<u>CONSTRUCTING TASK: PATTERN BLOCK FRACTIONS</u>

Adapted from the Lesson "Fun with Pattern Blocks" from NCTM's Illuminations
http://illuminations.nctm.org/LessonDetail.aspx?ID=L343

<u>STANDARDS FOR MATHEMATICAL CONTENT</u>

MCC3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

<u>STANDARDS FOR MATHEMATICAL PRACTICES</u>

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.

<u>BACKGROUND KNOWLEDGE</u>

Concepts about fractions are basic to mathematics but can pose challenges for students. In elementary schools, the most frequently used fraction models are the region and set models. This lesson exposes students to the region model and gives an opportunity for them to develop a thorough understanding of this model in multiple applications. As students work with a variety of fraction models in contexts that promote reasoning and problem solving, they develop a more thorough understanding of fractions and the relationships among them.

As the students work to understand fraction relationships using the region model, it is appropriate to work with concepts on a continuum from concrete to abstract. This lesson first exposes the students to a concrete representation of the region model through work with pattern blocks. As the students move toward more abstract work, it is appropriate to introduce semi-concrete representations. Having the students record fraction relationships pictorially gives them the opportunity to be exposed to such a model.

<u>ESSENTIAL QUESTIONS</u>

- Is there a way to represent the red trapezoid using blue and green pattern blocks?
- Can you cover the red trapezoid using only one color?
- What does this tell us about the relationship between the blue rhombus and the green triangle?
- Are there other ways to represent various pattern blocks (for example, the yellow hexagon) using more than one color pattern block?

- How do the relationships discovered with the pattern blocks help us understand fractions and area?
- What does 1/3 look like in the hexagon? What does 1/3 look like in the trapezoid? What does 1/3 look like in the rhombus? Does one shape represent 1/3 in all of the shapes?

MATERIALS

- Pattern Blocks (only hexagons, trapezoids, rhombuses and triangles are needed)
- Pattern Block Relationships Recording Sheet

GROUPING

Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

For this lesson, the students need a set of pattern blocks. (Only the hexagons, trapezoids, rhombuses, and triangles are needed. The students do not use the square or the rhombus for this lesson.) If the students are seated at tables, one complete set of pattern blocks should serve an entire group.

The most common regions studied at the elementary grade levels are the rectangle and circle. The "region" represents the "whole," and parts of the region are all congruent. The students should be exposed to a variety of shapes and not limited to the rectangle and circle. It is important that the students work with a variety of regions so that they do not think of the region as only "pieces of a pie." For this reason, pattern blocks are an appropriate tool for work with the region model.

The students should use pattern blocks to answer the questions on the Pattern Block Relationship Sheet. Have the students record as many fraction relationships as possible. You may choose to have them record the relationships in a math journal to which they may refer later. Each pair should record relationships on chart paper to share with the whole class. As each pair shares, have the students add to their journal any relationships they may have missed.

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<u>**FORMATIVE ASSESSMENT QUESTIONS**</u>

It is important to know whether the students can do the following:

- understand that a fraction is part of a whole
- state the relationship between the pattern block shapes [e.g., that there are three triangles in one red trapezoid]
- identify fractions when the whole (region) and a part of the region are given
- represent the fractional relationship between the pattern block shapes using standard form of the written notation (e.g., the green triangle is x of the blue rhombus.)
- identify the numerator in a fraction and understand that the numerator is the top number in a fraction and indicates the number of parts of the whole
- identify the denominator in a fraction and understand that the denominator is the bottom number in a fraction and indicates the number of parts into which the whole is divided

The students' recordings can be used to make instructional decisions about their understanding of fraction relationships. Areas needing additional work can be developed during subsequent lessons. Fractions will be explored more in Unit 6.

- How many triangles does it take to make a hexagon?
- Show me more than one way to make a trapezoid. Write the fraction that each pattern block represents.
- Does 1/3 represent the triangle in the rhombus and the hexagon? How do you know?

<u>**DIFFERENTIATION**</u>

Extension
> If students understand the areas of the whole, some students might be ready to explore when the whole changes. Instead of representing the whole with one yellow hexagon, the students explore fractional relationships when two, three, and four yellow hexagons constitute the whole. See "Expanding our Pattern Block Repertoire" lesson from Illuminations http://illuminations.nctm.org/LessonDetail.aspx?ID=L346.

Intervention
- Most students should have used the fraction ½ on numerous occasions. Lead the students in identifying and defining the numerator and denominator. Ask the students to explain what the top number in the fraction represents. [Students should indicate that this top number is the numerator and shows the number of parts of the whole.] The students should also identify the purpose of the bottom number, or denominator, as the number that indicates the number of parts into which the whole is divided. Since students are working in partners, all students should receive support from the peer or the teacher can guide the student through effective questioning.

TECHNOLOGY CONNECTIONS

- http://ejad.best.vwh.net/java/patterns/patterns_j.shtml - Pattern Blocks
- http://nlvm.usu.edu/en/nav/frames_asid_170_g_2_t_3.html?open=activities&from=category_g_2_t_3.html – National Library of Virtual Manipulatives

Pattern Block Relationships

NAME _____Date_____

How many triangles ▲ are in one rhombus ▰ ? _____

What would be the fraction of 1 triangle in the rhombus?_____

How many triangles ▲ are in one trapezoid ⬭ ? _____

What would be the fraction of 2 triangles in the trapezoid?_____

How many triangles ▲ are in one hexagon ⬡ ? _____

What would be the fraction of 4 triangles in the hexagon?_____

How many rhombuses ▰ are in one hexagon ⬡ ?_____

What would be the fraction of 3 rhombi in the hexagon? _____

How many trapezoids ⬭ are in one hexagon ⬡ ? _____

What would be the fraction of 1 trapezoid in the hexagon? _____