

## Lesson 7-1

## Example 1

Graph the image of  $\triangle DEF$  with vertices  $D(2, -5)$ ,  $E(3, -1)$ , and  $F(5, -4)$  under a translation of 6 units up and 4 units left.

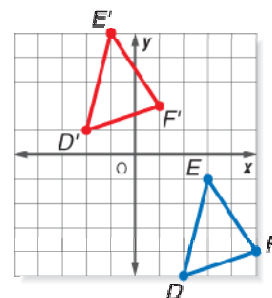
## Solution

First graph  $\triangle DEF$ . To slide the image up 6 units, add 6 to each  $y$ -coordinate. To slide the image 4 units left, subtract 4 from each  $x$ -coordinate. Graph  $\triangle D'E'F'$ .

$$D(2, -5) \rightarrow D'(2 - 4, -5 + 6) = D'(-2, 1)$$

$$E(3, -1) \rightarrow E'(3 - 4, -1 + 6) = E'(-1, 5)$$

$$F(5, -4) \rightarrow F'(5 - 4, -4 + 6) = F'(1, 2)$$



## Example 2

Write the rule that describes the translation of  $\triangle ABC$  to  $\triangle A'B'C'$ .

## Solution

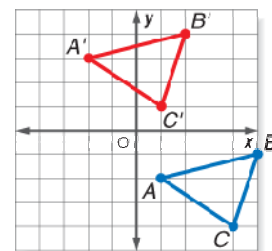
Look for a pattern between the  $x$ -coordinates and  $y$ -coordinates of each vertex of the preimage ( $\triangle ABC$ ) and the  $x$ -coordinates and  $y$ -coordinates of each vertex of the image ( $\triangle A'B'C'$ ).

$$A(1, -2) \quad B(5, -1) \quad C(4, -4)$$

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

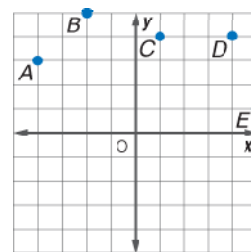
To find the  $x$ -coordinate of each image vertex, you must subtract 3 from the  $x$ -coordinate of each preimage vertex. To find the  $y$ -coordinate of each image vertex, you must add 5 to the  $y$ -coordinate of each preimage vertex.

The rule  $(x, y) \rightarrow (x - 3, y + 5)$  describes the translation of  $\triangle ABC$  3 units to the left and 5 units up.



**Example 3**

**RECREATION** A dance team uses a coordinate plane to map out parts of a dance routine. Each of the five dancers is represented by the letters  $A$ ,  $B$ ,  $C$ ,  $D$ , and  $E$ . Draw the image under the given translations. Which dancer moves the greatest distance during this part of the dance routine?



$A(-4, 3)$  under a translation of 1 unit left and 2 units down.

$B(-2, 5)$  under a translation of 1 unit left and 0 units up or down.

$C(1, 4)$  under a translation of 1 unit left and 5 units down.

$D(4, 4)$  under a translation of 1 unit left and 1 unit up.

$E(5, 1)$  under a translation of 0 units left or right and 0 units up or down.

**Solution**

Apply each translation to graph the five images.

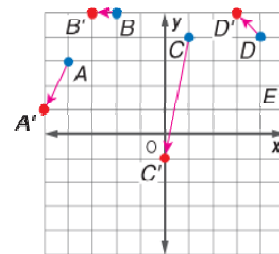
$$A(-4, 3) \rightarrow A'(-4 - 1, 3 - 2) = A'(-5, 1)$$

$$B(-2, 5) \rightarrow B'(-2 - 1, 5 + 0) = B'(-3, 5)$$

$$C(1, 4) \rightarrow C'(1 - 1, 4 - 5) = C'(0, -1)$$

$$D(4, 4) \rightarrow D'(4 - 1, 4 + 1) = D'(3, 5)$$

$$E(5, 1) \rightarrow E'(5 + 0, 1 + 0) = E'(5, 1)$$



Each dancer's translation is drawn in the figure. Dancer  $C$  moves the greatest distance during this part of the routine.