LESSON 6

Objective

Use various polygons to form a new, larger polygon and measure its area.

Common Core State Standards

- **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Geometry

Polygons: Exploring Area

In the earlier grades, students used concrete objects to measure the area of several different polygons. Students will now learn how to use concrete objects to create polygons with the same area. This skill provides students with a foundation for understanding formulas and concepts that will be introduced later in their mathematics instruction.

Try It! *Perform the Try It! activity on the next page.*

Talk About It

Discuss the Try It! activity.

- **Ask:** *If two polygons have the same area, will they also have the same perimeter?*
- **Ask:** *Which of the Pattern Blocks can't be used on the triangular grid paper? Explain.*
- **Ask:** *Can you create another polygon with an area of 18 or 24 triangles?*

Solve It

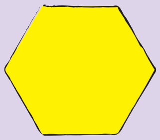
Reread the problem with students. Have them explain how various polygons can have the same area. Encourage students to include sketches in their explanations. Whenever possible, encourage them to use formulas for finding the area of a given polygon.

More Ideas

For another way to teach about the area of polygons—

- Have students extend this activity by using Pattern Blocks to create several polygons, each with an area of at least 16 triangular units. Have students then count the number of triangles the shapes cover. Tell students to write the area at the top of their paper. Find several students who have created figures with the same area. Share the drawings with the class.

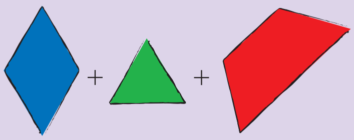
Formative Assessment



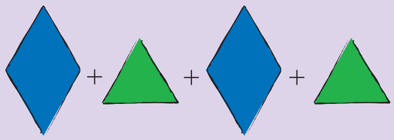
Have students try the following problem.

Which set of shapes below will not *have the same area as the figure to the right?*

A.



B.



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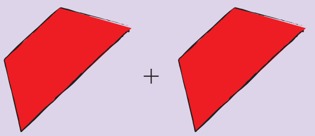
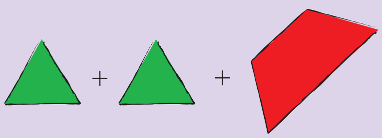


D.



Try It! 30 minutes | Pairs

Here is a problem about finding the area of specific polygons.

Samir is trying to decide which tile pattern to use in the entranceway of his home. He was told that any pattern he chooses must cover exactly 24 triangular units. He has narrowed down his choices to these three patterns:

Pattern #1: A large rhombus made up of three rows consisting of 1 triangle, 1 trapezoid, and 1 rhombus;

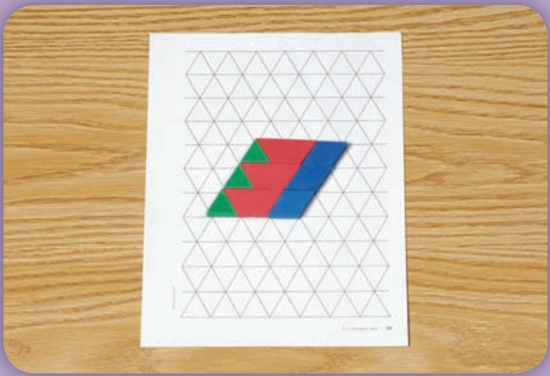
Pattern #2: A large parallelogram made up of three rows of 4 rhombuses;

Pattern #3: A large hexagon made up of a small central hexagon surrounded by 6 trapezoids.

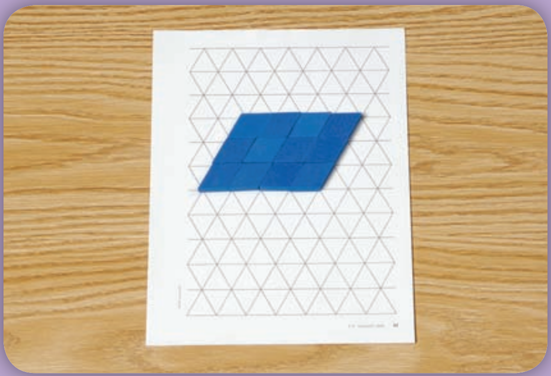
Do any of the tile patterns fit the area requirements?

Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

Materials
- Pattern Blocks
- BLM 11



1. Have students form a large rhombus consisting of three rows of 1 green triangle, 1 red trapezoid, and 1 blue rhombus as shown. **Ask:** *How many triangles are covered?*



2. Now have students form a large parallelogram using three rows of 4 blue rhombuses. **Ask:** *How many triangles are covered?*

3. Have students form a large hexagon using 1 yellow hexagon and 6 red trapezoids. Have students determine how many triangles are covered. **Ask:** *Is the area the same for all three tile patterns? Do any fit Samir's requirements?*

Look Out!

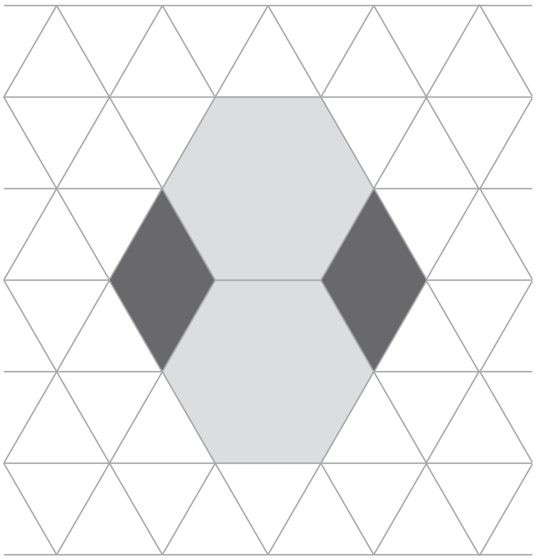
Some students may think that two of the green equilateral triangles together have an area of one square inch. It is a common error since the sides of the triangles each measure 1".
Ask: *What is the formula for the area of a triangle?* Write the formula on the board.
Ask: *What is the base of this triangle?* Elicit "one inch." Students should notice that the height cannot also be 1" if the sloping sides are 1" long. Have students measure the base and height of the triangle if necessary.

Answer Key

Use Pattern Blocks and 1-inch Triangular Grid Paper to build each figure shown. Find the number of triangles covered. Write the area of the figure in triangular units.

(Check students' work.)

1.



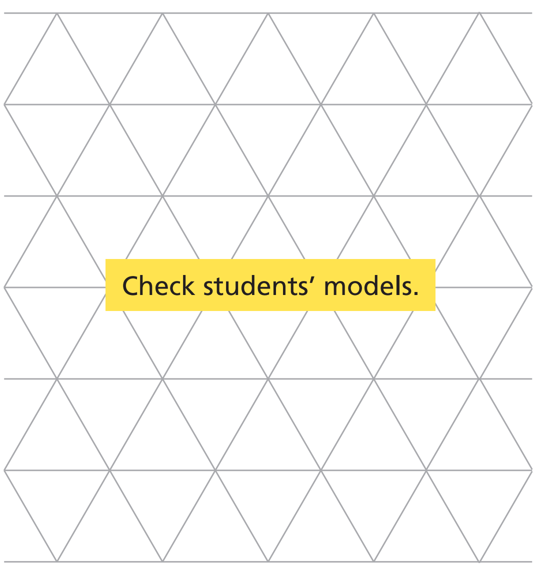
16 triangular units

2.

24 triangular units

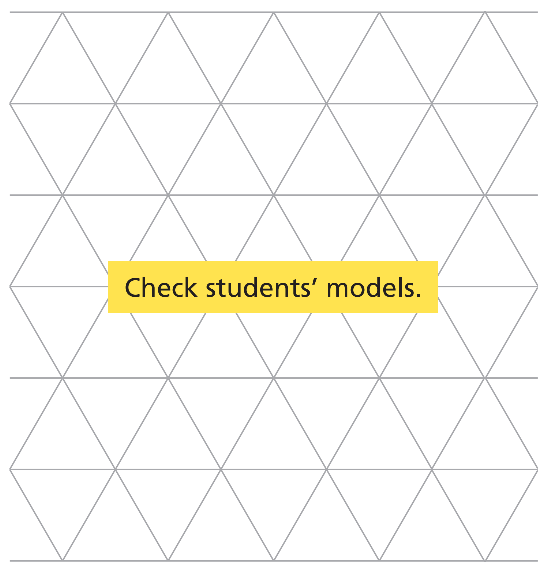
Using Pattern Blocks and 1-inch Triangular Grid Paper, build a quadrilateral that has each area given. Sketch the model.

