Reflectional and Rotational Symmetry

Purpose

Students will identify shapes that have reflectional and rotational symmetry and understand specific turns in regard to rotational symmetry.

Materials

For the teacher: templates from Black Line Master (BLM) *Shapes for Reflection and Rotation*, post (e.g., broomstick)
For each student: copy of BLM *Shapes for Reflection and Rotation*, piece of thick corrugated cardboard about 6 inches square, stick pin, unlined paper and heavier paper, 4 different colors of markers or crayons

Activity

A. Introduction

1. Distribute copies of the the BLM *Shapes for Reflection and Rotation* and have students cut out the shapes.
2. Explain that *reflectional symmetry* exists when a shape can be folded in half and the two halves overlap each other. Have students practice with the equilateral triangle from the BLM and find the lines of symmetry. [3]
3. Tell students that to check for *rotational symmetry*, an object is turned about a point. Explain that rotational symmetry exists if the turned object looks the same as the original object.
4. Demonstrate rotational symmetry by drawing a large "N" on a piece of paper. Place a dot on the center of the *N* and tape the paper to the chalkboard.
5. Ask a student to come to the board and rotate the paper $^1/_4$ turn, or 90°, using the dot as the rotation point. Ask students if the *N* looks the same as the original *N*. [Students should notice that it does not.]
6. Return the paper to its original position, and ask another student to come to the board and rotate the paper $^1/_2$ turn, or 180°, using the dot as the rotation point.
7. Ask students if the *N* looks the same as the original *N*. [Students should notice that it does.] Tell students that since the turned object looks the same as the original object, the object, *N*, is rotationally symmetric.

(continued)

MEETING INDIVIDUAL NEEDS

Help students who have difficulty by using a square and have them write about all the reflections and all the rotations of a square.

INCORPORATING TECHNOLOGY

Let students use a drawing program to create shapes and then use the flip and rotate tools to show reflectional and rotational symmetry.

Standards Link
5.4.1

Activity (continued)

8. Explain to students that they may choose to turn objects any given number of degrees except 360°. Remind students that turning an object 360° places the object in its original position.

B. Student Activity

1. Have students use the shapes on the BLM as templates that they can paste on heavier paper and cut out.
2. Ask students to take the parallelogram before it is pasted on heavier paper and try to fold it to find reflectional symmetry. Have them do the same with the *M*.
3. Direct students to draw around the template of the equilateral triangle onto a piece of paper. Have students place the template on top of this with a thumb tack in the indicated center.
4. Ask students to turn the triangle until it fits on top of the drawn outline and describe the turn as more than 90° but less than 180° (or maybe as 120°).
5. Have students turn the template again until it fits exactly on to the tracing (240°) and again until it returns to its original position (360°).
6. Have students follow steps 3 through 5 with the rectangle (180° and then 360°) and the square (90°, 180°, 270°, and 360°).
7. Have students draw around the *A* template on unlined paper with one color, turn it $\frac{1}{4}$ turn or 90°, and draw around it with another color.
8. Direct students to turn it another 90° and draw around it with another color. Remind students that this color is 180° or $\frac{1}{2}$ turn from the original.
9. Have students turn it another 90° and trace around it again and remind students that this is 270° or $\frac{3}{4}$ turn from the original. Have students recognize that the *A* looks different in all these positions and so does not have rotational symmetry.
10. Have students paste the parallelogram to heavier paper and discuss how it will rotate and fit. Then have them draw around it, put a tack in the center, and turn it until it matches. Have them describe the rotational symmetry.

