Variation
Toothpicks or pretzels sticks could be used to create the shape instead of using the geoboard.

Begin reading the book again, however, this time stop at each shape and allow the students to create that shape on their geo-boards using rubber bands. (Students who can create the shapes quickly may explore creating various sizes and irregular examples of the shapes)

While students are working, ask questions like:

- How many sides does your shape have now?
- What shape have you made? How do you know it is that shape?
- What characteristics of a shape help us figure out/determine the name of the shape?
- How did your shape change?
- What are differences between a (triangle) and a (quadrilateral)?
- Can you make that shape smaller? Larger?
- What would happen if you made that edge longer? Would it still be a (triangle?)

Once all students have created the shape, allow a partner group to come to the board. Have one student demonstrate how to make the shape using the overhead or possibly a virtual geoboard: http://nlvm.usu.edu/en/nav/vlibrary.html. Discuss with students the meaning of the word "regular polygon"; that the shape is a regular polygon if all the sides are equal. However, show the students that you can make the figure an irregular polygon by grasping one or more of the vertices and extending the sides. Ask the students, "What do we call this three sided shape that does not have all sides the same length? (*a triangle*) Why do we still call it a triangle? (*because it still has three sides*)." Make sure that students understand and can explain that making sides longer or shorter does not change the name of the shape (*triangle, quadrilateral, pentagon, etc.*) because the number of sides and vertices is still the same. It is very important for students to understand and articulate that knowing the number of sides and vertices of a shape is how we determine/decide the name of the shape.
Allow the other student in the partner group to record the number of sides and vertices by the shape name on the class chart. Allow all the students in the class to record the number of edges, vertices, and several of their favorite examples of each shape on their student chart.
Continue with the book, stopping at each shape and repeating the process as above.
Note

When students are creating quadrilaterals, encourage them to create various kinds of quadrilaterals (parallelograms, squares, rectangles, and trapezoids).

Part III

Organize students into small groups. Distribute the sets of cut-out figures, one set per group and the recording sheet. "What's My Rule?" task sheet cards should be distributed. Then review the rules of the game. One participant in each group is the sorter. The sorter writes down a "secret rule" to classify the set of figures into two groups and uses that rule to slowly sort the pieces as the other players observe. At any point in the game, the players can call "stop" and guess the rule. After the correct rule identification, the player who figured out the rule becomes the sorter. The correct identification from the sorter is worth five points. A correct answer, but not the written one, is worth one point. As a variation, each incorrect guess results in a two-point penalty. The winner is the first one to accumulate ten points.

You may also use this set of shapes, which provides more variety, thus expanding the possible conversations about shapes and their attributes-

BLM 20-26: http://www.ablongman.com/vandewalleseries/volume_1.html

As students are sorting the cards and making decisions about the sort, the teacher should be listening for student's descriptions of the shapes.

FORMATIVE ASSESSMENT QUESTIONS

- What are differences between a (triangle) and a (quadrilateral)?
- How do we determine, or decide, the name of a shape?
- Can you make that shape smaller? Larger?
- What would happen if you made that edge longer? Would it still be the same shape?

DIFFERENTIATION

Extension

- Students who demonstrate an understanding of the shapes presented in this lesson may be introduced to heptagons (7 sides), octagons (8 sides), nonagons (9 sides), decagons (10 sides), and dodecagons (12 sides). Students can create these shapes using their geo-boards and add information regarding these shapes to their charts.
- Choose a polygon and create a picture using the shape. Describe it with mathematical words and then create a story about your picture.

