

## Objective

Build a shape with a given area.

## Common Core State Standards

- **3.MD.6** Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).
- **3.MD.7a** Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

## Measurement and Data

## Building Area

Students benefit from having concrete experiences working with measurement before being expected to comprehend measurement formulas, such as  $l \times w$  for finding area. By building shapes with a given area, students are able to explore ways to manipulate figures so that their appearance is altered but their area remains constant. They will discover that as some measurements increase, others must decrease if the area of the figures is to stay the same. Such generalizations provide the foundation for later understanding of the standard formula for area.

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

## Talk About It

Discuss the Try It! activity.

- **Ask:** How many Color Tiles did you use to cover 4 square inches? What about the shapes you made that had areas of 6 and 10 square inches?
- **Say:** Remember, you also can find the area of squares and rectangles by multiplying the length of the shape times the width. Have students make several square and rectangle shapes and check the area using the  $l \times w$  formula.
- **Say:** Suppose you used blocks to make a figure with an area of 12 square inches. Then you rearranged those blocks into a different design without adding or removing any blocks. **Ask:** Would the area change? Have students model the two shapes using blocks and find the area of both.

## Solve It

With students, reread the problem. Have students describe in writing how they used tiles to fill up 6 square inches. They should then explain how they can check the area of their shapes using length times width if their design was a perfect square or rectangle.

## More Ideas

For other ways to teach about building shapes with a given area—

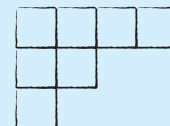
- Distribute Geoboards to the class. Have students work with a partner to make 4 different shapes or designs with the same area.
- Have students use Pattern Blocks and Inch Grid Paper (BLM 8) to try to create patterns given a target area (i.e., make a design that covers 8 square inches).

## Formative Assessment

Have students try the following problem.

What is the area of the shape?

- A. 5 square units
- B. 7 square units
- C. 9 square units
- D. 12 square units



**Try It!** 25 minutes | Pairs

Here is a problem about building a shape with a given area.

*The students in Miss Ling's class are going to make a mosaic using square tiles. Each student will have about 6 square inches to fill with a design. How can the students use squares to fill up 6 square inches?*

Introduce the problem. Then have students do the activity to solve the problem. Distribute Color Tiles and Inch Grid Paper (BLM 8) to students.

**Materials**

- Color Tiles (24 per pair)
- Inch Grid Paper (BLM 8; 1 per pair)



**1.** Have students place a tile on the Inch Grid Paper. **Ask:** *How long is one side of the square?* Have students use tiles to make a larger square that has an area of 4 square inches.



**2.** Instruct students to use tiles to create a design on the grid paper that has an area of 6 square inches. Have students compare designs to see the various ways the area can be shown.



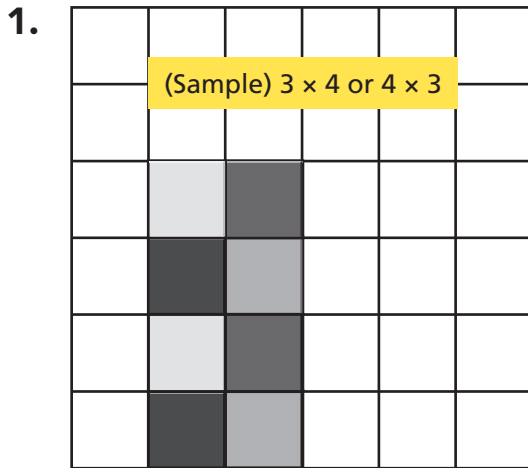
**3.** Next have students use tiles to create a rectangle with an area of 10 square inches on the grid paper. Have students compare their designs with that of another set of partners and check each other's designs to verify the area. Then guide students to use the formula  $l \times w$  to check the area of their rectangles.

**! Look Out!**

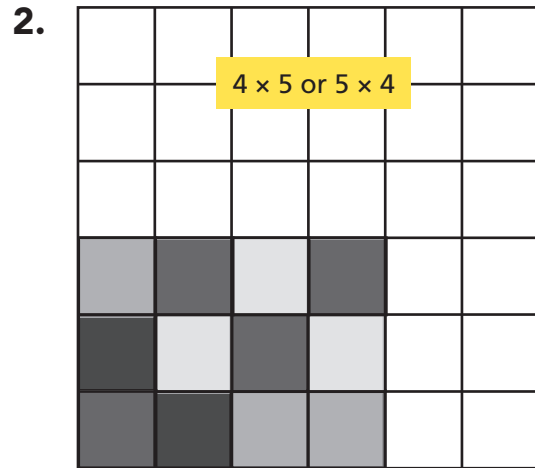
Watch for students who confuse perimeter and area. Remind students that perimeter is the distance around a shape, whereas area measures the space inside the shape. Have students use squares to build a shape and find both the perimeter and the area.



Use Color Tiles to build each model. Expand the rectangle so that it has the given area. Write the dimensions. (Check students' work.)



A rectangle with an area of 12 square units is \_\_\_\_\_ × \_\_\_\_\_.