3. 20 triangular units



Check students' models.

4. 30 triangular units



Check students' models.

Answer Key

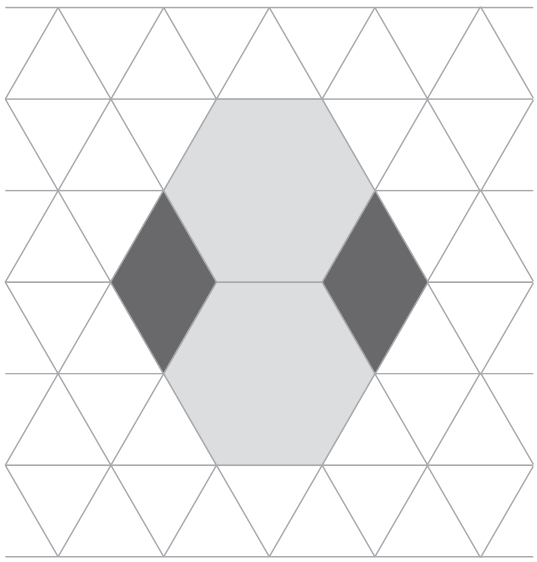
Challenge! Explain how a hexagon formed using two trapezoids can have the same area as a hexagon formed using six equilateral triangles. Draw a picture to help.

Challenge: (Sample) The area of one trapezoid can be equal to the area of three of the equilateral triangles, so a hexagon formed using two trapezoids can have the same area as a hexagon formed by six equilateral triangles.

Name ______________________________

Use Pattern Blocks and 1-inch Triangular Grid Paper to build each figure shown. Find the number of triangles covered. Write the area of the figure in triangular units.

1.



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2.

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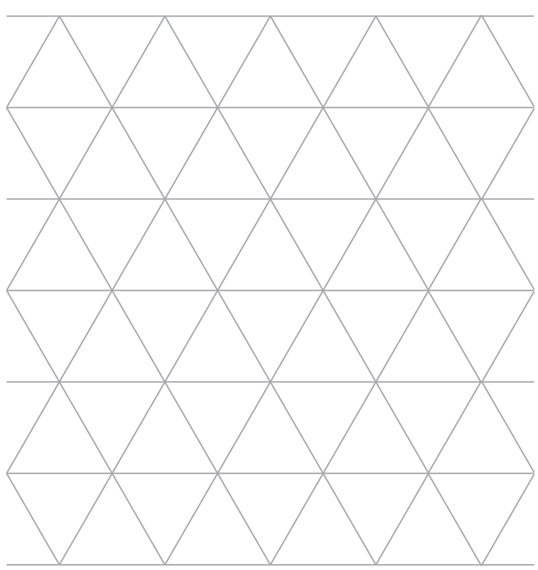
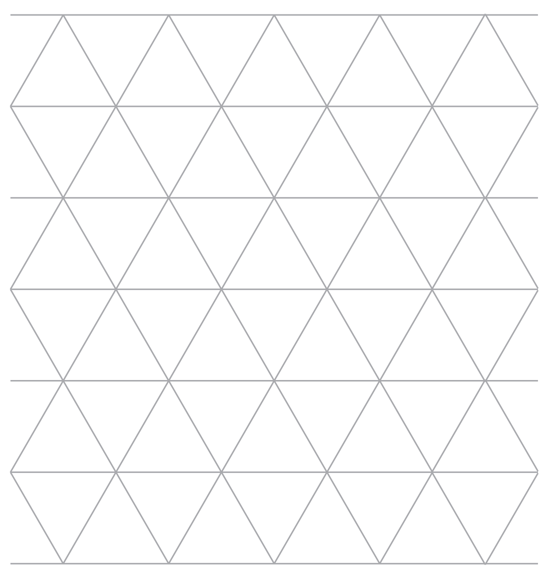
Using Pattern Blocks and 1-inch Triangular Grid Paper, build a quadrilateral that has each area given. Sketch the model.

3. 20 triangular units



4. 30 triangular units



Name ___________________________________

Challenge! Explain how a hexagon formed using two trapezoids can have the same area as a hexagon formed using six equilateral triangles. Draw a picture to help.

Name ____________________