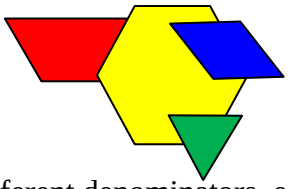
Culminating Task: Pattern Block Puzzles



STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

MCC4.NF.1 Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

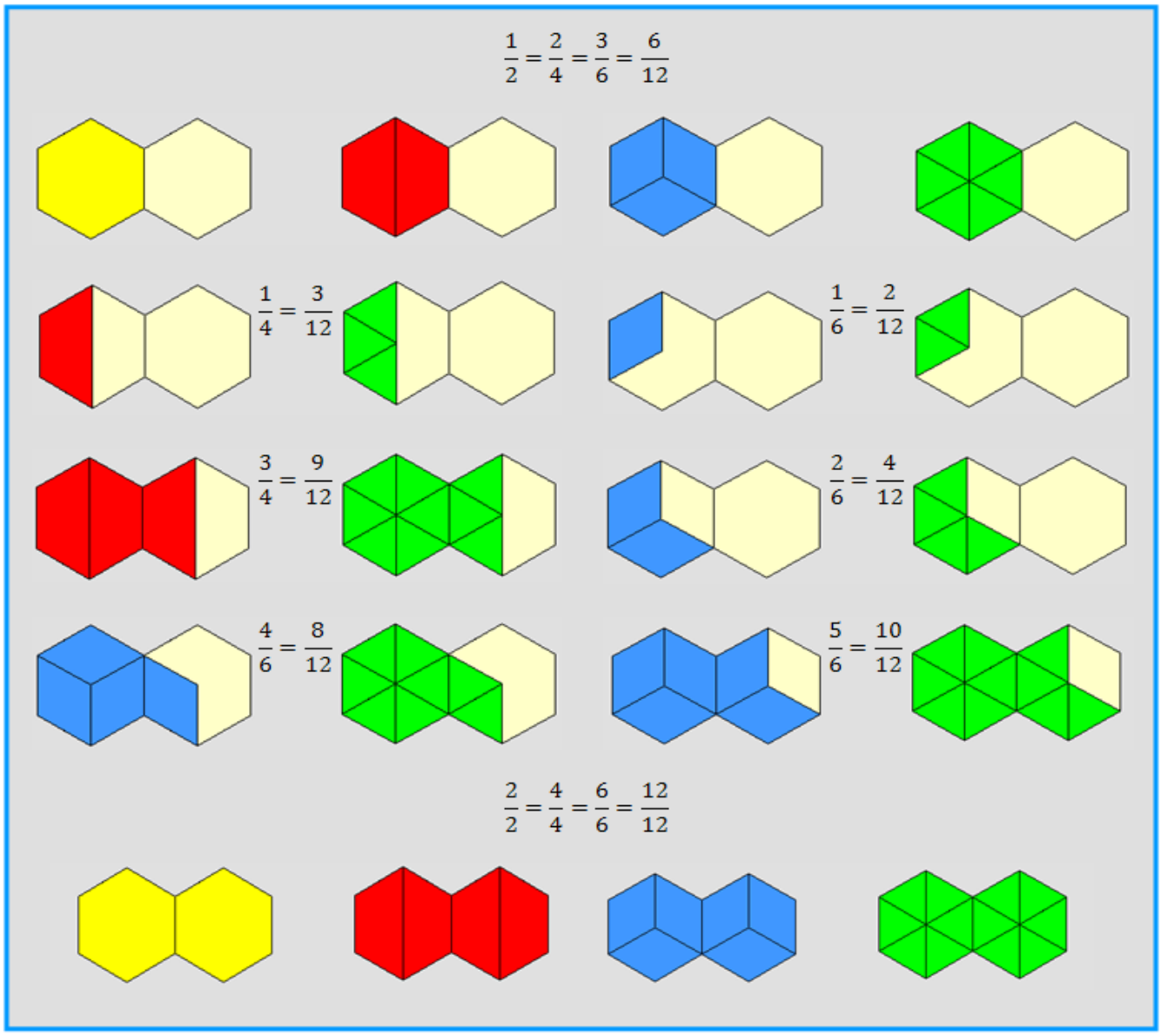
STANDARDS FOR MATHEMATICAL PRACTICE

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.

