Transformations

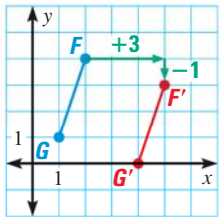
TEKS 8.6.A, 8.6.B

A **transformation** is a change made to the position or to the size of a figure. Each point (x, y) of the figure is mapped to a new point, and the new figure is called an **image**.

A **translation** is a transformation in which each point of a figure moves the same distance in the same direction. A figure and its translated image are congruent.

Translation a Units Horizontally and b Units Vertically
$(x, y) \rightarrow (x + a, y + b)$

EXAMPLE **Translate $\overline{FG}$ right 3 units and down 1 unit.**



To move right 3 units, use $a = 3$. To move down 1 unit, use $b = -1$. So, use $(x, y) \rightarrow (x + 3, y + (-1))$ with each endpoint.

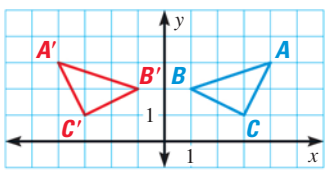
$F(2, 4) \rightarrow F'(2 + 3, 4 + (-1)) = F'(5, 3)$
$G(1, 1) \rightarrow G'(1 + 3, 1 + (-1)) = G'(4, 0)$

Graph the endpoints (5, 3) and (4, 0). Then draw the image.

A **reflection** is a transformation in which a figure is reflected, or flipped, in a line, called the **line of reflection**. A figure and its reflected image are congruent.

Reflection in x-axis	Reflection in y-axis
$(x, y) \rightarrow (x, -y)$	$(x, y) \rightarrow (-x, y)$

EXAMPLE **Reflect $\triangle ABC$ in the y-axis.**



Use $(x, y) \rightarrow (-x, y)$ with each vertex.

$A(4, 3) \rightarrow A'(-4, 3)$
$B(1, 2) \rightarrow B'(-1, 2)$
$C(3, 1) \rightarrow C'(-3, 1)$

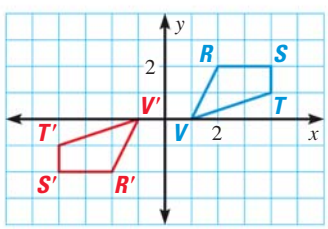
Change each x-coordinate to its opposite.

Graph the new vertices. Then draw the image.

A **rotation** is a transformation in which a figure is turned about a fixed point, called the **center of rotation**. The direction can be clockwise or counterclockwise. A figure and its rotated image are congruent.

Rotation About the Origin	
180° either direction	$(x, y) \rightarrow (-x, -y)$
90° clockwise	$(x, y) \rightarrow (y, -x)$
90° counterclockwise	$(x, y) \rightarrow (-y, x)$

EXAMPLE **Rotate $RSTV$ 180° about the origin.**



Use $(x, y) \rightarrow (-x, -y)$ with each vertex.

$R(2, 2) \rightarrow R'(-2, -2)$
$S(4, 2) \rightarrow S'(-4, -2)$
$T(4, 1) \rightarrow T'(-4, -1)$
$V(1, 0) \rightarrow V'(-1, 0)$

Change every coordinate to its opposite.

Graph the new vertices. Then draw the image.