

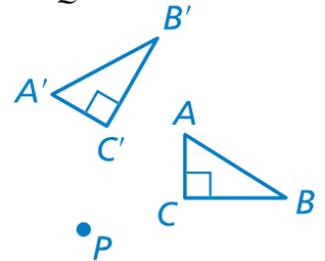
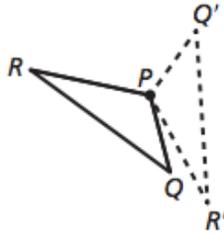
### 4.3 Notes - Transformation #3: Rotations

**Rotation:** a rotation is a transformation in which a figure is turned about a fixed point called the \_\_\_\_\_  
\_\_\_\_\_.

→ Rays drawn from the center of rotation to a point and its image form the \_\_\_\_\_

A rotation about a point  $P$  through an angle of  $x^\circ$  maps every point  $Q$  in the plane to a point  $Q'$  so that one of the following is true:

1. If  $Q$  is NOT the center of rotation  $P$ , then  $QP = Q'P$  and  $m\angle QPQ' = x^\circ$   
OR
2. If  $Q$  is the center of rotation  $P$ , then  $Q = Q'$



ROTATING COUNTERCLOCKWISE	ROTATING CLOCKWISE

\*\*“about” means “\_\_\_\_\_” in math language

#### Coordinate Rules for Rotations about the Origin

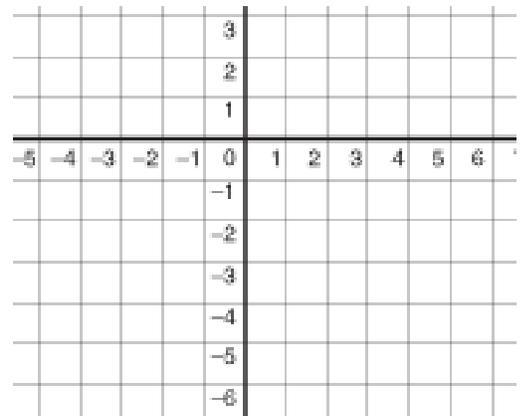
When a point  $(x, y)$  is rotated COUNTERCLOCKWISE about the origin, the following are true:

1. For a rotation of  $90^\circ$ :  $(x, y) \rightarrow (-y, x)$
2. For a rotation of  $180^\circ$ :  $(x, y) \rightarrow (-x, -y)$
3. For a rotation of  $270^\circ$ :  $(x, y) \rightarrow (y, -x)$

\*\*Unless otherwise stated, a rotation will always be \_\_\_\_\_

*Example:*

1. Graph quadrilateral RSTU with vertices  $R(3, 1)$ ,  $S(5, 1)$ ,  $T(5, -3)$ , and  $U(2, -1)$  and its image after a  $270^\circ$  rotation about the origin.



\*\*REMEMBER: a full rotation is \_\_\_\_\_ $^\circ$

## Rotational Symmetry

A figure in the plane has rotational symmetry when the figure can be mapped onto itself by a rotation of \_\_\_\_\_ about the \_\_\_\_\_ of the figure.

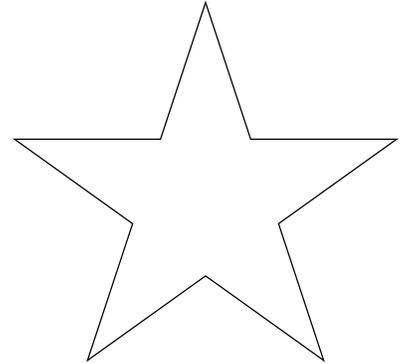
→ The point in which the figure rotates is called the \_\_\_\_\_

→ Note that the rotation can be either clockwise OR counterclockwise.

→ A figure is said to have point symmetry when the figure has an angle of rotation of \_\_\_\_\_°

*Examples:*

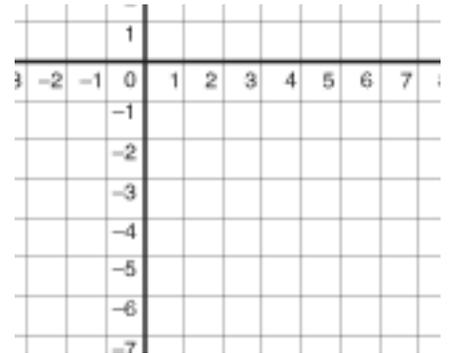
- Determine whether the figure (the star) has rotational symmetry.
- What is the smallest angle that maps the figure (the star) onto itself?
- Describe what your group did to find the answer to #3.
- Describe the rotation(s) that map the figure onto itself.  
In other words, what angle(s) between  $0^\circ$  and  $360^\circ$  map the figure onto itself?



## Compositions with Rotations

*Example*

- Graph  $\overline{RS}$  with endpoints  $R(1, -3)$  and  $S(2, -6)$  and its image after the composition:  
**Reflection:** in the y-axis  
**Rotation:**  $90^\circ$  about the origin



- Graph  $\overline{AB}$  with endpoints  $A(-4, 4)$  and  $B(-1, 7)$  and its image after the composition:  
**Translation:**  $(x, y) \rightarrow (x - 2, y - 1)$   
**Rotation:**  $90^\circ$  clockwise about the origin