BACKGROUND KNOWLEDGE

Encourage students to organize their thinking to be sure they have found as many ways as possible to represent equivalent fractions. Possible equivalent fractions are shown below.
Before asking students to work on this task, be sure students are able to:

- identify the number of equal pieces needed to cover one whole as the denominator
- show equivalent fractions with the pattern blocks
- record on the student sheet equivalent fractions (either by coloring or gluing die cut pattern blocks)
- write an equation which shows the equivalent fractions



ESSENTIAL QUESTIONS

- How can we find equivalent fractions?
- In what ways can we model equivalent fractions?
- How can we find equivalent fractions and simplify fractions?
- How can identifying factors and multiples of denominators help to identify equivalent fractions?
- How can the denominator tell me if a fraction is in the smallest equivalent fraction?

MATERIALS

- Pattern blocks
- "Pattern Block Puzzles" student recording sheet
- Die cut paper pattern blocks (or pencils and crayons for recording findings)
- "Pattern Block Puzzles, Version 2" student recording sheet, for intervention students only

GROUPING

individual or partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments: A limited set of pattern blocks should be available for the students. It may be helpful to create sets of pattern blocks in plastic bags beforehand for ease in distributing them to the student groups. One possible "limited set" of pattern blocks might have 1 hexagon, 1 trapezoid, 1 rhombus, and 3 triangles. This set would require students to apply their understanding of equivalent fractions as developed in this unit.

If available, students can glue die-cut pattern block pieces. Alternately, students can manipulate the virtual pattern blocks online and easily print and then label their work. One site for pattern blocks is: http://gingerbooth.com/flash/patblocks/patblocks.php.

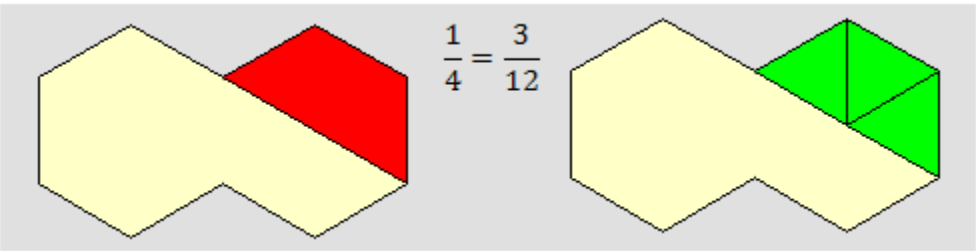
This task could be introduced by reading *The Hershey's Milk Chocolate Bar Fractions Book,* by Jerry Pallotta, illustrated by Rob Bolster or another story about equivalent fractions.

Task Directions:

Students will follow directions below from the "Pattern Block Puzzle" student recording sheet.

- Obtain a set of pattern blocks.
- Use the pattern blocks to show equivalent fractional amounts.
- Record the equivalent fractions on the "one whole" pairs below.
- Write a number sentence for each equivalent fraction. (See example.)
- How many equivalent fractions can you find?
- Use what you know about factors and multiples to identify two equivalent fractions without using the pattern blocks.
- Which equivalent fractions are the smallest of all of its equivalent fractions? How do you know?

Example:



FORMATIVE ASSESSMENT QUESTIONS

- How are you keeping your work organized?
- Have you found all of the possible equivalent fractions? How do you know?
- How do you know these two fractions are equivalent?
- How many different illustrations can be created to show equivalent fractions**?** How do you know?

