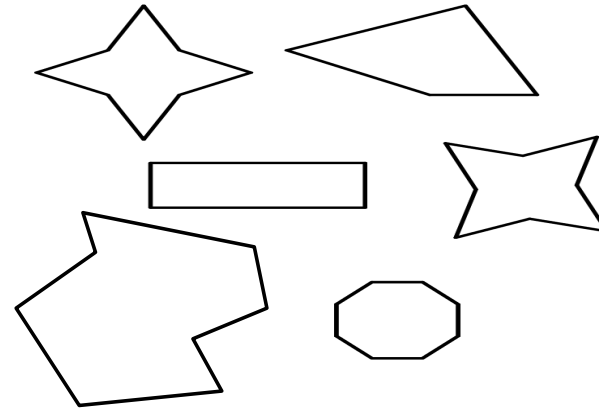


Section 5 – Topic 3
Symmetries of Regular Polygons

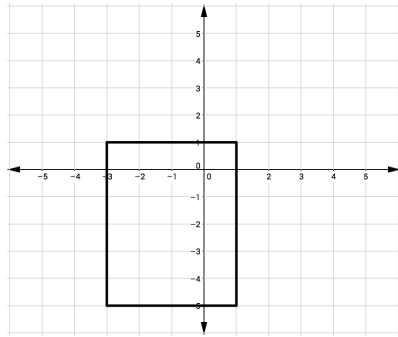
Which of the following are symmetrical? Circle the figure(s) that are symmetrical.



What do you think it means to map a figure onto itself?

Draw a figure and give an example of a single transformation that carries the image onto itself.

Consider the rectangle shown below in the coordinate plane. We need to identify the equation of the line that maps the figure onto itself after a reflection across that line.



Reflect the image across the line $x = -1$. Does the transformation result in the original pre-image?

Reflect the image across the line $y = -1$. Does the transformation result in the original pre-image?

Reflect the image across the line $y = x - 1$. Does the transformation result in the original pre-image?

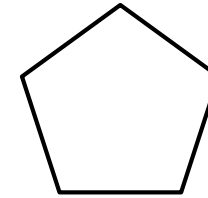
Reflect the image across the line $y = -2$. Does the transformation result in the original pre-image?

The equations of the lines that map the rectangle above onto itself are _____ and _____.

Reflecting a regular n – gon across a line of symmetry carries the n – gon onto itself.

Let's explore lines of symmetry.

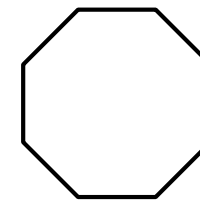
In regular polygons, if n is odd, the lines of symmetry will pass through a vertex and the midpoint of the opposite side. Draw the lines of symmetry on the polygon below.



In regular polygons, if n is even, there are two scenarios.

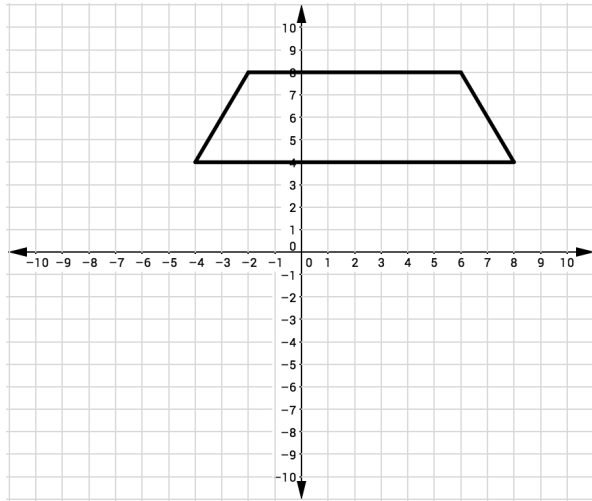
- The lines of symmetry will pass through two opposite vertices.
- The lines of symmetry will pass through the midpoints of two opposite sides.

Draw the lines of symmetry on the polygon below.



Let's Practice!

1. Consider the trapezoid below.

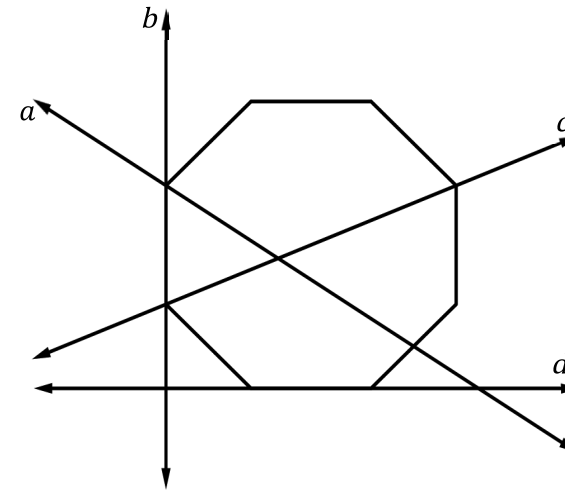


Which line will carry the figure onto itself?

