LESSON 7.3

NAME ______________________ DATE ________

Reteaching with Practice

For use with pages 412–420

GOAL **Identify rotations in a plane.**

VOCABULARY

A **rotation** is a transformation in which a figure is turned about a fixed point.

The fixed point of a rotation is called the **center of rotation.**

Rays drawn from the center of rotation to a point and its image form an angle called the **angle of rotation.**

A figure in the plane has **rotational symmetry** if the figure can be mapped onto itself by a clockwise rotation of 180° or less.

Theorem 7.2 Rotation Theorem
A rotation is an isometry.

Theorem 7.3
If lines k and m intersect at point P, then a reflection in k followed by a reflection in m is a rotation about point P.

The angle of rotation is $2x°$, where $x°$ is the measure of the acute or right angle formed by k and m.

EXAMPLE 1 ***Rotations in a Coordinate Plane***

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

SOLUTION

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

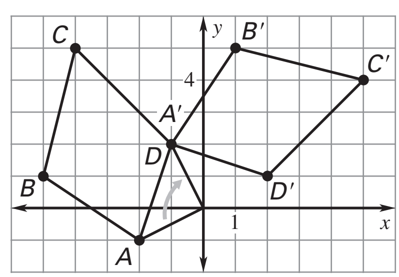

Figure $ABCD$	Figure $A'B'C'D'$
$A(-2, -1)$	$A'(-1, 2)$
$B(-5, 1)$	$B'(1, 5)$
$C(-4, 5)$	$C'(5, 4)$
$D(-1, 2)$	$D'(2, 1)$

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

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

NAME ______________________________ DATE ____________

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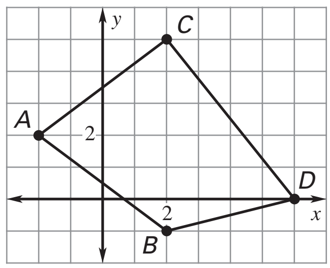
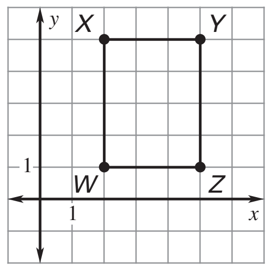
Exercises for Example 1

In Exercises 1 and 2, use the given information to rotate the quadrilateral. Name the vertices of the image and compare with the vertices of the preimage. Describe any patterns you see.

1. 90° clockwise about origin



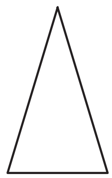
2. 180° counterclockwise about origin

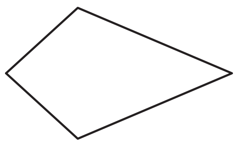


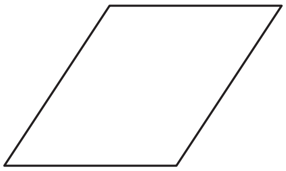
EXAMPLE 2 Identifying Rotational Symmetry

Which figures have rotational symmetry? For those that do, describe the rotations that map the figure onto itself.

a. Isosceles triangle **b.** Kite **c.** Rhombus







Solution

a. The isosceles triangle does not have rotational symmetry.

b. This kite has rotational symmetry. It can be mapped onto itself by a rotation of 180° about its center.

c. This rhombus has rotational symmetry. It can be mapped onto itself by a rotation of 180° about its center.

Exercises for Example 2

Decide which figures have rotational symmetry. For those that do, describe the rotations that map the figure onto itself.

3. Equilateral triangle **4.** Rectangle **5.** Regular pentagon