DIFFERENTIATION

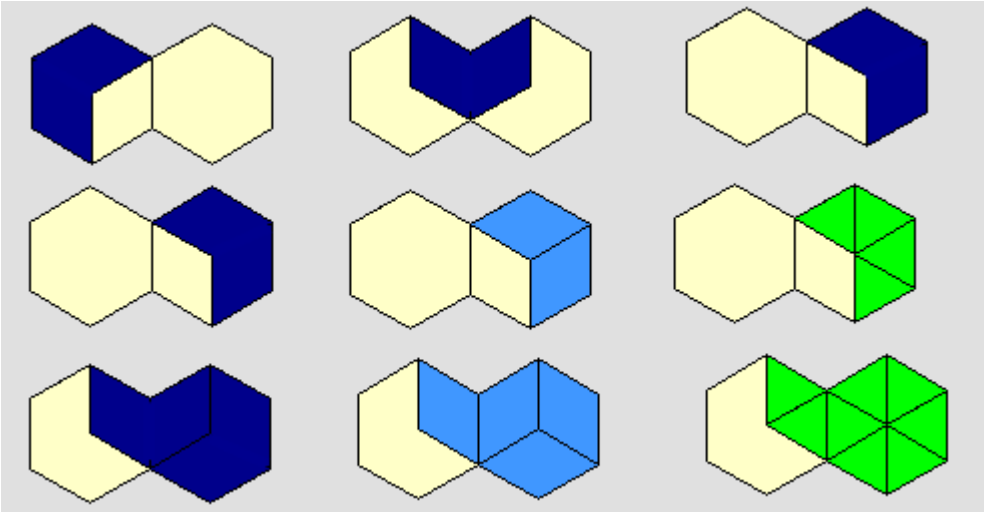
Extension

- Once students have completed the task above, this lesson can be extended to other shapes or sets that can serve as a template to show equivalent fractions. For example:
  - ~ Use a set of 8, 10 or 12 unit cubes to represent one whole.
  - ~ Use a hexagon and rhombus to represent one whole or use a hexagon and a trapezoid to represent one whole.
- How could you show one-third of this figure? (See diagram to the right.) Students will need to create a "new" pattern block made from two rhombi to show one-third. Students could then be asked to find equivalent fractions for thirds.

Three examples of one third

$\frac{1}{3} = \frac{2}{6} = \frac{4}{12}$

$\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$



Of course students can also show **–** one whole.

- Encourage students to add some of the fractions found in this task. This will give students an opportunity to begin exploring improper fractions and mixed numbers. Be sure pattern block models are used to show the addition problems.

Intervention

- Allow students to record equivalent fractions using pre-cut paper pattern blocks.

- Allow students to use the "Pattern Block Puzzles, Version 2" student recording sheet. In version 2, the whole is represented by the yellow hexagon. Students should be able to find most if not all of the possible equivalent fractions.
- Possible solutions:

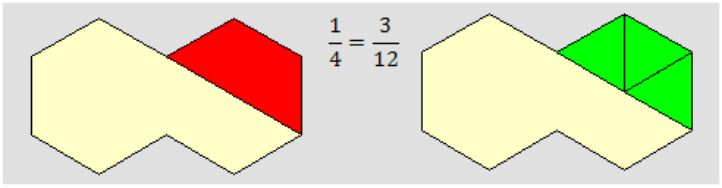
$\frac{1}{2} = \frac{3}{6}; \frac{1}{3} = \frac{2}{6}; \frac{2}{3} = \frac{4}{6}; 1 = \frac{2}{2}; 1 = \frac{3}{3}; 1 = \frac{6}{6}.$