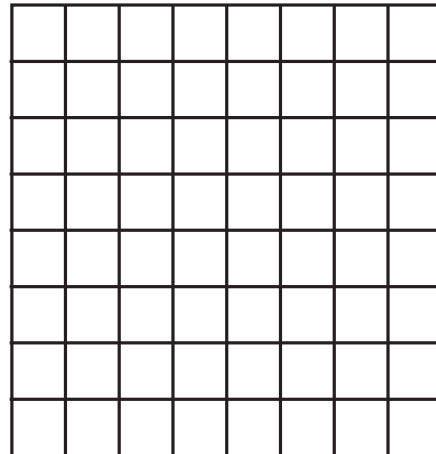


A rectangle with an area of 20 square units is \_\_\_\_\_ × \_\_\_\_\_.

Using Color Tiles, model a rectangle with an area of 24 square units. Sketch the model. Write the dimensions. (Check students' models.)

3. A rectangle with an area of 24 square units is \_\_\_\_\_ × \_\_\_\_\_.

4 × 6 or 6 × 4 or 8 × 3 or 3 × 8 or 12 × 2 or 2 × 12



Find the area of each rectangle.

4. length: 6 units, width: 3 units  
\_\_\_\_\_ **18** \_\_\_\_\_ square units

6. length: 5 units, width: 6 units  
\_\_\_\_\_ **30** \_\_\_\_\_ square units

5. length: 4 units, width: 9 units  
\_\_\_\_\_ **36** \_\_\_\_\_ square units

7. length: 2 units, width: 7 units  
\_\_\_\_\_ **14** \_\_\_\_\_ square units

## Answer Key

**Challenge!** Describe the relationship between the dimensions of a rectangle and the area of the rectangle. Draw a picture to help. Write a formula for finding the area of a rectangle.

Challenge: (Sample) The area of a rectangle is the product of the dimensions. A formula for the area of a rectangle is  $\text{Area} = \text{length} \times \text{width}$ .

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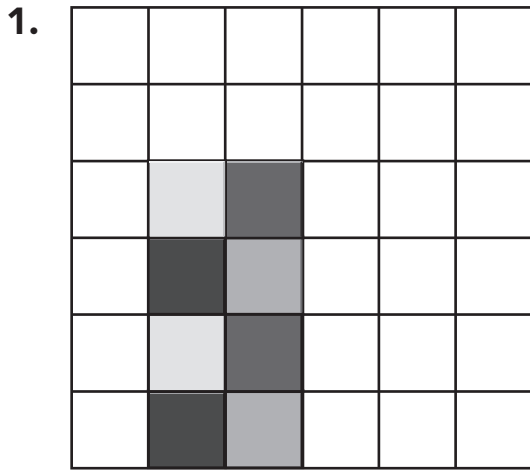
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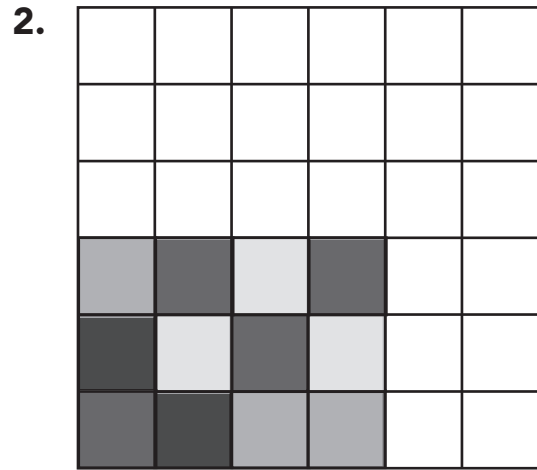
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Use Color Tiles to build each model. Expand the rectangle so that it has the given area. Write the dimensions.



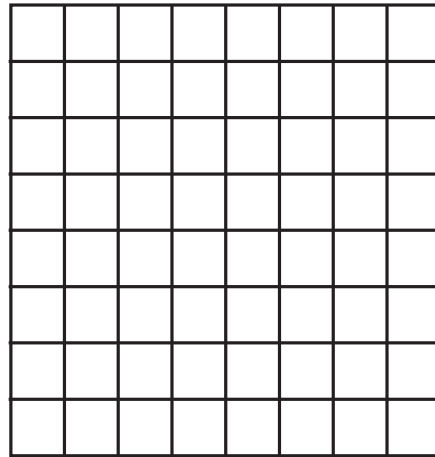
A rectangle with an area of 12 square units is \_\_\_\_\_ × \_\_\_\_\_.



A rectangle with an area of 20 square units is \_\_\_\_\_ × \_\_\_\_\_.

Using Color Tiles, model a rectangle with an area of 24 square units. Sketch the model. Write the dimensions.

3. A rectangle with an area of 24 square units is \_\_\_\_\_ × \_\_\_\_\_.



Find the area of each rectangle.

4. length: 6 units, width: 3 units  
\_\_\_\_\_ square units

5. length: 4 units, width: 9 units  
\_\_\_\_\_ square units

6. length: 5 units, width: 6 units  
\_\_\_\_\_ square units

7. length: 2 units, width: 7 units  
\_\_\_\_\_ square units

Name \_\_\_\_\_

**Challenge!** Describe the relationship between the dimensions of a rectangle and the area of the rectangle. Draw a picture to help. Write a formula for finding the area of a rectangle.

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Name \_\_\_\_\_
