

Build What I've Created

Grades 3–5

Goals

- Construct a geometric design from oral directions
- Use precise geometric vocabulary in giving directions
- Recognize geometric shapes and patterns in quilt designs

Prior Knowledge

Students should have a knowledge of such basic shapes as the triangle and the square and be able to use the attributes of these shapes to describe specific examples of them to a partner. It is not necessary that they know the formal terms for trapezoid and hexagon. They can learn them as the lesson progresses. It will be helpful if students have had previous experiences with pattern blocks.

Materials and Equipment

- Two identical sets of pattern blocks, each containing from six to twelve blocks and a variety of shapes for each pair of students. (A template for pattern blocks is available on the CD-ROM that accompanies this book.)
- A six-inch-square outline for each student on which to create designs (A template for this outline, “Quilt-Patch Work Space,” is available on the CD-ROM.)

Learning Environment

Students work in pairs. If the partners are facing each other, place a divider between them so that the builder cannot see the pattern being described. Otherwise, they can sit back to back. The activity is most successful when students are paired homogeneously by ability in both verbal and spatial skills. This activity can be easily modified by altering the number of blocks used and by varying the types of questions the students are allowed to ask. Most students should be encouraged not to use color to identify a block but rather to use its name or talk about its characteristics. For advanced students, the re-creator of the design might be allowed to request only that the directions be repeated. Other students might be permitted to ask only questions that can be answered by yes or no. Students who need more help could have no restrictions on dialogue between the direction giver and the re-creator of the design.

Important Geometric Terms

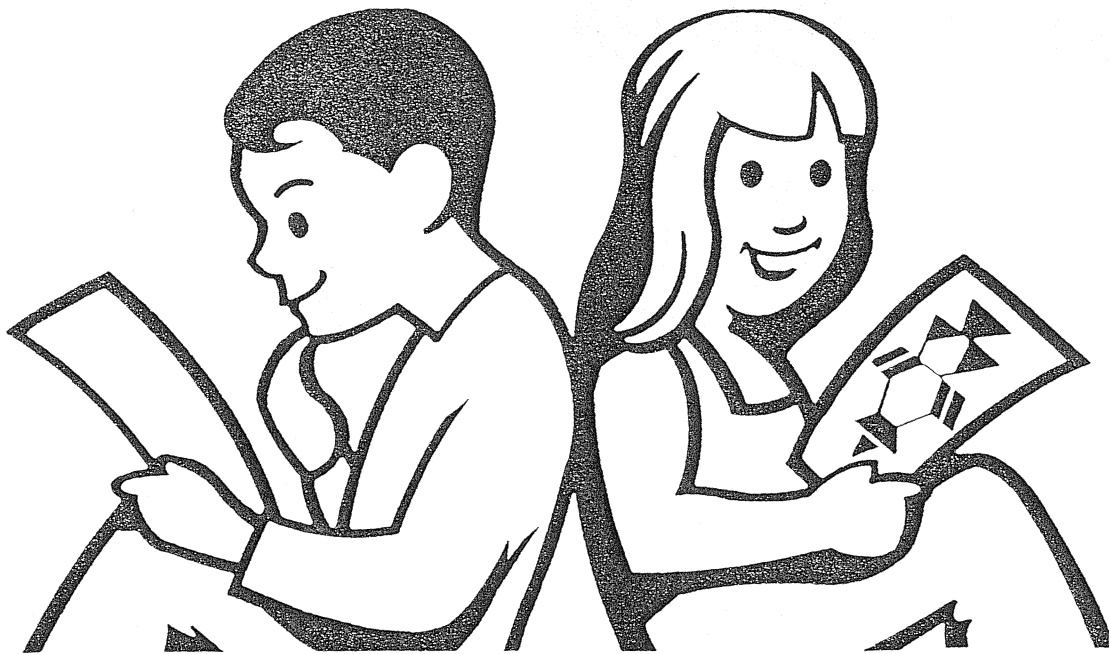
Shapes: *triangle, square, hexagon, trapezoid, rhombus*

Position: *above, below, on top of, left, right, parallel, perpendicular, horizontal, vertical, and adjacent*



Investigate, describe, and reason about the results of subdividing, combining, and transforming shapes





To explore cultural connections, students could read about the history of quilts in the United States in a classroom reading center on this topic. The Web site www.womenfolk.com is useful. Go to Grandmothers' Quilts for a history of quilts and photographs of different kinds of quilts.

