LESSON 3

Objective

Compare the areas of triangles and parallelograms.

Common Core State Standards

- **6.G.1** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Geometry

Area of a Triangle

The area of a parallelogram is $b \times h$, or *base times height.* Squares, rectangles, and parallelograms can all be divided in half to form congruent triangles. Any triangle made in this way has an area that is half the area of the original figure. Most students already have experience with this fact. For example, they might have seen a square sandwich cut in half to make two triangles. They can probably reason that each triangle has an area that is half the area of the whole sandwich. The same reasoning can be applied using a parallelogram as the original figure. This leads to the general formula for the area of a triangle: $A = \frac{1}{2} \times b \times h$.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *How can you compare the area of the triangle with the area of the parallelogram without using formulas?*
- **Ask:** *If you know that the area of a parallelogram is* b × h*, how do you reason that the area of a triangle is* $\frac{1}{2}$ × b × h*?*
- **Ask:** *When is the height of a triangle equal to the length of a side?*

Solve It

Reread the problem with students. The area of the triangle is half the area of the related parallelogram. So the area of the triangle is 1 square unit and the area of the parallelogram is 2 square units.

More Ideas

For other ways to teach about the area of a triangle—

- Have students use Pattern Blocks to see the relationship between the area of a triangle and the area of a parallelogram. Two green triangles placed together cover the same area as one blue parallelogram.
- Have students use a Geoboard to design a quilt block with various shapes of squares, rectangles, triangles, and parallelograms. Have them complete a table for the quilt block with the columns *Color, Shape, Area,* and *Total Area in Quilt Block*. Students can copy their quilt blocks onto grid paper and color them, then exchange blocks and analyze the areas of particular colors.

Formative Assessment

Have students try the following problem.

A parallelogram has a base of 7 feet and a height of 4 feet. What is the area of a triangle formed by drawing a diagonal on the parallelogram?

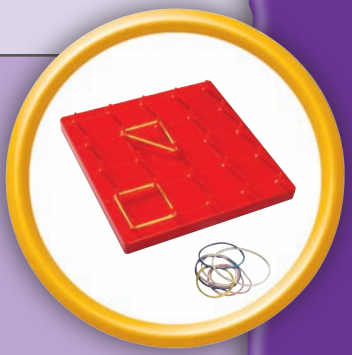
A. 7 square feet

B. 14 square feet

C. 28 square feet

D. 56 square feet

Try It! 30 Minutes | Groups of 4



Here is a problem about the area of a triangle.

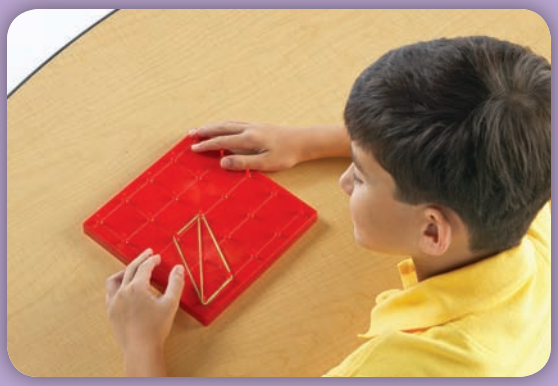
Samira has made a triangle on a geoboard. Jo says she can find the area of the triangle by changing it into a parallelogram. How might Jo do this?

Introduce the problem. Then have students do the activity to solve the problem. Distribute Geoboards, rubber bands, grid paper, paper, and pencils to students.

Materials

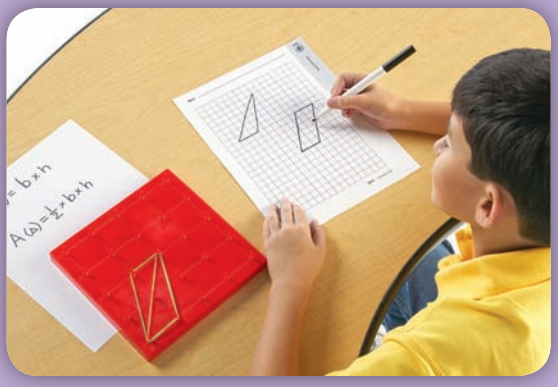
- Geoboards (1 per group)
- rubber bands (2 per group)
- Centimeter Grid Paper (BLM 10; 1 sheet per group)
- paper (1 sheet per group)
- pencils (1 per group)

1. Say: *Make a triangle on the geoboard using the points (0, 0), (1, 0), and (2, 2).* Students use a rubber band to make the triangle. Have students place a second rubber band over the first.



2. Say: *Now create a parallelogram with one of the rubber bands. Stretch the rubber band to create a fourth corner at the point (1, 2).* One of the rubber bands is stretched to the point (1, 2). **Say:** *Compare the triangle with the parallelogram.* Elicit that the triangle is half of the parallelogram.

3. Ask: *What is the formula for finding the area of a parallelogram?* Elicit that the formula is $A(\square) = b \times h$. **Ask:** *What is the formula for finding the area of a triangle?* **Say:** *Use the models on the geoboard to help you determine the formula.* Elicit that the formula is $A(\triangle) = \frac{1}{2} \times b \times h$.

