

## Translations

A translation is a transformation in a plane that maps all points of a preimage the same distance and in the same direction.

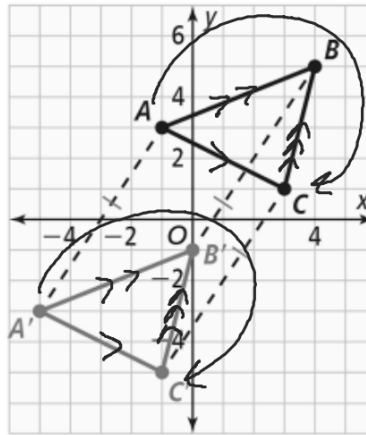
The translation of  $\triangle ABC$  by  $x$  units along the  $x$ -axis and by  $y$  units along the  $y$ -axis can be written as  $T_{\langle x, y \rangle}(\triangle ABC) = \triangle A'B'C'$ .

A translation has the following properties:

If  $T_{\langle x, y \rangle}(\triangle ABC) = \triangle A'B'C'$ , then

- $\overline{AA'} \parallel \overline{BB'} \parallel \overline{CC'}$ .
- $\overline{AA'} \cong \overline{BB'} \cong \overline{CC'}$ .
- $\triangle ABC$  and  $\triangle A'B'C'$  have the same orientation.

A translation is a rigid motion, so length and angle measure are preserved.



$T_{\langle x, y \rangle}$

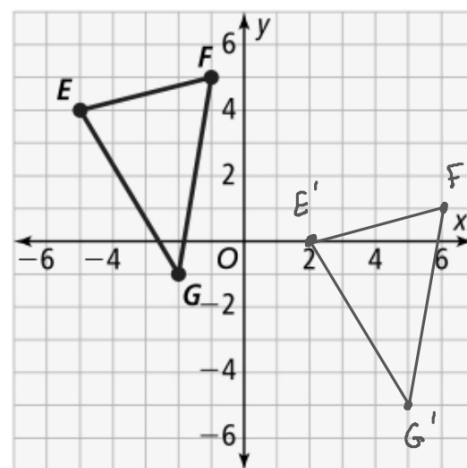
What is the graph of  $T_{(7, -4)}(\triangle EFG) = \triangle E'F'G'$ ?

Right 7      Down 4

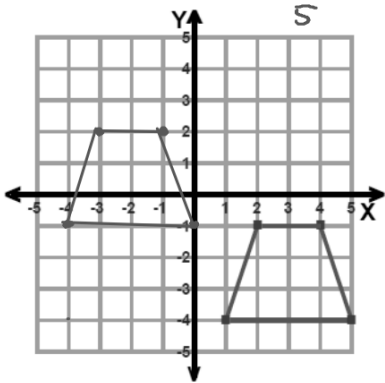
$$E(-5, 4) \quad E'(2, 0)$$

$$F(-1, 5) \quad F'(6, 1)$$

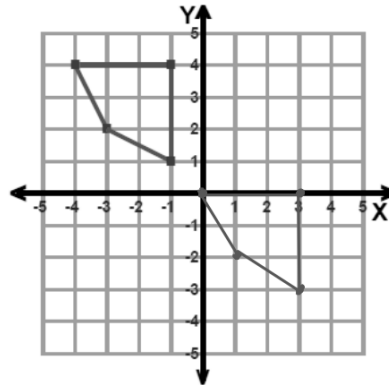
$$G(-2, -1) \quad G'(5, -5)$$



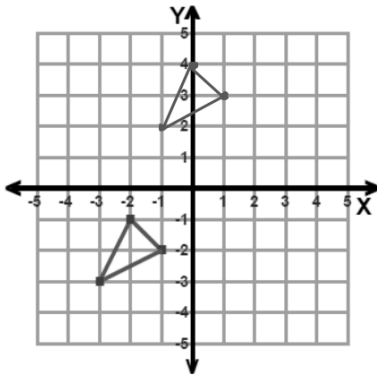
What is the graph of  $T_{(-5,3)}$   
*Left 5*  
*Left 3*  
*Up 3*



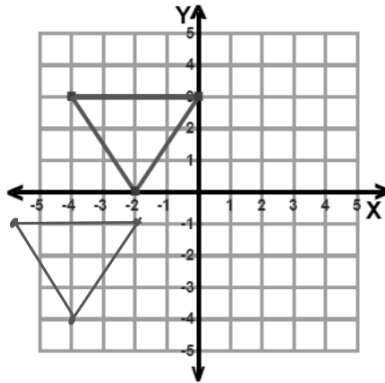
What is the graph of  $T_{(4,-4)}$   
*Right 4*  
*Down 4*