Using the Pattern Patch applet on the CD-ROM, students can design a quilt patch and explore characteristics of shapes.



Activity

Engage

Quilting activities can be used to make many connections to literature. You could begin this activity by reading *Sweet Clara and the Freedom Quilt*, by Deborah Hopkinson (1993), or *Sam Johnson and the Blue Ribbon Quilt*, by Lisa Ernst (1983). Besides portraying positive gender-role models for students, both books have excellent connections to social studies. Discuss the quilt patterns in the book, encouraging the students to determine how they are alike and how they are different, and note the connection to mathematics and art.

Explore

On the "Quilt-Patch Work Space," one student designs a "quilt patch" from pattern blocks (fig. 1.1) without the partner's seeing it. Then the creator of the design gives directions to the partner so that the partner can re-create the design without looking at it. The re-creator then explains to the designer what the design looks like. Finally, the quilt designs are compared visually, and the students together record answers to the following questions:

- What words or phrases helped you re-create the design?
- What words or phrases confused you? Why?
- Can you think of better ways to explain the directions for making the design?

The activity is then repeated with partners switching roles. Follow the activity with a classroom discussion that develops the geometric vocabulary used by the students.

Have the students examine the designs to see if they can rearrange the pattern blocks to find new shapes with five, six, or seven sides. They should record which blocks make up the new figure, trace around the new shapes, and verify the number of edges by counting the sides in the diagram. They can also discuss the number of angles in their diagrams and compare that number with the number of sides.

3.6

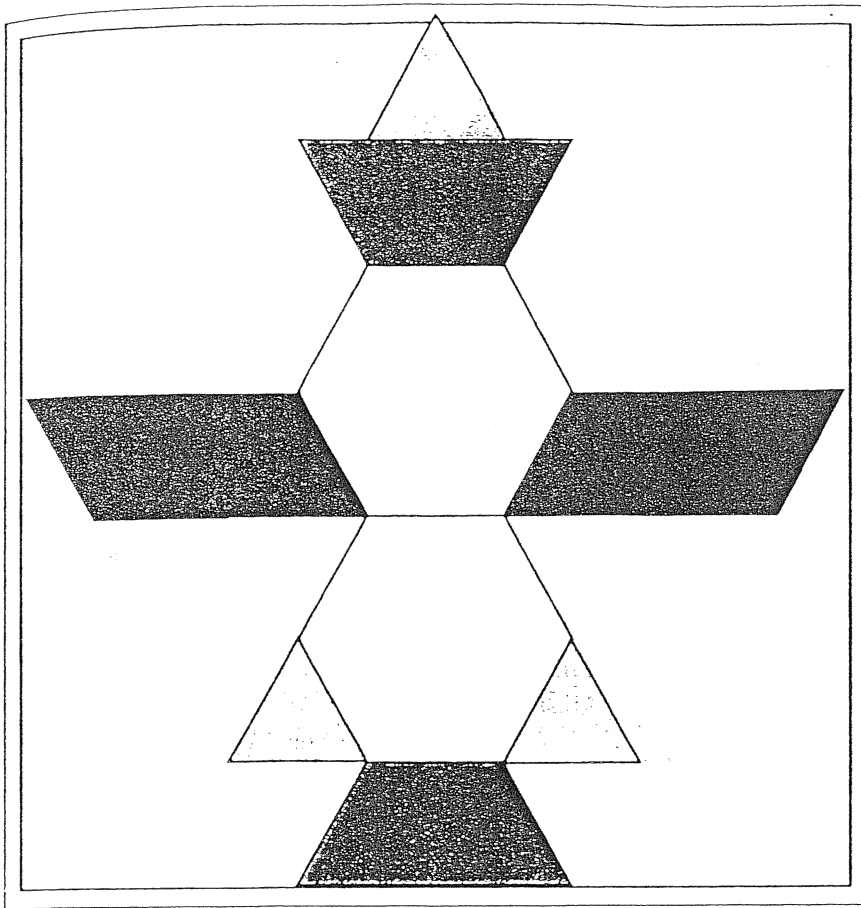


Fig. 1.1.