Questions for Review

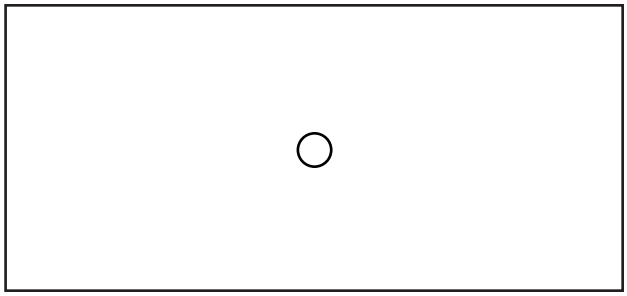
Basic Concepts and Processes

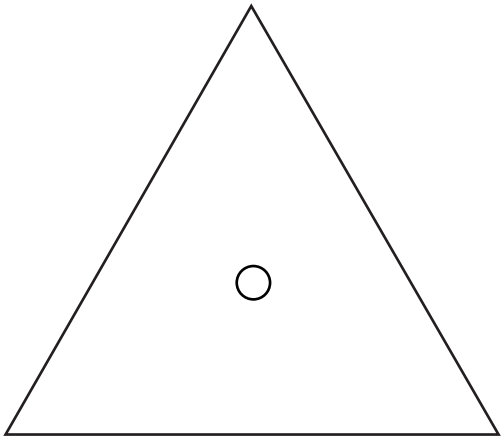
During the activity, discuss the following questions with your students:

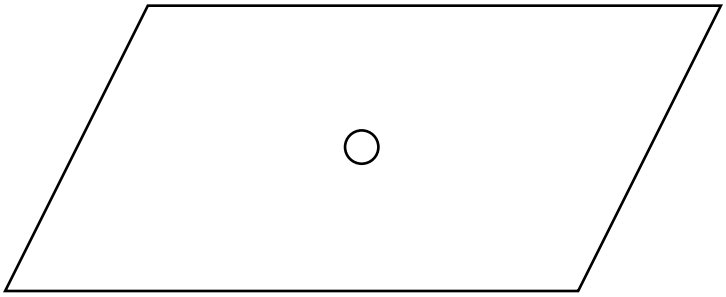
How far can you rotate this shape [*indicate shape from BLM* Shapes for Reflection and Rotation] before it fits over its outline?

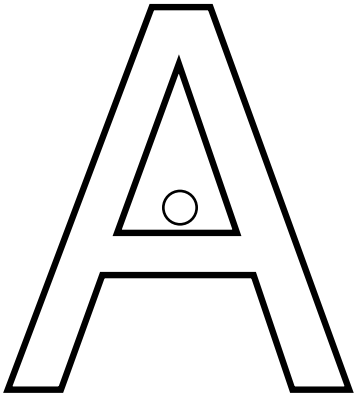
Describe the difference between reflectional and rotational symmetry.

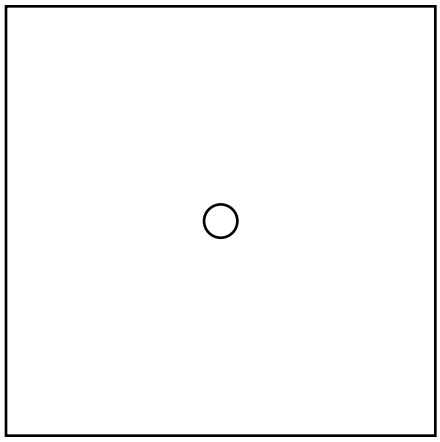
Shapes for Reflection and Rotation

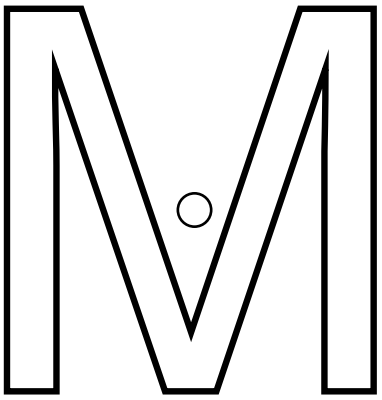












Shapes for Reflection and Rotation

Teacher Directions

Distribute one copy of the BLM *Shapes for Reflection and Rotation* to each student.
Have students cut out the shapes on the BLM and use them as described in the activity.

Answer Key

Rectangle	– reflectional symmetry – rotational symmetry (180°)
Triangle	– reflectional symmetry – rotational symmetry (120°)
Parallelogram	– rotational symmetry (180°)
A	– reflectional symmetry
Square	– reflectional symmetry – rotational symmetry (90° 180°, 270°)
M	– reflectional symmetry