

# Transformations on the Coordinate Plane: Translations

A **translation** is a type of transformation that slides every point in a figure the same distance and direction without rotating or resizing. Here is a rule to find the points of a translated figure:

## Rule:

$$\begin{array}{lcl} \text{Preimage} & \rightarrow & \text{Image} \\ (x, y) & \mapsto & (x + h, y + k) \end{array}$$

- When translating to the right,  $h$  is positive.
- When translating to the left,  $h$  is negative.
- When translating up,  $k$  is positive.
- When translating down,  $k$  is negative.

Note: For translations, the preimage and its image are congruent!

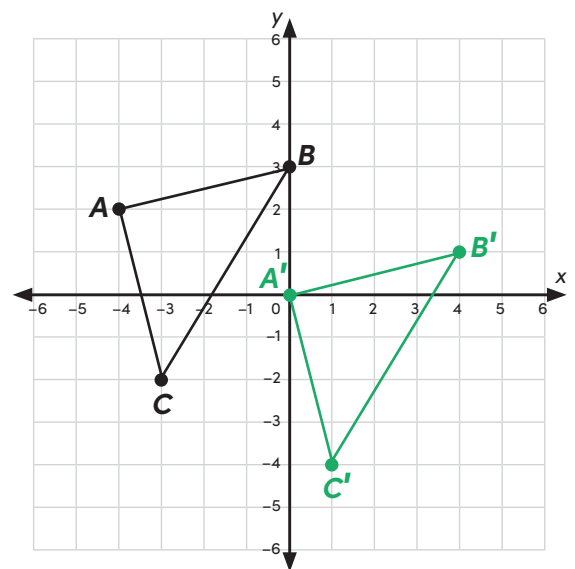
**Translating a Figure:** Translate  $\triangle ABC$  **4 units to the right** and **2 units down**. Find the coordinates of the image.

$$A(-4, 2) \mapsto A'(-4 + 4, 2 - 2) = A'(0, 0)$$

$$B(0, 3) \mapsto B'(0 + 4, 3 - 2) = B'(4, 1)$$

$$C(-3, -2) \mapsto C'(-3 + 4, -2 - 2) = C'(1, -4)$$

The coordinates of the image are  $A'(0, 0)$ ,  $B'(4, 1)$ , and  $C'(1, -4)$ .



**Describing a Translation:** Describe the translation of  $\triangle DEF$  to  $\triangle D'E'F'$ .

$\triangle DEF$  was translated **5 units to the left** and **3 units up**.

You can also describe this with a rule:

$$(x, y) \mapsto (x - 5, y + 3)$$

