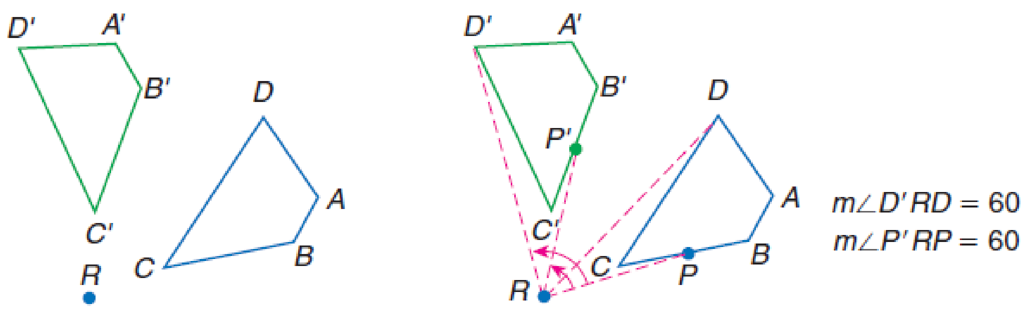
Notes 9.3 Rotations

DRAW ROTATIONS A **rotation** is a transformation that turns every point of a preimage through a specified angle and direction about a fixed point. The fixed point is called the **center of rotation**.

In the figure, R is the center of rotation for the preimage $ABCD$. The measures of angles ARA', BRB', CRC', and DRD' are equal. Any point P on the preimage $ABCD$ has an image P' on $A'B'C'D'$ such that the measure of $\angle PRP'$ is a constant measure. This is called the **angle of rotation**.



Rotations:

$pre - image \rightarrow image$

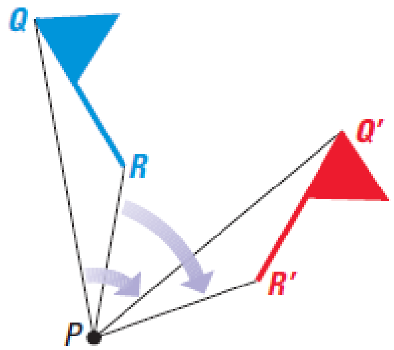
90° clockwise about the origin: $(x, y) \rightarrow (y, -x)$

90° counterclockwise about the origin: $(x, y) \rightarrow (-y, x)$

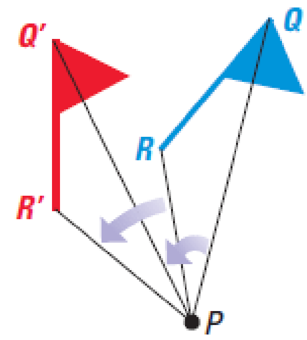
180° about the origin: $(x, y) \rightarrow (-x, -y)$

Notes 9.3Rotations

Rotations can be clockwise or counterclockwise, as shown below.



Clockwise rotation of 60°



Counterclockwise rotation of 40°

EXAMPLE 2 *Rotations in a Coordinate Plane*

In a coordinate plane, sketch the quadrilateral whose vertices are $A(2, -2)$, $B(4, 1)$, $C(5, 1)$, and $D(5, -1)$. Then, rotate $ABCD$ 90° counterclockwise about the origin and name the coordinates of the new vertices. Describe any patterns you see in the coordinates.

SOLUTION

Plot the points, as shown in blue. Use a protractor, a compass, and a straightedge to find the rotated vertices. The coordinates of the preimage and image are listed below.

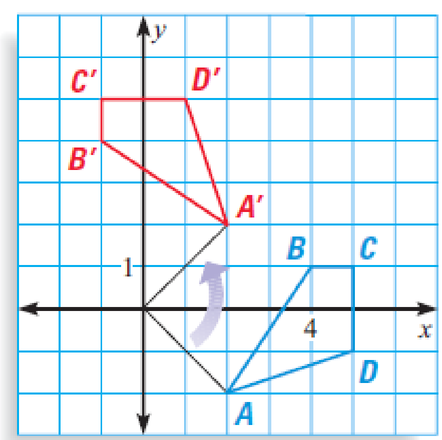


Figure $ABCD$	Figure $A'B'C'D'$
$A(2, -2)$	$A'(2, 2)$
$B(4, 1)$	$B'(-1, 4)$
$C(5, 1)$	$C'(-1, 5)$
$D(5, -1)$	$D'(1, 5)$

In the list above, the x-coordinate of the image is the opposite of the y-coordinate of the preimage. The y-coordinate of the image is the x-coordinate of the preimage.

▶ This transformation can be described as $(x, y) \rightarrow (-y, x)$.