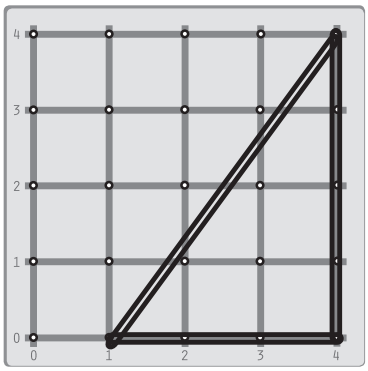


4. Say: *Draw the triangle and parallelogram on grid paper and compare their areas.* **Ask:** *What is the area of each shape?*

Answer Key

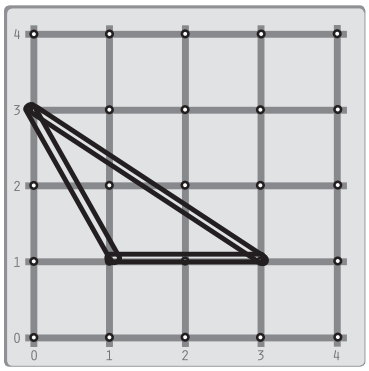
Use a Geoboard to model each triangle. Find its area. (Check students' work.)

1.



6 square units

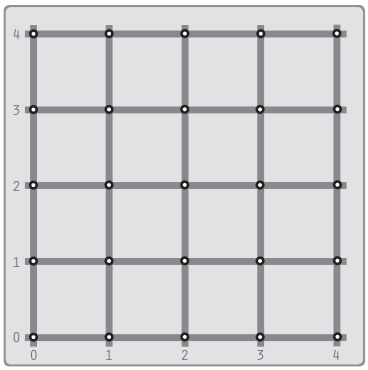
2.



2 square units

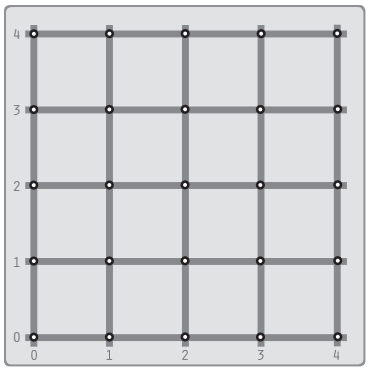
Using a Geoboard, model each triangle. Sketch the model. Find its area.

3. base: 4 units, height: 2 units



4 square units

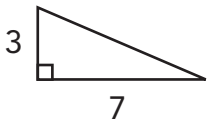
4. base: 4 units, height: 4 units



8 square units

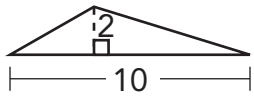
Find the area of each triangle.

5.



10.5

6.



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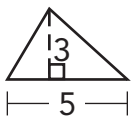
7.



7.5

Answer Key

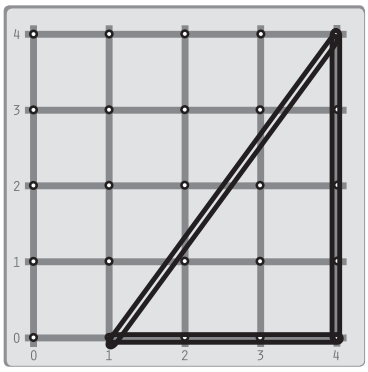
Challenge! Explain why the formula for the area of a triangle includes the fraction $\frac{1}{2}$. Draw a picture.

Challenge: (Sample) You can duplicate a triangle and rotate it 180° to form a rectangle that has a length equal to the base of the triangle and a width equal to the height of the triangle. The size of the original triangle is only half the size of the rectangle. So the area of the triangle is half of the area of the rectangle.

Name _____

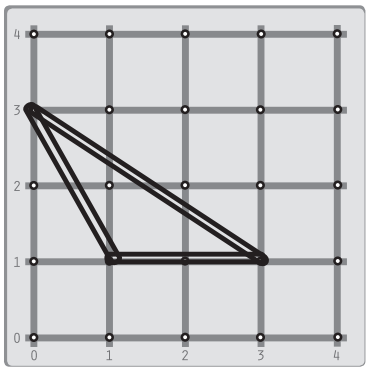
Use a Geoboard to model each triangle. Find its area.

1.



_____ square units

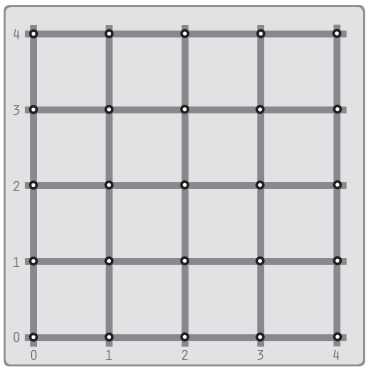
2.



_____ square units

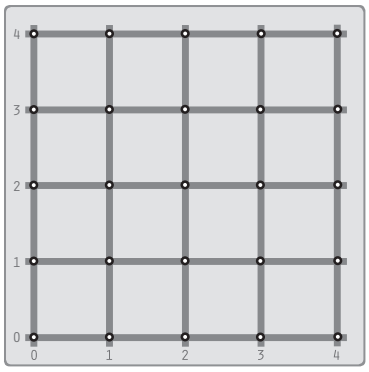
Using a Geoboard, model each triangle. Sketch the model. Find its area.

3. base: 4 units, height: 2 units



_____ square units

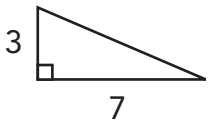
4. base: 4 units, height: 4 units



_____ square units

Find the area of each triangle.

5.



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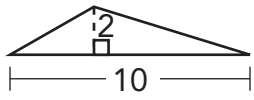
6.



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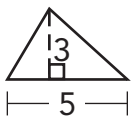

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Name _____

Challenge! Explain why the formula for the area of a triangle includes the fraction $\frac{1}{2}$. Draw a picture.

Name _____