- (A) $x = 1$
- (B) $x = 2$
- (C) $y = 4$
- (D) $y = 6$

Try It!

2. Which of the following transformations carries this regular polygon onto itself?



- (A) Reflection across line a
- (B) Reflection across line b
- (C) Reflection across line c
- (D) Reflection across line d

3. How many ways can you reflect the following figures onto itself?

a. Regular heptagon: _____

b. Regular octagon: _____

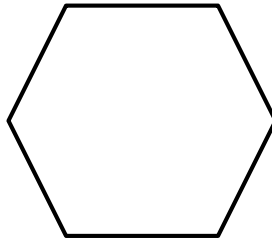


Rotations also carry a geometric figure onto itself.

What rotations will carry a regular polygon onto itself?

About which location do you rotate a figure in order to carry it onto itself?

What rotation would carry this regular hexagon onto itself?



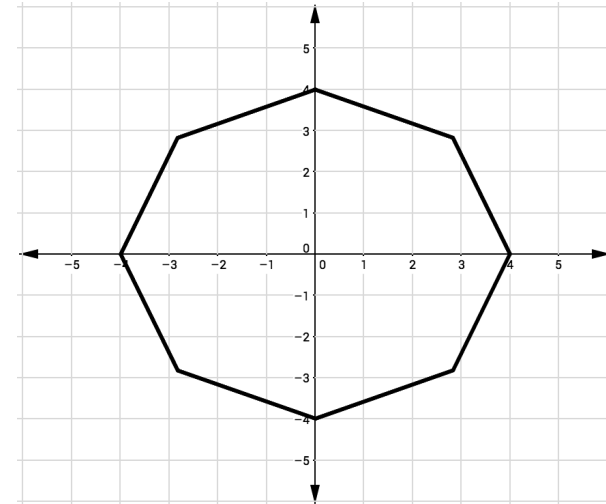
**STUDY
EDGE
TIP**

Rotating a regular n – gon by a multiple of $\frac{360^\circ}{n}$ carries the n – gon onto itself.



Let's Practice!

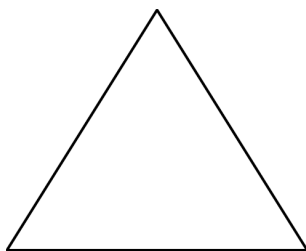
4. Consider the regular octagon below with center at the origin and a vertex at $(4, 0)$.



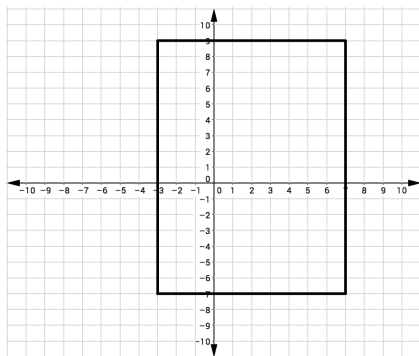
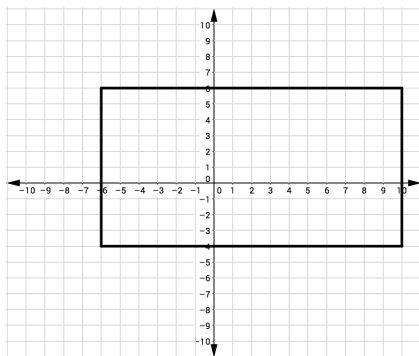
Describe a rotation that will map this regular octagon onto itself.

Try It!

5. Which rotations will carry this regular polygon onto itself?



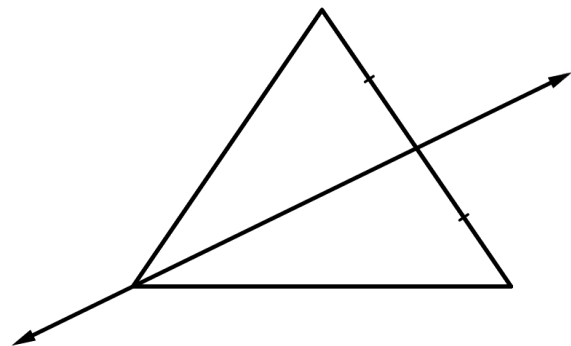
6. Consider the two rectangles below.



The degree of rotation that maps each figure onto itself is a rotation _____ degrees about the point (_____, _____).

BEAT THE TEST!

1. Which of the following transformations carry this regular polygon onto itself? Select all that apply.



- Reflection across line t
- Reflection across its base
- Rotation of 40° counterclockwise
- Rotation of 90° counterclockwise
- Rotation of 120° clockwise
- Rotation of 240° counterclockwise