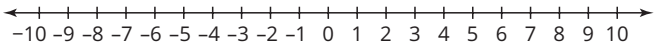
6

OKEECHOBEE

Reflectional and Rotational Symmetry

Warm Up

Identify the opposite of each number on the number line.



1. -8

2. $-|-2|$

3. 9

4. $-(-7)$

Learning Goals

- Identify geometric figures with line symmetry and rotational symmetry.
- Identify lines of symmetry for different geometric figures.
- Describe rotations that carry a figure onto itself.
- Describe reflections that carry a figure onto itself.

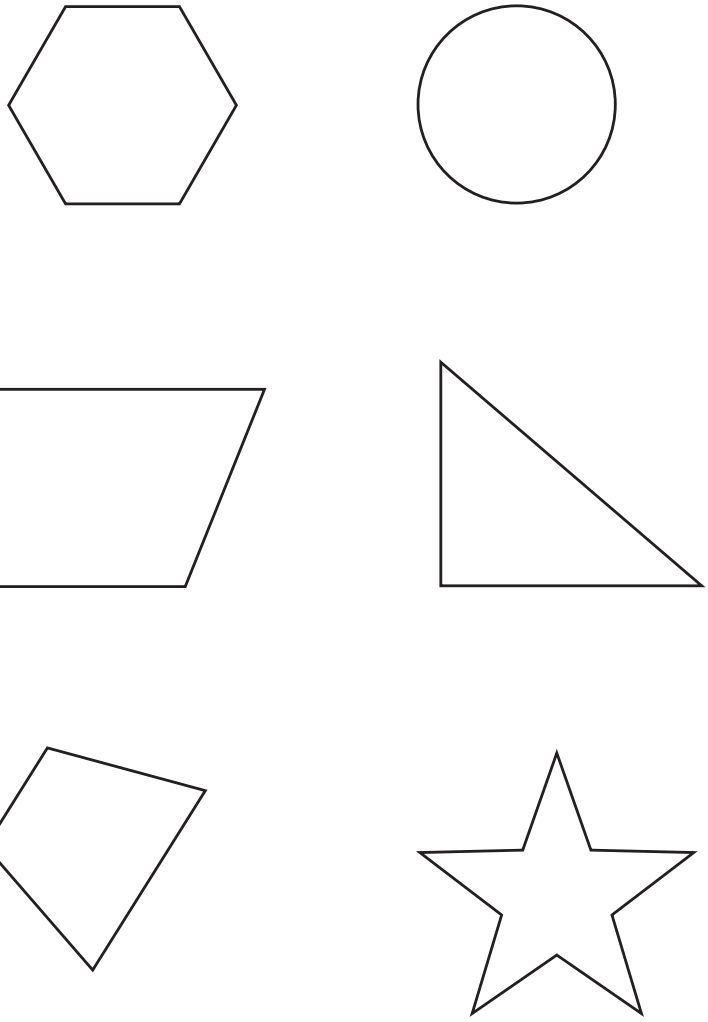
Key Terms

- reflectional symmetry
- rotational symmetry

You have learned that pre-images are congruent to images after rigid motion transformations. How can you use transformations to show that a figure can be carried onto itself?

WOW MOM

Consider the different shapes shown.



1. **Copy each shape onto patty paper. For each shape:**

   a. **Determine whether you can fold the shape so that half of the figure lies exactly on the other half of the figure. If so, are there any other folds that will do this?**

   b. **Determine whether you can rotate the figure so that it looks exactly like it did before the rotation. If so, are there other rotations that will do this?**

ACTIVITY
6.1 Reflectional and Rotational Symmetries

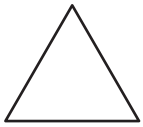
Consider the shapes from the Getting Started.

1. Name the shapes.

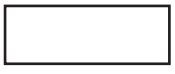
A plane figure has **reflectional symmetry** if you can draw a line so that the figure to one side of the line is a reflection of the figure on the other side of the line. Recall that the line that you drew on each shape is called the line of symmetry. A figure may have more than one line of symmetry.

2. Which shapes have reflectional symmetry?

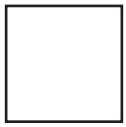
3. Consider the equilateral triangle shown. It has 3 lines of symmetry. Draw these lines of symmetry.



4. How many lines of symmetry does the rectangle shown have? Explain your reasoning.



5. **How many lines of symmetry are there in a square? Show the line(s) of symmetry.**



A plane figure can also have **rotational symmetry** if you can rotate the figure more than 0^{o} but less than 360^{o} and the resulting figure is the same as the original figure in the original position.

6. **Which shapes in the Getting Started have rotational symmetry?**

7. **Do you think that the given shape has rotational symmetry? Why or why not?**

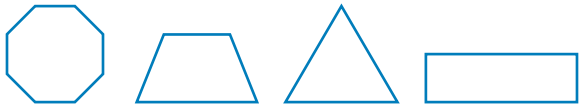
8. **Can a shape have both reflectional and rotational symmetry? Explain your reasoning.**

You have also identified transformations that carry a figure onto itself. Reflectional and rotational symmetry are properties of figures that can be carried onto themselves by reflections and rotations.

Think about:

For reflections, identify the line of reflection. For rotations, describe the rotation angle and center of rotation.

9. Consider the 4 shapes shown.



a. Describe the reflections and rotations that can carry each figure onto itself.

b. Clark says that the horizontal line of symmetry in the rectangle means that a reflection across that line carries the figure onto itself. He also says that it means that a 180° rotation will carry the figure onto itself.

Is Clark correct? Does his reasoning apply to other figures? Explain your thinking using the shapes from the Getting Started.

ACTIVITY
6.2 Identifying Symmetry

The standard alphabet has many letters that have a variety of symmetries, including reflectional and rotational symmetry. Some letters have a vertical line of symmetry. Other letters have a horizontal line of symmetry.

1. Which letter(s) have a horizontal but not a vertical line of symmetry?

A **C** **H** **M**

2. Which letter(s) have a vertical but not a horizontal line of symmetry?

M **B** **H** **X**

3. Which letter(s) have both a horizontal and a vertical line of symmetry?

Z **E** **H** **M**

4. Which letter(s) have rotational symmetry?

Z **W** **K** **M**

NOTES

TALK the TALK

CHECK

The title of this lesson, OKEECHOBEE, is the name of a city, a county, and a lake in Florida. That title, along with the title of the Getting Started activity, WOW MOM, and the title of this activity, CHECK, all have rotational and/or reflectional symmetry.

1. **Identify the symmetries in each title. Explain your thinking.**

2. **Consider the rotational symmetries of an equilateral triangle, square, and regular hexagon.**

   a. **What relationship exists between the rotational symmetries of each figure and its interior angle measures?**

   b. **Test the pattern you noticed on a regular pentagon and regular hexagon. What do you notice?**