

GEOMETRY PLAYGROUND

Activities | Grades 3–5

www.exploratorium.edu/geometryplayground/activities

EXPERIMENTING WITH SYMMETRY

See how mirrors reflect the features of a shape.

[30 minutes]

Materials:

- Pattern blocks (multiple sets) You can purchase these online, or download and print out paper patterns here:
<http://mason.gmu.edu/~mmankus/Handson/manipulatives.htm>
- Paper
- Pencil
- A partner
- Tape
- One or two small mirrors, preferably with no frames

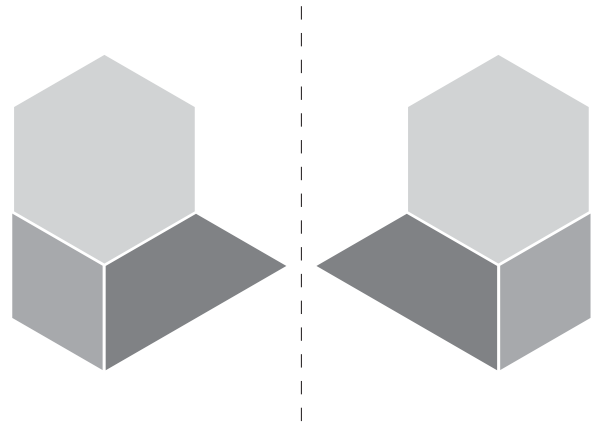
Try This:

Step 1 You'll need a piece of paper with a line drawn down the middle. You should sit on one side of the line, and your partner on the other. The line represents a mirror.

Step 2 Put two blocks down on the paper on your side of the line. Your partner should place blocks on his or her side of the line so that the blocks are a reflection of yours.

Step 3 Take turns adding one block at a time to the paper. Each time a block is added, the other partner should make the reflection.

Step 4 In the end, your design should look symmetrical. In other words, if you were to fold it in half, the two parts would match up exactly from one side to the



- other, like the wings of the butterfly.
- Step 5 On your own, make a simple design with your blocks on one side of the divided paper.
- Step 6 Describe your design. Then describe its mirror image.
- Step 7 Try to re-create the mirror image of your design. You can check your work by placing the mirror on the dividing line and comparing the two patterns. To do this, stand the mirror along the edge of your pattern, with one edge on the table and the reflective surface perpendicular to the table so you can see the reflection of your pattern in the mirror. What do you notice? The entire shape that you see (what's on the table plus what's in the mirror) is *bilaterally symmetrical*. This means that the reflection in the mirror is the same as the original pattern, but reversed.
- Step 8 If you have two mirrors, tape them together like a book with the mirrored surfaces facing each other. Open your mirror book to a 90° angle. Make a pattern on the table that touches both mirrors. What do you see in the mirrors? How many times are the shapes repeated? Is there anything surprising?
- Step 9 Now try changing the angle of the mirrors so that they are closer together or further apart. What happens to the image you see? Can you re-create these patterns without the mirrors?
- Step 10 How else can you experiment with the blocks and mirrors?

EXPERIMENTING WITH SYMMETRY

Specify locations and describe spatial relationships using coordinate geometry and other representational systems:

- Describe location and movement using common language and geometric vocabulary.

Apply transformations and use symmetry to analyze mathematical situations:

- Identify and describe line and rotational symmetry in two- and three-dimensional shapes and designs.

Use visualization, spatial reasoning, and geometric modeling to solve problems:

- Create and describe mental images of objects, patterns, and paths;
- Identify and build a three-dimensional object from two-dimensional representations of that object.