4.3 - Rotations

4.3 - Rotations

Lesson Objectives

- Perform rotations
- Perform compositions with rotations
- Identify rotational symmetry

4 Types of Transformations

1.) Translation (Translate)
  – Move or slide

2.) Reflection (Reflect)
  – Mirror image over a line

3.) Rotation (Rotate)
  – Turn or spin around a point

4.) Dilation (Dilate)
  – Increase or decrease scale/size

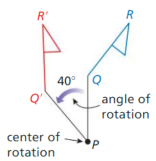
Rotation = Turns a figure around a fixed point → A point that does not move

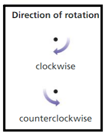
Every to rotation has 3 key pieces of information.

1.) Center of rotation = the fixed point you are rotating around

2.) Angle of rotation = how far (in degrees) you are rotating

3.) Direction = which way to turn (clockwise or counterclockwise) →

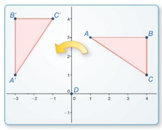




CW

CCW

Essential Question How can you rotate a figure in a coordinate plane?



EXPLORATION 1 **Rotating Triangle in the Coordinate Plane**

Work with your group.

a.) The figure at the right shows $\triangle ABC$ rotated 90° counterclockwise around the origin to form $\triangle A'B'C'$. List the coordinates of both triangles below.

$A(\ ,\ )$ $A'(\ ,\ )$
$B(\ ,\ )$ $B'(\ ,\ )$
$C(\ ,\ )$ $C'(\ ,\ )$

b.) Using the coordinates from part (a), write a rule to describe the rotation.

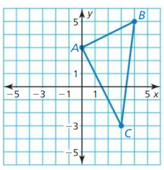
$(x,y)\rightarrow(\quad ,\quad)$

EXPLORATION 2 **Rotating Triangle in the Coordinate Plane**

Work with your group.

a.) Using your rule from Exploration 1 part (b), write the coordinates when $\triangle ABC$ below is rotated 90° counterclockwise around the origin to form $\triangle A'B'C'$.

$A(\ ,\ )$ $A'(\ ,\ )$
$B(\ ,\ )$ $B'(\ ,\ )$
$C(\ ,\ )$ $C'(\ ,\ )$



b.) Using the coordinates of from part (a), rotate $\triangle ABC$ 90° counterclockwise again to form $\triangle A''B''C''$. Write the new coordinates below.

$A''(\ ,\ )$
$B''(\ ,\ )$
$C''(\ ,\ )$

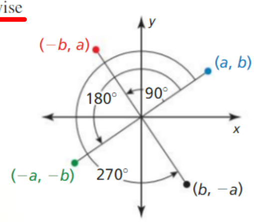
c.) Performing two rotations of 90° is the same as performing one rotation of 180°. Using the coordinates from parts (a) and (b), write a rule to describe a rotation of 180°.

$(x,y)\rightarrow(\quad ,\quad)$

Coordinate Rules for Rotations about the Origin

When a point (a, b) is rotated counterclockwise about the origin, the following are true.

- For a rotation of 90°, $(a, b) \rightarrow (-b, a)$. | Same as 270° CW
- For a rotation of 180°, $(a, b) \rightarrow (-a, -b)$. | Same as 180° CW
- For a rotation of 270°, $(a, b) \rightarrow (b, -a)$. | Same as 90° CW



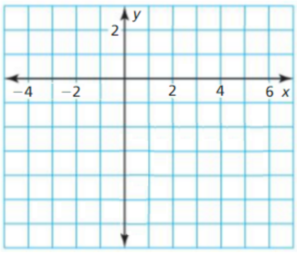
Key Points:

- If no direction is listed (CW or CCW), then:
  – Positive angles of rotation are always CCW
  – Negative angles of rotation are always CW

4.3 - Rotations

EXAMPLE 2 **Rotating a Figure in the Coordinate Plane**

Graph quadrilateral *RSTU* with vertices *R*(3, 1), *S*(5, 1), *T*(5, −3), and *U*(2, −1) and its image after a 270° rotation about the origin.

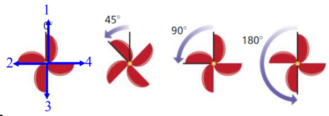


Rotational Symmetry

A figure has *rotational symmetry* if it can be rotated $180°$ or less around a central point in such a way that the figure and its rotated image look exactly the same.

To determine the possible angles of rotation, identify how many identical "spokes" the figure has, and divide $360°$ by this number. This will give you the smallest angle of rotation.

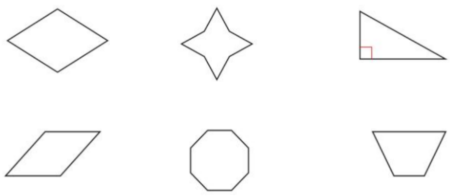
$$\frac{360°}{4} = 90°$$



90°, 180°, 270°

EXAMPLE 4 **Identifying Rotational Symmetry**

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



Homework

4.3 p.194

- #8,11,13,17-19,30 (Assigned Mon Nov. 6)
- #4,6,23,24 (Assigned Wed Nov. 8)
- #16,35,39 (Assigned Thur Nov. 9)

No school Fri Nov. 10 (Veteran's Day)

HW Check over all 3 parts on Monday Nov. 13

Chapter 4 Test Tues Nov. 14