Changing Wholes (Pattern Block Challenge)

Description
Students use pattern blocks as area models to compare fractional regions and explore how the regions change in relation to the whole.

Mathematics
Students need to understand that a fractional unit can be represented flexibly. For example, one green triangle is $\frac{1}{6}$ of the whole if one hexagon is the whole. If one hexagon equals 3 wholes, then one green triangle equals $\frac{1}{2}$. This flexibility and proportional reasoning is important to understanding fractions.

Students benefit from opportunities to compose and decompose fractions (using both concrete models and symbolic representations) to compare fractional parts and recognize equivalent fractions. Answers may include repeated addition and/or multiplication of unit fractions.

Curriculum Connections
Students will:
- represent fractions using models and symbols;
- compare fractions symbolically and with models by considering the fractional unit;
- find equivalent fractions using concrete materials;
- determine the relationship between fractional parts and the whole.

Instructional Sequence
1. Partner students and provide each pair with BLM 1 and pattern blocks.
2. Allow students to use the pattern blocks to solve each of the problems. Note: You might decide to sequence the tasks in an intentional order depending on student familiarity with fractions and/or using pattern blocks in a fractions context. Since students often use the yellow hexagon as one whole, starting with the yellow hexagon equal to three wholes disrupts this persistent notion.
3. Some discussion about ratios including part-part relationships may be necessary for the final task, which could alternatively be an extension question or a diagnostic opportunity.
4. Consolidate by selecting student responses which highlight a range of strategies and discussing as a class. Create an anchor chart to share successful strategies.
5. **To extend:** Have each pair of students make up a set of questions for another pair to solve. They could choose another shape as the whole.

Highlights of Student Thinking
Students may:
- physically layer pattern blocks to make comparisons;
- draw or manipulate the shapes using repeated addition to solve (e.g., $1\frac{1}{2} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$ or $3 \times \frac{1}{2}$);
- identify the fraction unit (e.g., $\frac{1}{2}, \frac{1}{6}$) by considering the relationship between the whole and one pattern block;
- demonstrate spatial reasoning, geometric thinking, and/or proportional reasoning;
- write equivalent fractions;
- use unit fractions to add up to one whole to prove their answer;
- switch to set representations on the ratio question.

Key Questions
1. Is there another way to say/name that fraction (e.g. three-sixths is also one-half)?
2. Can you show me how you know what one _____ (e.g., triangle, trapezoid) is worth?
3. Can you show me some equivalent fractions that you notice?

Materials
BLM 1 (one copy per pair of students)   Pattern blocks (at least 3 yellow hexagons, 6 red trapezoids, 9 blue rhombuses, 18 green triangles per pair)