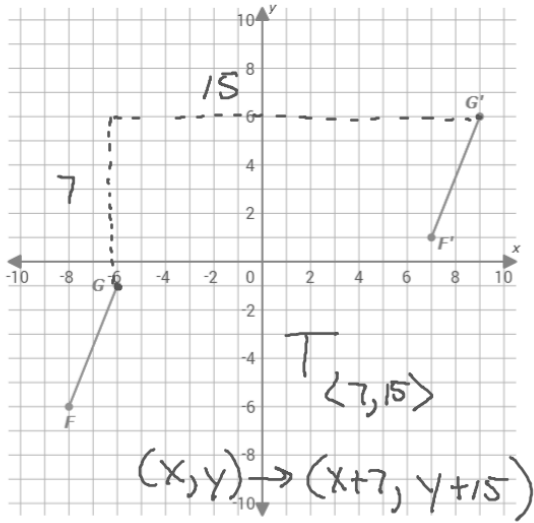
What is the graph of  $T_{(2,5)}$



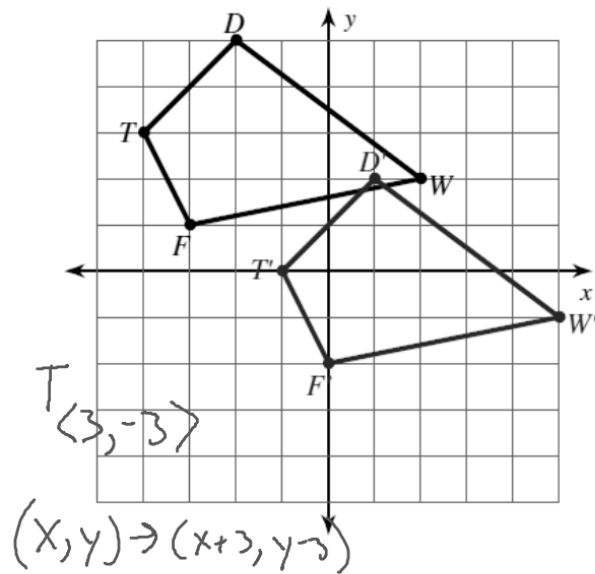
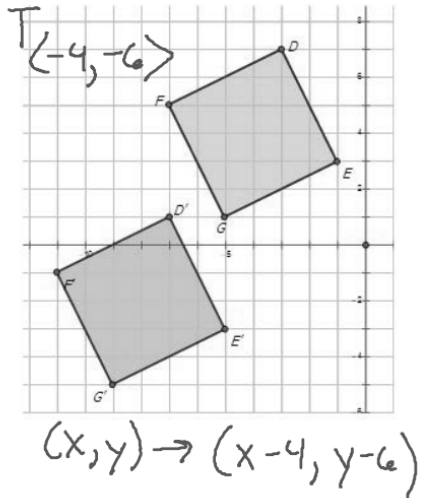
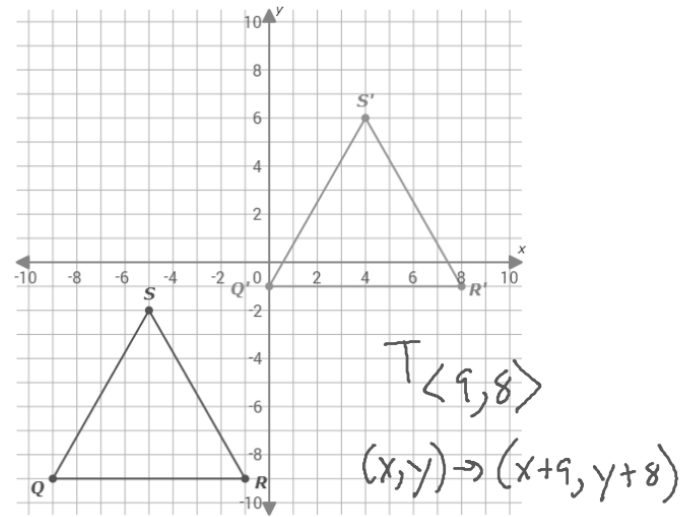
What is the graph of  $T_{(-2,-4)}$   
*Left 2*  
*Down 4*



$\overline{F'G'}$  is a translation of  $\overline{FG}$ . Write the translation rule.



$\triangle Q'R'S'$  is a translation of  $\triangle QRS$ . Write the translation rule.



A **composition of rigid motions** is a transformation with two or more rigid motions in which the second rigid motion is performed on the image of the first rigid motion.

Step 1 Translate  $\triangle ABC$  left 2 units and up 5 units.

$$(R_\ell \circ T_{\langle -2, 5 \rangle})(\triangle ABC)$$

Step 2 Reflect  $\triangle A'B'C'$  across line  $\ell$ .

This notation uses a small open circle to indicate a composition of rigid motions on  $\triangle ABC$ .

$$(R_\ell \circ T_{\langle -2, 5 \rangle}) \triangle ABC$$

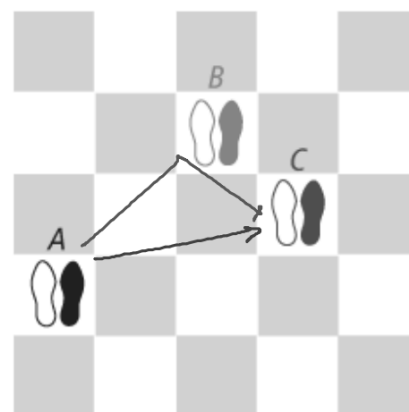
In learning a new dance, Kyle moves from position A to position B and then to position C. What single transformation describes Kyle's move from position A to position C?

**SOLUTION**

$$A \rightarrow B \quad T\langle 2, 2 \rangle$$

$$B \rightarrow C \quad T\langle 1, -1 \rangle$$

$$A \rightarrow C \quad T\langle 3, 1 \rangle$$



3. What is the composition of the transformations written as one transformation?

a.  $T_{\langle 3, -2 \rangle} \circ T_{\langle 1, -1 \rangle}$

$$T_{\langle 4, -3 \rangle}$$

3. What is the composition of the transformations written as one transformation?

b.  $T_{\langle -4, 0 \rangle} \circ T_{\langle -2, 5 \rangle}$

$$T_{\langle -6, 5 \rangle}$$