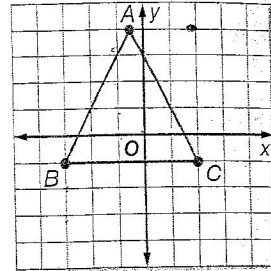


2-7 Translations and Reflections on the Coordinate Plane (pp. 103-108)

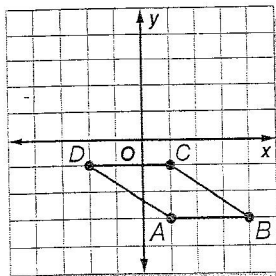
- The vertices of rectangle $ABCD$ are $A(-6, 5)$, $B(-2, 5)$, $C(-2, 2)$, and $D(-6, 2)$. What are the vertices of its image after a translation of 4 units to the right?
- Rectangle $ABCD$ has vertices $A(2, 1)$, $B(5, 1)$, $C(5, 5)$, and $D(2, 5)$. Graph the rectangle and its image after a reflection over the x -axis.
- A triangle has vertices $A(-14, 12)$, $B(6, 7)$, and $C(-5, 0)$. Its image has vertices $A'(-9, 8)$, $B'(11, 3)$, and $C'(0, -4)$. Describe the transformation.

Use the coordinate plane at the right.



- Find the coordinates of the vertices of the image of $\triangle ABC$ translated 3 units to the right and 4 units down.
- Find the coordinates of the vertices of the image of $\triangle ABC$ reflected over the y -axis.

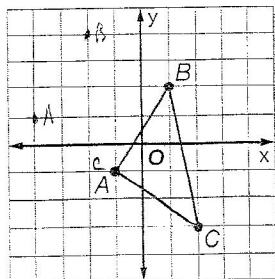
6. The vertices of figure $ABCD$ are $A(1, -3)$, $B(4, -3)$, $C(1, -1)$, and $D(-2, -1)$. Find the vertices after a reflection over the x -axis.



7. A triangle has vertices $N(6, 3)$, $P(3, 9)$, and $Q(9, 6)$. The triangle is translated 2 units right and 2 units down. Graph the figure and its image.

8. **ESCALATORS** What type of transformation is used when moving up an escalator?

9. Triangle ABC is graphed on the coordinate plane shown below. Find the coordinates of the vertices of the image of $\triangle ABC$ translated 3 units to the left and 2 units up.



Example 12

The vertices of $\triangle JKL$ are $J(1, 2)$, $K(3, 2)$, and $L(1, -1)$. Find the vertices of the image after a translation 3 units left and 2 units up. Then find the vertices of the image after $\triangle JKL$ is reflected over the x -axis.

Translation This translation can be written as $(-3, 2)$.

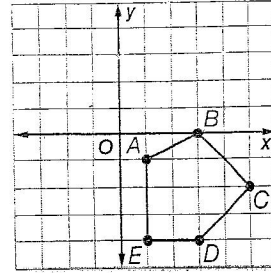
original	translation	image
$J(1, 2)$	$+ (-3, 2)$	$\rightarrow J'(-2, 4)$
$K(3, 2)$	$+ (-3, 2)$	$\rightarrow K'(0, 4)$
$L(1, -1)$	$+ (-3, 2)$	$\rightarrow L'(-2, 1)$

Reflection Use the same x -coordinate and replace the y -coordinate with its opposite.

original	reflection	image
$J(1, 2)$	\rightarrow opposite	$J'(1, -2)$
$K(3, 2)$	\rightarrow same	$K'(3, -2)$
$L(1, -1)$	\rightarrow opposite	$L'(1, 1)$

Figure $ABCDE$ is shown.

- Graph the image of the figure after a 90° counterclockwise rotation about the origin.
- Find the coordinates of the vertices of the figure after a 180° rotation about the origin.
- Graph the image of the figure after a 90° clockwise rotation about the origin.
- LETTERS** Determine whether the letter shown at the right has rotational symmetry. If it does, describe the angle of rotation.

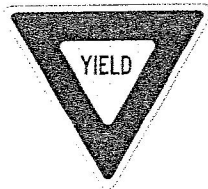


17. Triangle ABC has vertices $A(2, 0)$, $B(4, -1)$, and $C(1, -3)$. Graph the figure and its image after a clockwise rotation of 180° about vertex A . Give the coordinates of the vertices for triangle $A'B'C'$.

Graph each figure and its image after a clockwise rotation about the origin.

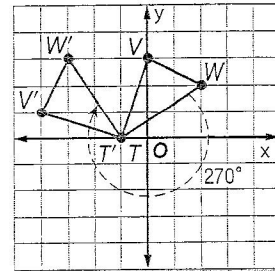
- triangle GHJ with vertices $G(0, -1)$, $H(3, 3)$, and $J(2, -3)$; 270° clockwise rotation
- quadrilateral $NPQR$ with vertices $N(1, 1)$, $P(2, 3)$, $Q(4, 2)$, and $R(4, -2)$; 90° clockwise rotation

20. **SIGNS** Determine whether the shape of the sign shown at the right has rotational symmetry. If it does, describe the angle of rotation.



Example 3

Triangle $T'VW$ has vertices $T(-1, 0)$, $V(0, 3)$, and $W(2, 2)$. Graph the figure and its image after a clockwise rotation of 270° about vertex T . Give the coordinates of the vertices for triangle $T''V''W''$.



The coordinates of the vertices are $T''(-1, 0)$, $V''(-4, 1)$, and $W''(-3, 3)$.