Intervention

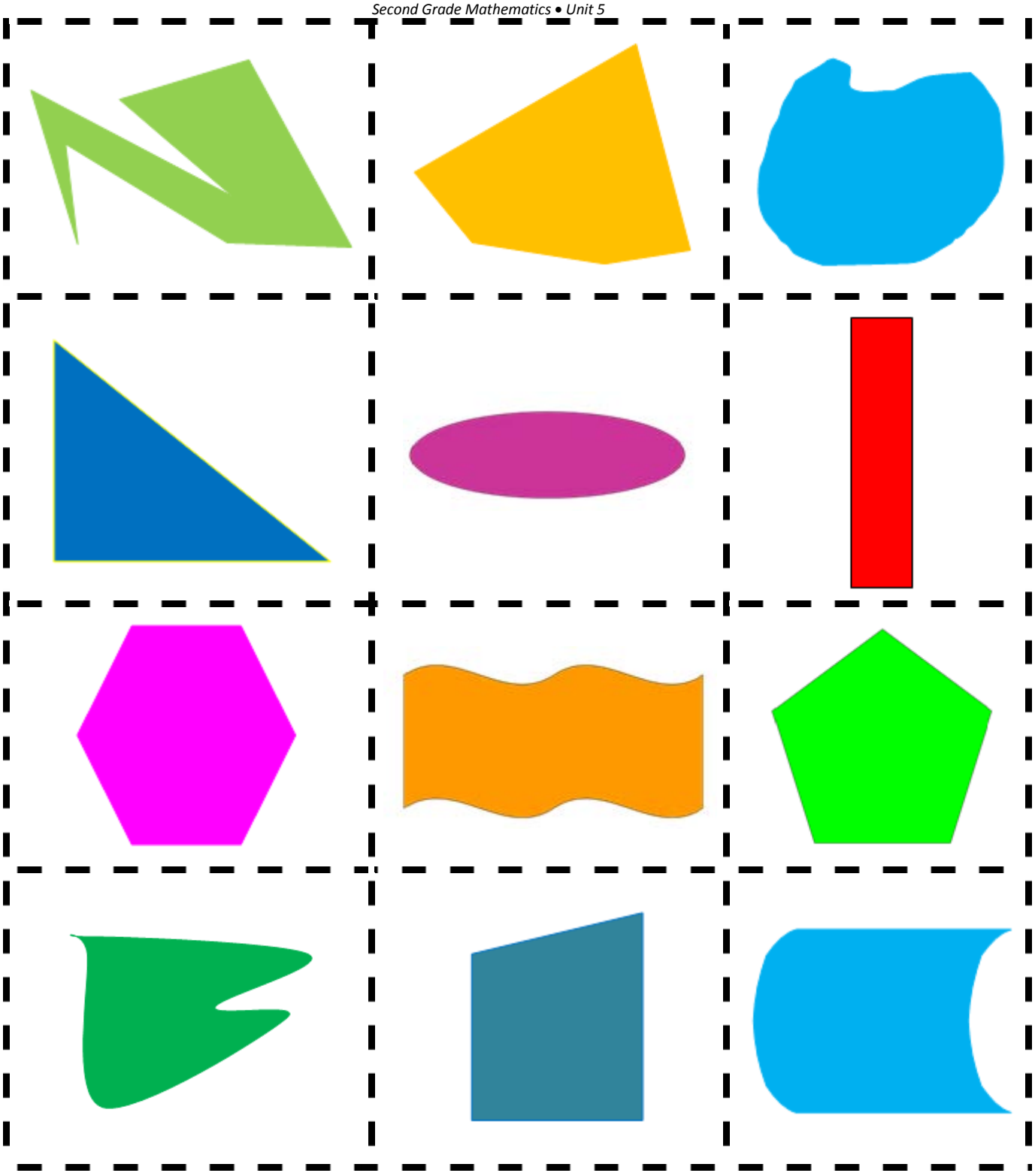
- Some students may have difficulty using the geobards with rubber bands. These students can use dot paper instead. They can draw lines between the dots to create the various shapes.
- Use dot paper to model various shapes such as triangles, quadrilaterals, pentagons, hexagons, etc.

Name _____ Date _____

Describing Plane Shapes

Shape Name	Model of the Shape	Number of Sides	Number of Vertices	Examples
Triangle				
Quadrilateral				
Pentagon				
Hexagon				

"What's My Rule?" Cards for Greedy Shapes



Name: _____

WHAT'S MY RULE?

Part III Recording Sheet

GROUP MEMBERS	SCORE

Sorter	Rule
1. _____	_____ _____ _____ _____
2. _____	_____ _____ _____ _____
3. _____	_____ _____ _____ _____
4. _____	_____ _____ _____ _____