**Getting Ready**

**What You’ll Need**
- Geoboards, 1 per child
- Rubber bands
- Geodot paper, page 90
- Overhead Geoboard and/or geodot paper transparency (optional)

**Overview**
Children solve riddles by making Geoboard polygons that fit given sets of clues. In this activity, children have the opportunity to:
- identify distinguishing attributes that differentiate polygons
- apply logical reasoning to find solutions that fit a set of clues
- use geometric language to describe properties of polygons

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**Introducing**

**Introductory Riddle**

It is a quadrilateral.
Its angles are all the same size, or congruent.
Its length is twice its width.

Ask children to construct any 4-sided figure, or quadrilateral, on their Geoboards. Then give them this riddle.

Ask children to decide whether or not their quadrilaterals fit the clues in the riddle. Have volunteers explain their decisions.

Discuss these three possible solutions, and have children explain why there are only three solutions.
On Their Own

Can you solve these Geoboard riddles by making shapes that fit the clues?

<table>
<thead>
<tr>
<th>Riddle 1</th>
<th>Riddle 2</th>
<th>Riddle 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has 3 sides.</td>
<td>It has 4 sides.</td>
<td>It has 6 sides.</td>
</tr>
<tr>
<td>Each side is a different length.</td>
<td>It has only 1 pair of parallel sides.</td>
<td>It has an area of 5 square units.</td>
</tr>
<tr>
<td>It has one interior peg.</td>
<td>No sides are the same length, or congruent.</td>
<td>It has 2 right angles.</td>
</tr>
<tr>
<td>It has no right angles.</td>
<td></td>
<td></td>
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</tbody>
</table>

- Work with a group to find several possible solutions for each riddle.
- Record your solutions on geodot paper.
- Be ready to explain how you found your solutions.

The Bigger Picture

Thinking and Sharing

Have groups take turns presenting solutions for each of the riddles. Write the clues for each riddle on a different section of the chalkboard. Post the solutions for each riddle under its clues. Encourage children to discuss how the solutions are alike and how they are different.

Use prompts such as these to promote class discussion:

- How did you go about solving the riddles?
- Which kinds of clues were easiest to follow? Which were more difficult? Why?
- What mathematical names could you give the shapes you have made?
- For each riddle, how might you add a clue (or clues) that would lead to only one possible solution?

Writing

Have children make a list of words that are the most helpful in the clues in this activity. Have them explain why they are good “clue words.”

Extending the Activity

Have children work in pairs or small groups to write their own riddles for other groups to solve. Ask children to vary the kinds of riddles that they write. For example, children could write riddles that have several solutions, just one solution, or no solutions.
Children develop their logical reasoning ability as they experiment to find polygons that fit the clues in the riddles. Children also become more familiar with the properties of polygons, as well as with the geometric language that is used to describe these properties.

The following drawings show three possible solutions for each riddle and the mathematical terms that describe the solutions. Children, however, will probably explain these solutions in their own terms. For example, instead of scalene they may say “no sides that are the same.”

Children may go about solving the riddles in different ways. Some children may form a shape that fits the first clue, and then adjust the shape as they read each successive clue. For example, for Riddle 1:
Other children may read the whole riddle, reforming a shape in their minds until they think it fits all the clues. Then they make the shape on their Geoboard and check it against the clues.

Some children may use the process of elimination to solve the riddles. For example, in the riddle in the *Introducing*, the first two clues eliminate all shapes except squares and rectangles. The third clue eliminates the squares and narrows down the possible rectangles to those that have lengths that are twice their widths. Although these rectangles can be positioned differently on the Geoboard, they are all slides, flips, or turns of only three unique rectangles. Thus, through experimentation, children find that there are only three rectangles on the Geoboard that are solutions to this riddle.

When adding clues to a riddle so that it will produce a unique solution, children may focus on one particular solution and look for ways to eliminate all the other solutions. For example, in order to make the shape below the unique solution for Riddle 1, children would have to add clues such as the following:

**Additional Clues:**
- One side is 3 units long.
- It has an obtuse angle.

These additional clues will make this shape the unique solution for Riddle 2.

**Additional Clues:**
- The shorter of the parallel sides is 3 units long.
- The shortest side is 2 units long.

These additional clues will make this shape the unique solution for Riddle 3.

**Additional Clues:**
- There are 3 pairs of parallel sides.
- One pair of parallel sides are each 2 units long.
- One pair of parallel sides are each 1 unit long.