Objective

Partition shapes into equal areas.

Common Core State Standards

- **3.G.2** Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

Geometry

Partitioning More Shapes

In the previous lesson, students partitioned shapes into parts with equal areas using Pattern Blocks. Now students will build on this understanding using the Geoboard. By using the Geoboard, students can create a different variety of shapes and partition those into equal areas and describe the area of each part as a unit fraction of the whole.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *Why couldn't Elana's shape be a trapezoid?* Guide discussion to cover the need for a shape with square corners (right angles.) **Ask:** *Why couldn't Elana's shape be a square?* Discuss that on a Geoboard a square can be made of 1, 4, 9, or 16 equal squares, not 8.

- **Ask:** *What quadrilateral is made of 8 equal squares on a Geoboard?* Discuss that Elana's shape is a rectangle, because a rectangle can be made with 2 rows of 4, or 4 rows of 2.

Solve It

With students, reread the problem. Have them draw Elana's shape on Inch Grid Paper (BLM 8) and shade $\frac{1}{8}$ of it. Have them write two sentences describing their shape and telling why it matches Elana's description of her shape.

More Ideas

For other ways to teach about partitioning shapes into equal areas—

- Have students make a large rectangle on the Geoboard. Have them partition the rectangle into smaller equal sections as many ways as they can and record each of the ways on grid paper. For each way, have students count the number of smaller equal sections and write the fraction for one piece.

- Have one student create a shape on the Geoboard and give it to a partner. Then have the partner partition the shape into smaller equal parts. Have students describe their shape, the number of equal parts in it, and how one fractional piece would be represented.

Formative Assessment

Have students try the following problem.

If the following is $\frac{1}{6}$, what is the whole?

A.

B.

C.

D.
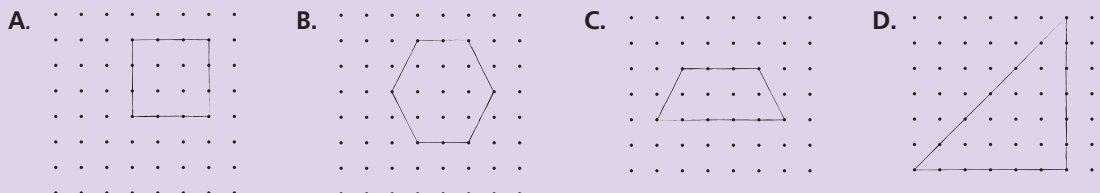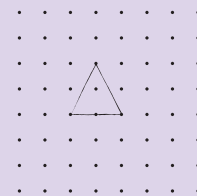
Try It!   25 minutes | Pairs

Here is a problem about partitioning shapes into equal areas.

Elana created a shape on her Geoboard. She described it as a quadrilateral and said that $\frac{1}{8}$ of it was a square. What shape did she make?

Introduce the problem. Then have students do the activity to solve the problem. Distribute Geoboards, Inch Grid Paper (BLM 8), and pencils to students.
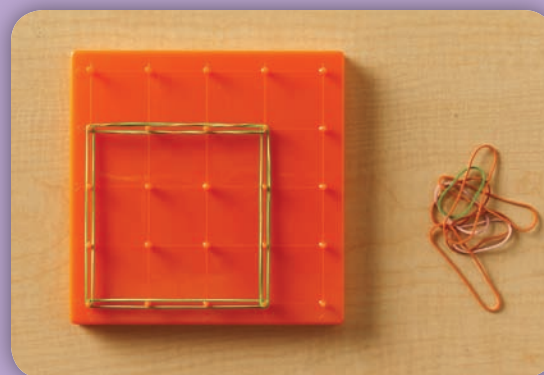
Materials
- Geoboard (1 per pair)
- Inch Grid Paper (BLM 8; 1 per student)
- pencils (1 per student)
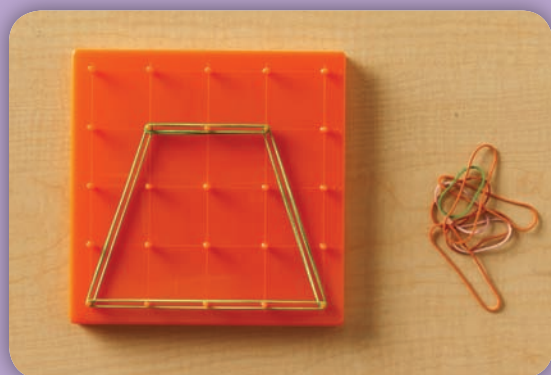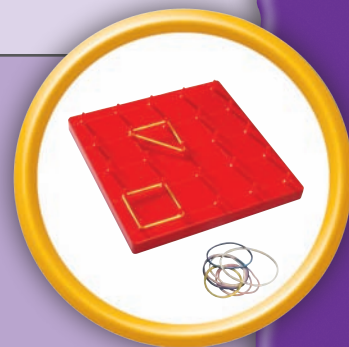
**1. Say:** *Elana says her shape is a quadrilateral.* **Ask:** *What does that tell us? What are some shapes that are quadrilaterals?* List shapes on the board: *square, rectangle, trapezoid, rhombus,* etc. **Say:** *Make a trapezoid on your Geoboard.*

2. Say: *Elana also said that $\frac{1}{8}$ of the shape is a square.* **Ask:** *How many squares is her shape divided into? Can you divide your trapezoid into 8 equal squares? Why not?* Elicit that the shape must have square corners (right angles). **Say:** *Make a square on your Geoboard.*

⚠ Look Out!