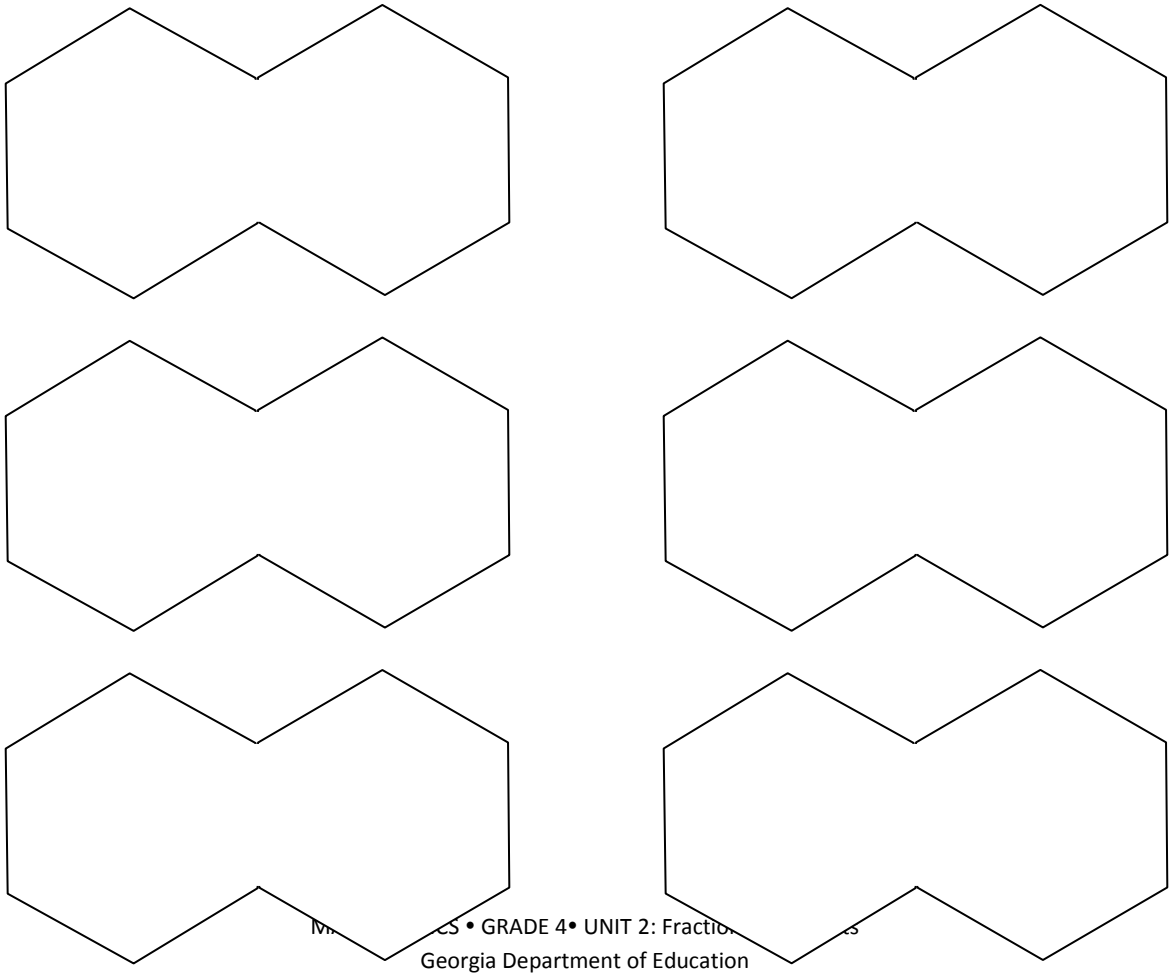
Name _____ Date _____

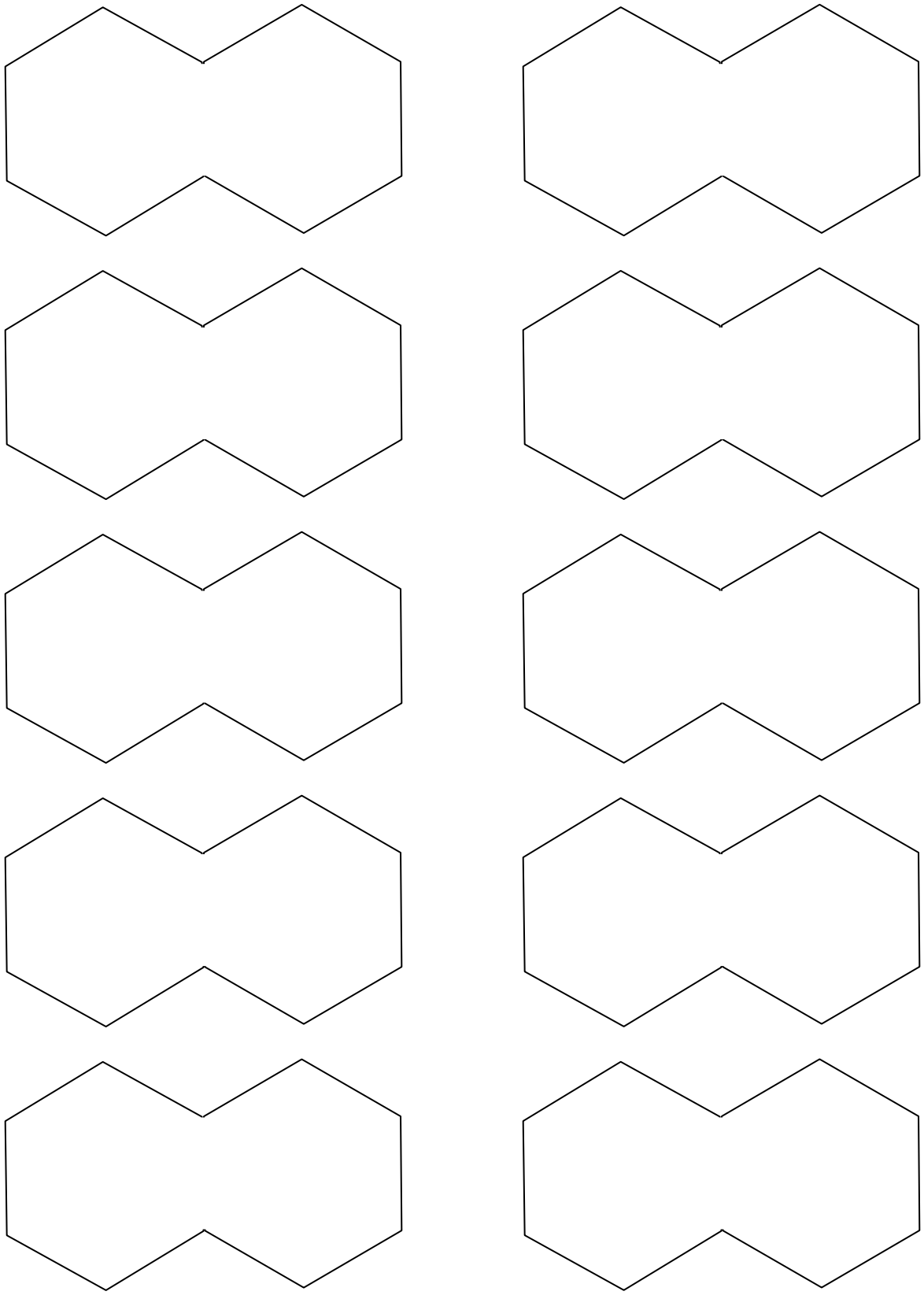
Pattern Block Puzzles

Directions

- Obtain a set of pattern blocks from your teacher.
- Use the pattern blocks to show equivalent fractional amounts.
- Record the equivalent fractions on the "one whole" pairs below.
- Write a number sentence for each equivalent fraction. (See example.)
- How many equivalent fractions can you find?
  - Use what you know about factors and multiples to identify two equivalent fractions without using the pattern blocks.
  - Which equivalent fractions are the smallest of all of its equivalent fractions? How do you know?







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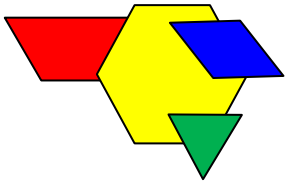

Pattern Block Puzzles

Version 2

Directions

- Obtain a set of pattern blocks.
- Use the pattern blocks to show equivalent fractional amounts.
- Record the equivalent fractions on the "one whole" pairs below.
- Write a number sentence for each equivalent fraction. (See example.)
- How many equivalent fractions can you find?
  - Use what you know about factors and multiples to identify two equivalent fractions without using the pattern blocks.
  - Which equivalent fractions are the smallest of all of its equivalent fractions? How do you know?