Name _____ Date _____

LESSON 4.8

LESSON 4.8 Study Guide

For use with pages 271–279

GOAL **Create an image congruent to a given triangle.**

Vocabulary

A **transformation** is an operation that moves or changes a geometric figure in some way to produce a new figure. The new figure is called the image.

A **translation** moves every point of a figure the same distance in the same direction. A **reflection** uses a *line of reflection* to create a mirror image of the original figure. A **rotation** turns a figure about a fixed point, called the *center of rotation*.

A **congruence transformation** changes the position of the figure without changing its size or shape.

Coordinate notation for a translation:
The notation $(x, y) \rightarrow (x + a, y + b)$ shows that each point (x, y) of the original figure is translated horizontally a units and vertically b units.

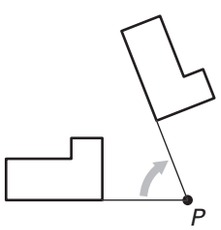
Coordinate notation for a reflection in the *x*-axis:
Multiply the y-coordinate by -1. $(x, y) \rightarrow (x, -y)$

Coordinate notation for a reflection in the *y*-axis:
Multiply the x-coordinate by -1. $(x, y) \rightarrow (-x, y)$

EXAMPLE 1 ## Identify transformations

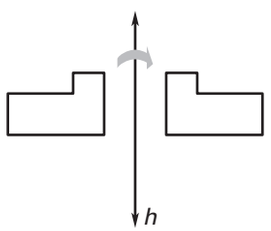
Name the type of transformation demonstrated in each picture.

a.



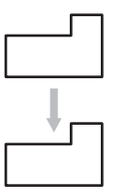
Rotation about a point

b.



Reflection in a vertical line

c.



Translation in a straight path

Exercise for Example 1

1. Name the type of transformation shown.

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EXAMPLE 2 Transform a figure in the coordinate plane

Triangle *ABC* has the vertices *A*(3, 5), *B*(4, 2), and *C*(1, 0). Sketch $\triangle ABC$ and its image after the given transformation.

a. Translation: $(x, y) \rightarrow (x - 4, y + 1)$ **b.** Reflection in the y-axis

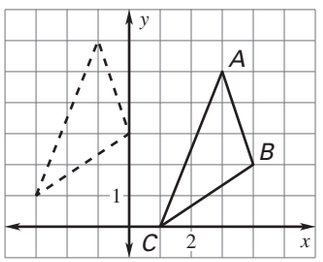
Solution

a. $(x, y) \rightarrow (x - 4, y + 1)$

$A(3, 5) \rightarrow (-1, 6)$

$B(4, 2) \rightarrow (0, 3)$

$C(1, 0) \rightarrow (-3, 1)$

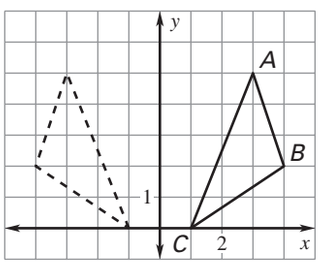


b. $(x, y) \rightarrow (-x, y)$

$A(3, 5) \rightarrow (-3, 5)$

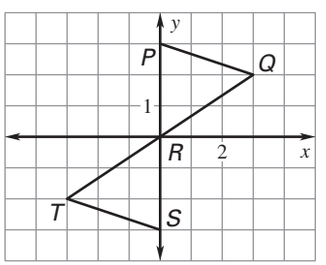
$B(4, 2) \rightarrow (-4, 2)$

$C(1, 0) \rightarrow (-1, 0)$



EXAMPLE 3 Identify a rotation

Tell whether $\triangle STR$ is a rotation of $\triangle PQR$ about the origin. If so, give the angle and direction of the rotation.



Solution

Because $m\angle PRS = m\angle QRT = 180°$, this is a 180° rotation in either the clockwise or counterclockwise direction.

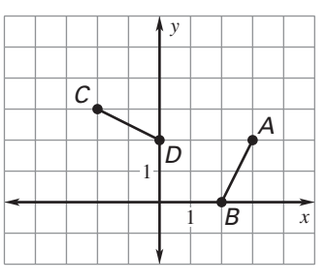
Exercises for Examples 2 and 3

Figure *ABCD* has the vertices *A*(−5, 5), *B*(−1, 2), *C*(−3, 0), and *D*(−5, 0). Sketch *ABCD* and its image after the given transformation.

2. Translation: $(x, y) \rightarrow (x + 6, y - 2)$ **3.** Reflection in the x-axis

Tell whether $\overline{CD}$ is a rotation of $\overline{AB}$ about the origin. If so, give the angle and direction of rotation.

4.



5.