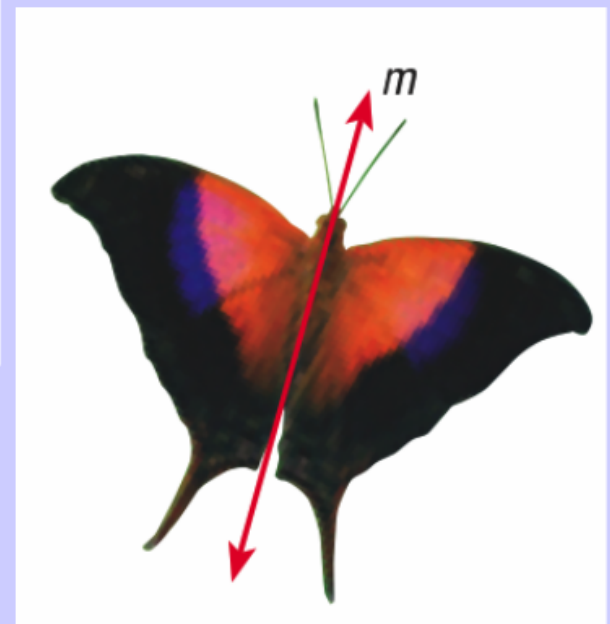


9.6 Identify Symmetry

A figure in the plane has **line symmetry** if the figure can be mapped onto itself by a reflection in a line. This line of reflection is a **line of symmetry**, such as line m at the right. A figure can have more than one line of symmetry.



EXAMPLE 1 Identify lines of symmetry

How many lines of symmetry does the hexagon have?

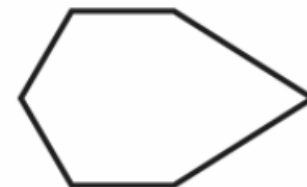
a.



b.



c.



How many lines of symmetry does the object appear to have?

1.



2.

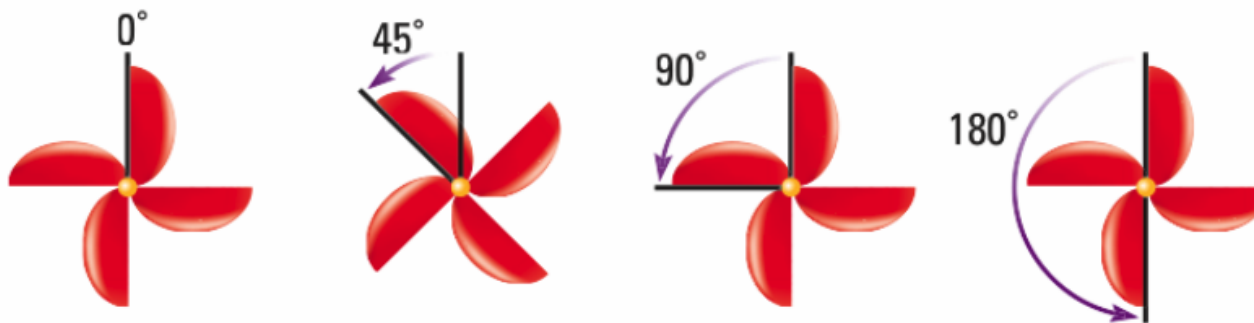


3.



ROTATIONAL SYMMETRY A figure in a plane has **rotational symmetry** if the figure can be mapped onto itself by a rotation of 180° or less about the center of the figure. This point is the **center of symmetry**. Note that the rotation can be either clockwise or counterclockwise.

For example, the figure below has rotational symmetry, because a rotation of either 90° or 180° maps the figure onto itself (although a rotation of 45° does not).



The figure above also has *point symmetry*, which is 180° rotational symmetry.

EXAMPLE 2 Identify rotational symmetry

Does the figure have rotational symmetry? If so, describe any rotations that map the figure onto itself.

a. Parallelogram



b. Regular octagon



c. Trapezoid



EXAMPLE 3 Standardized Test Practice

Identify the line symmetry and rotational symmetry of the equilateral triangle at the right.

- Ⓐ 3 lines of symmetry, 60° rotational symmetry
- Ⓑ 3 lines of symmetry, 120° rotational symmetry
- Ⓒ 1 line of symmetry, 180° rotational symmetry
- Ⓓ 1 line of symmetry, no rotational symmetry



Assignment:

9.6 WS

LESSON
9.6**Practice***For use with pages 619–624*

Determine whether the figure has rotational symmetry. If so, describe the rotations that map the figure onto itself.

1.



2.



3.

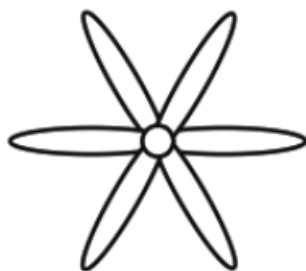


4.



Does the figure have the rotational symmetry shown? If not, does the figure have any rotational symmetry?

5. 120°



6. 180°



7. 45°



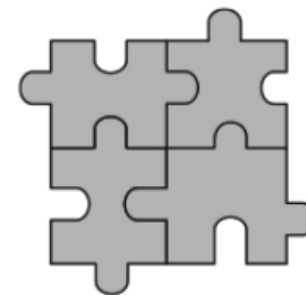
8. 36°



9. 180°



10. 90°



In Exercises 11–16, draw a figure for the description. If not possible, write *not possible*.