Watch for students who do not partition the larger shape into equal smaller parts. Remind students that the smaller parts need to be the same size and shape, because fractional parts mean equal parts.
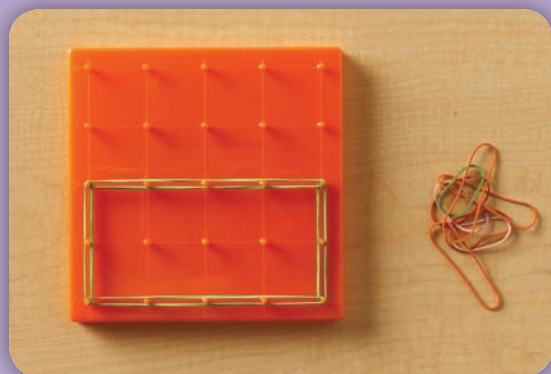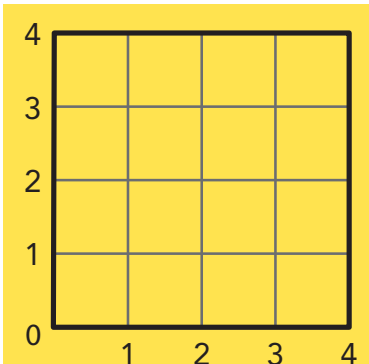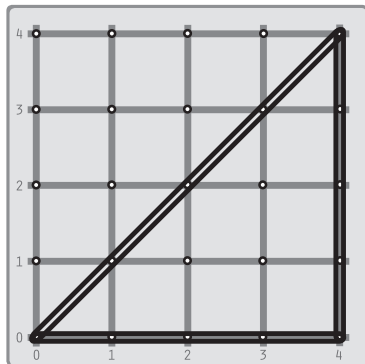

3. Ask: *How many smaller squares are in your square? Can you make a square with 8 equal square parts on your Geoboard?* **Say:** *Make a quadrilateral that you can divide into 8 equal square parts.*

**Use a Geoboard to model a whole shape using the part given.
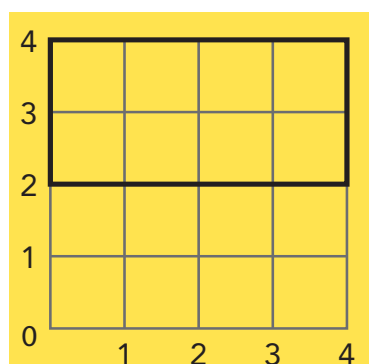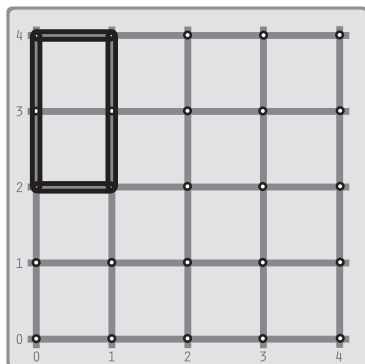Draw the whole shape on the grid.** (Check students' work.)

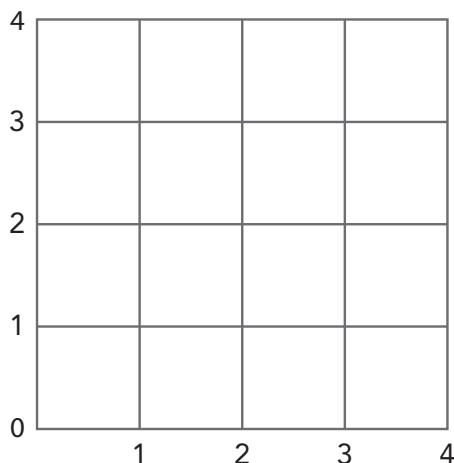**1.** triangle = $\frac{1}{2}$ square | a 4 × 4 square made of 2 equal triangles