A "quilt patch" composed of pattern blocks

Assess

This activity can be used for preassessment at the beginning of a unit on geometry. By observation, teachers can determine students' familiarity with the geometry terms that are important in this activity.

To assess students' performance, ask them to design a quilt patch and then write directions for another student to re-create the design. Their success is determined by the quality of another student's re-creation of the design. This approach encourages self-assessment as students modify their directions on the basis of the outcome.

Extend

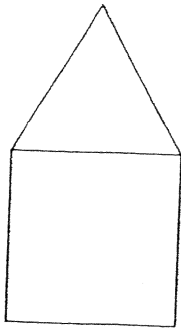
Show students prints of paintings, for example, *Harmonie Tranquille*, by Wassily Kandinsky, or *Three Musicians*, by Pablo Picasso, and ask them to identify all the different shapes found in the paintings. Working with the art teacher, you can introduce cubism to students and encourage them to create original artwork that includes a variety of shapes in this genre. You can find copies of these paintings at www.art-modes.com.

Where to Go Next in Instruction?

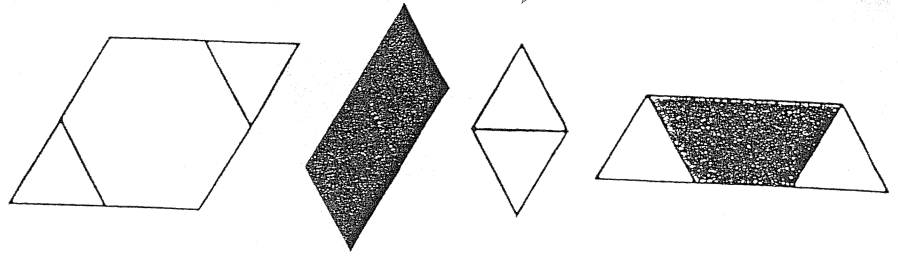
With this activity as an introduction, students should be prepared to begin a unit on discovering the properties of shapes and angles. Be flexible in grouping students on the basis of informal observations of their performance in this activity. Pattern blocks are excellent manipulatives for students to use to explore combining and transforming shapes. Spark students' discovery with the following questions:

This assessment activity can be set up as a classroom center. The designs can be used as a decorative room or door border showing the connection of mathematics to art.

Students may notice that in combining shapes, they lose one side of each shape. So if they want to make a pentagon (five sides), they can use a triangle (three sides) and a square (four sides). In combining the triangle and square, one side of each figure is "lost" when it becomes part of the interior of the pentagon.



- How many ways can you make a quadrilateral by putting different blocks together? Show some examples.



- What are the names for the quadrilaterals you made?
- Which ones are the same size and shape (congruent)? How can you tell?
- Can you make a five-sided figure by combining shapes? A six-sided figure? A seven-sided figure?
- What patterns do you notice?

Pattern blocks are also excellent manipulatives for exploring angle measures. For example, three green triangles can be put together at one of their vertices to demonstrate that the angle formed is a straight angle (measure 180°); thus, each of the three angles measures 60 degrees. The measure of each angle of a hexagon is made of two angles of the green triangle, so each interior angle of a hexagon measures 120 degrees.

Teachers should be aware that pattern blocks are actually three-dimensional shapes; however, they are commonly referred to by the name for the two-dimensional shape of the two large faces. For example, the triangle is really a triangular prism. It is not necessary to elaborate on this distinction at this time, but be aware of it in case a student recognizes it.

Quilt designs can also be used to explore symmetry and transformations. Patchwork Symmetry in chapter 3 offers further explorations and makes a nice segue from the study of shapes into the study of transformations, using quilting as the link.