11. A triangle with exactly two lines of symmetry

12. A quadrilateral with exactly two lines of symmetry

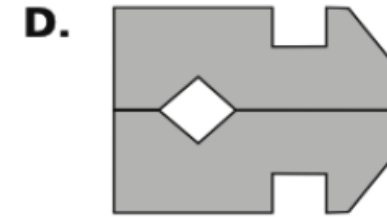
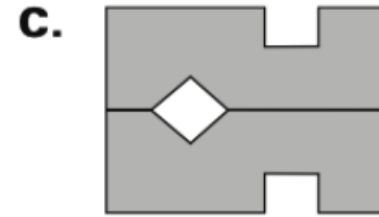
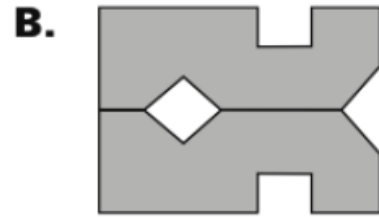
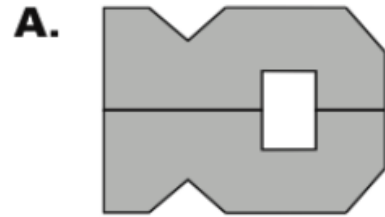
13. A pentagon with exactly two lines of symmetry

14. A hexagon with exactly two lines of symmetry

15. An octagon with exactly two lines of symmetry

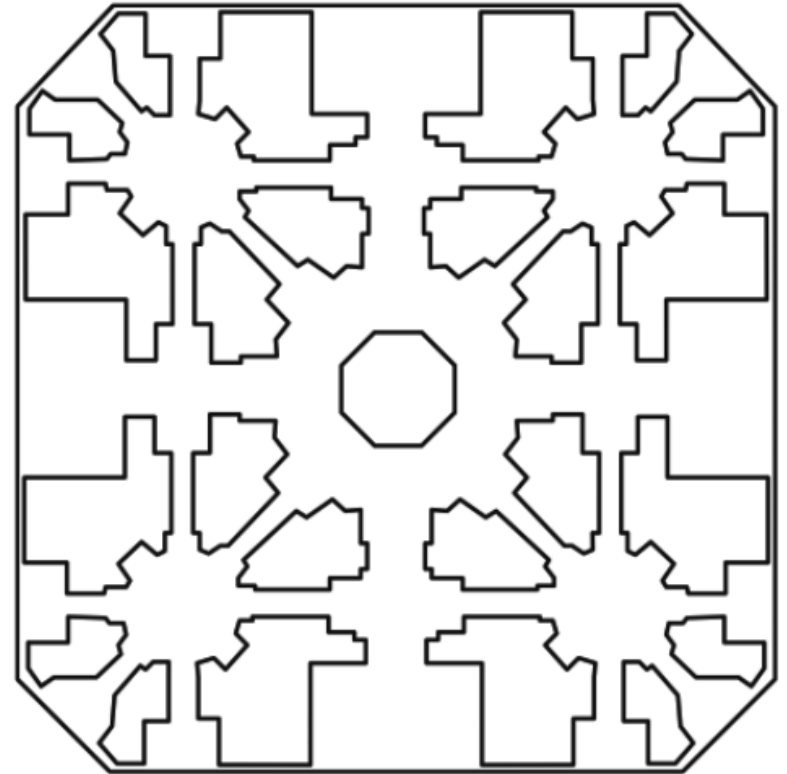
16. A quadrilateral with exactly four lines of symmetry

17. Paper Folding A piece of paper is folded in half and some cuts are made, as shown. Which figure represents the piece of paper unfolded?



In Exercises 18 and 19, use the following information.

Taj Mahal The Taj Mahal, located in India, was built between 1631 and 1653 by the emperor Shah Jahan as a monument to his wife. The floor map of the Taj Mahal is shown.

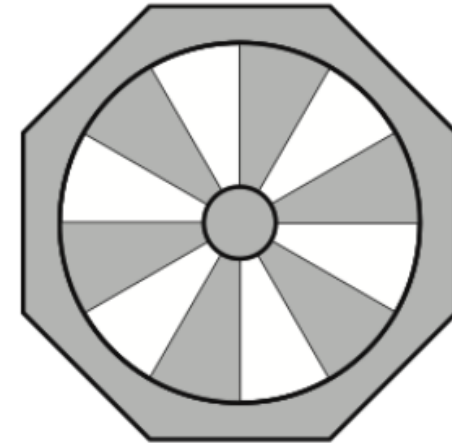


- 18.** How many lines of symmetry does the floor map have?
- 19.** Does the floor map have rotational symmetry? If so, describe a rotation that maps the pattern onto itself.

In Exercises 20 and 21, use the following information.

Drains Refer to the diagram below of a drain in a sink.

- 20.** Does the drain have rotational symmetry? If so, describe the rotations that map the image onto itself.



- 21.** Would your answer to Exercise 20 change if you disregard the shading of the figures? *Explain* your reasoning.