2. rectangle = $\frac{1}{4}$ rectangle | a 4 × 2 or 2 × 4 rectangle made of 4 equal rectangles
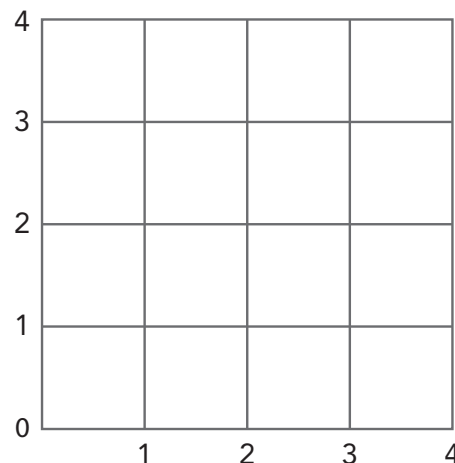
3. square = $\frac{1}{9}$ square

a 3 × 3 square made of 9 equal squares

4. trapezoid = $\frac{1}{2}$ hexagon

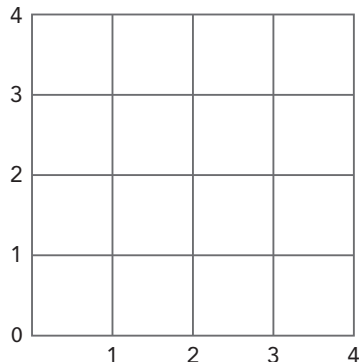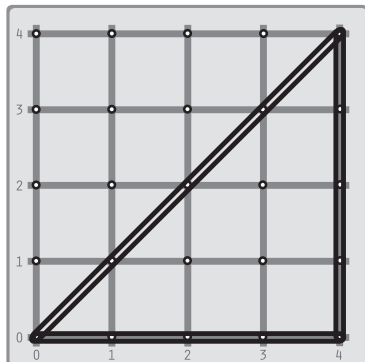a hexagon made of 2 equal trapezoids

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Challenge! Cheryl says she can make a pentagon on her Geoboard using 6 right triangles. Use your Geoboard to try this, and draw the shapes to show if Cheryl is correct. Describe your work.

Challenge: (Sample) A pentagon, or house, can be made using 2 right triangles as the roof, and then 4 alternating right triangles to make the bottom of the house.
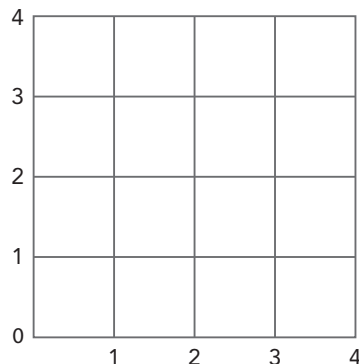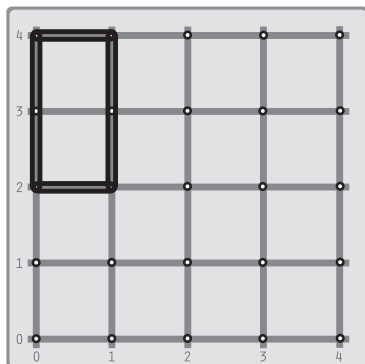
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Name _____

Use a Geoboard to model a whole shape using the part given. Draw the whole shape on the grid.
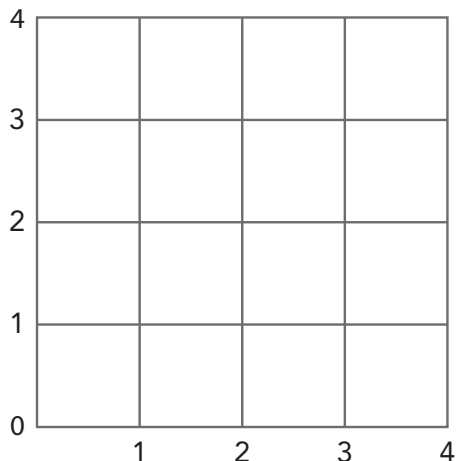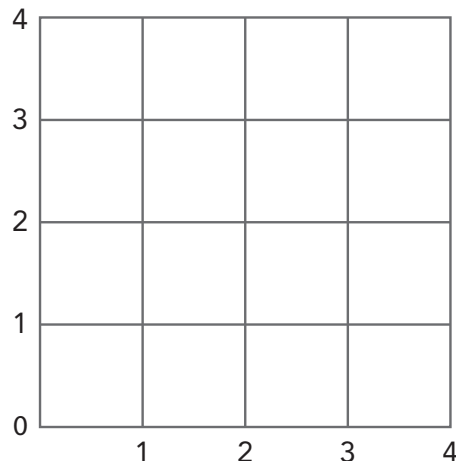
1. triangle = $\frac{1}{2}$ square

2. rectangle = $\frac{1}{4}$ rectangle

3. square = $\frac{1}{9}$ square

4. trapezoid = $\frac{1}{2}$ hexagon

Name _____

Challenge!   Cheryl says she can make a pentagon on her Geoboard using 6 right triangles. Use your Geoboard to try this, and draw the shapes to show if Cheryl is correct. Describe your work.

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Name _____