

# GEOMETRY PLAYGROUND

Activities | Grades K–2

[www.exploratorium.edu/geometryplayground/activities](http://www.exploratorium.edu/geometryplayground/activities)

## STRING SHAPES

Make many-sided shapes with string.

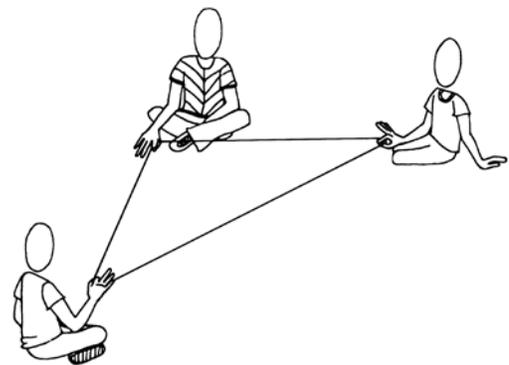
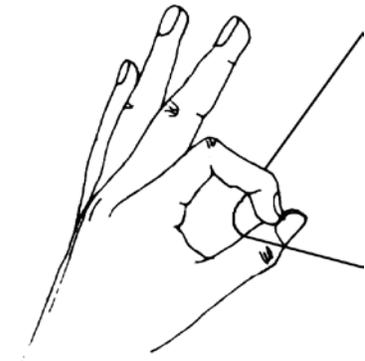
[45 minutes]

### Materials:

- String, about 2.5 meters (8 feet) long, tied at the ends to form a loop
- Masking tape
- Floor space
- Three people (more can join later)

### Try This:

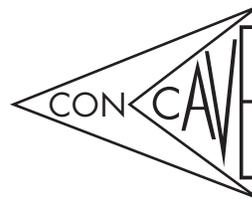
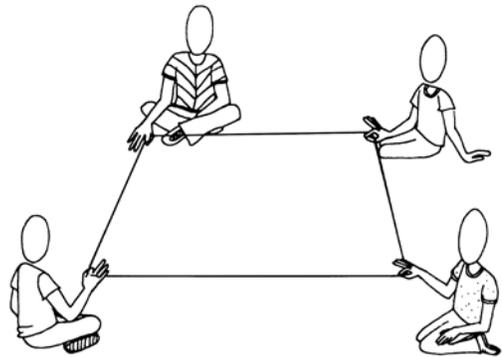
- Step 1 Sit on the floor with your friends, facing one another. Start with three people.
- Step 2 Each person should take one hand and close the thumb and index finger around the string. The string should slide through easily. (If you have only two people, one person should use both hands.)
- Step 3 Pull the string taut. What shapes can you make with three people, each using one hand? How many sides does the shape have? How many points?
- Step 4 By changing your hand positions while allowing the string to slide through your fingers, you can make different kinds of triangles. How are they different? What happens to the lengths of the sides of the triangle?



Step 5 When the group finds an interesting triangle, take turns describing the triangle from your point of view. Does it remind you of anything?

Step 6 How can you make a shape with four sides? Have a fourth person join your group and hold the string with one hand.

Step 7 What interesting shapes can you make with four people? Four-sided shapes are called *quadrilaterals*. Notice that you can make *concave* shapes—where some of the points go inward—as well as *convex* shapes, where all the points go outward. Keep your hands close to the floor as you make shapes.



Step 8 When one group has found an interesting shape, work with the teacher to lower that shape down, and carefully tape each point of the shape to the floor.

Step 9 Stand in a circle around the shape.

Step 10 Take turns describing the quadrilateral from different points of view. Move around the circle to the right and describe the shape again. Keep doing this until you're back where you started.

Step 11 How can you make a shape with five sides?

### **Make up your own question!**

Try to make up an interesting question that you can answer with this activity. The question should begin with the phrase:

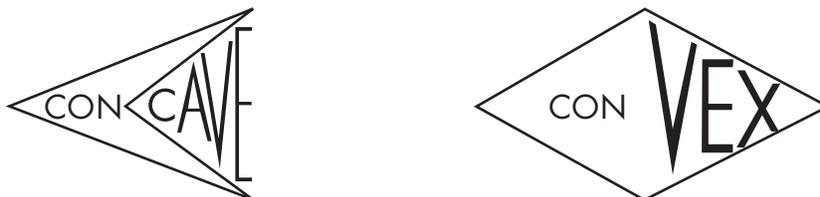
How can I make a \_\_\_\_\_?

## What's Going On?

When three or more people hold the string taut, it creates a polygon. A polygon is any flat shape whose sides are straight lines. There are many kinds of polygons, such as triangles, quadrilaterals, rectangles, and squares.

The number of hands holding the string determines how many sides and how many points, or *vertices*, the polygon will have. Three hands create triangles, which have three sides and three vertices. Four hands create *quadrilaterals*—four sides and four vertices. By adding hands, one at a time, you can make *pentagons* (5), *hexagons* (6), *heptagons* (7), and *octagons* (8).

Depending on position of the hands holding the string, your polygon may be a convex polygon, or a concave polygon. *Concave* polygons have at least one point that goes in like a cave. In *convex* polygons all the points go outward.



Describing the shapes from different points of view is similar to turning—or *rotating*—the shape. Instead of rotating the shape itself, you are moving around the shape. The shape itself never changes, yet each view of it looks a little different.

## STRING SHAPES

Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships:

- Recognize, name, build, draw, compare, and sort two- and three-dimensional shapes;
- Describe attributes and parts of two- and three-dimensional shapes.

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

- Recognize and represent shapes from different perspectives.