

Geometry Lesson 71

Objective: TSW understand and use translations.

A translation shifts every point of a figure the same distance in the same direction. A figure that is transformed by a translation remains congruent to its preimage. Its side lengths, angle measures, and other properties remain the same. Translation changes nothing but the location of a figure.

Translation - A translation is an isometry, meaning the preimage and its translated image are the same shape and size.

Example 1 Translations in One Dimension

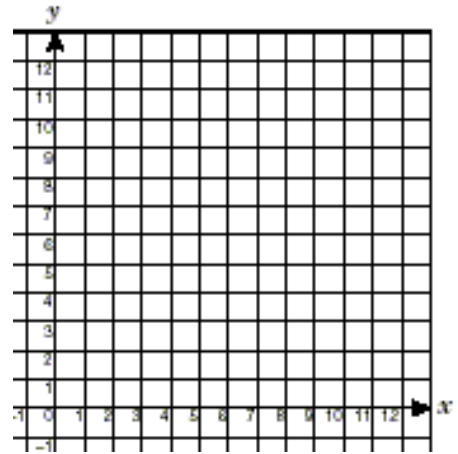
A square has vertices $A(1, 1)$, $B(4, 1)$, $C(4, 4)$, and $D(1, 4)$.

a. Find the coordinates of the vertices of the image of square $ABCD$ after a translation of 5 units to the right. Show the preimage and image on the same coordinate grid.

SOLUTION

b. Show that the area of $A'B'C'D'$ is equal to the area of $ABCD$.

SOLUTION



Mapping notation is used to indicate the way in which a point or several points should be transformed. An example of translation mapping notation is given below.

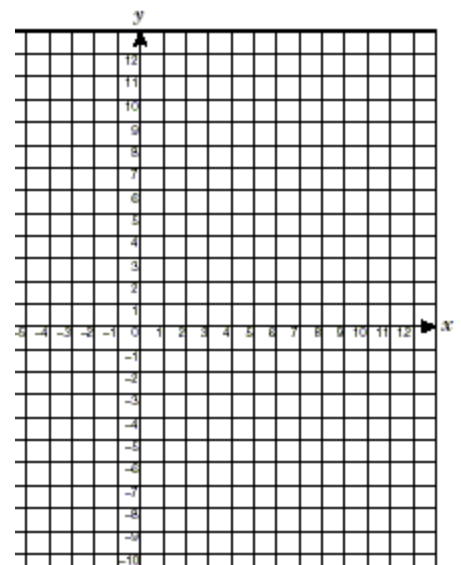
$$T: (x, y) \rightarrow (x + 1, y - 2)$$

This mapping says that in a transformation, the original pair of coordinates, (x, y) , will be changed into $(x + 1, y - 2)$. That is, the x -coordinate will increase by 1 and the y -coordinate will decrease by 2.

Example 2 Translations in Two Dimensions

The vertices of a triangle are $X(-2, 0)$, $Y(-2, -4)$ and $Z(1, -4)$. Find the image of $\triangle XYZ$ after the translation $T: (x, y) \rightarrow (x + 5, y + 4)$. Show the preimage and image on the same coordinate grid.

SOLUTION

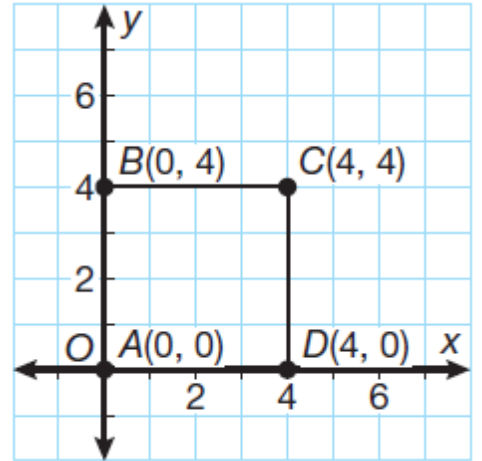


A translation for a polygon can also be represented using a vector. Placing the initial point of the vector on each point of the preimage will indicate the position of the point in the image.

Example 3 Showing Translations with Vectors

Find the image of $ABCD$ under the translation vector $\langle 2, 3 \rangle$.

SOLUTION



Example 4 Application: Computer Animation

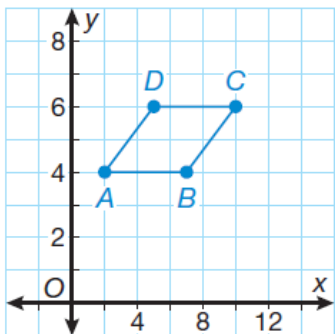
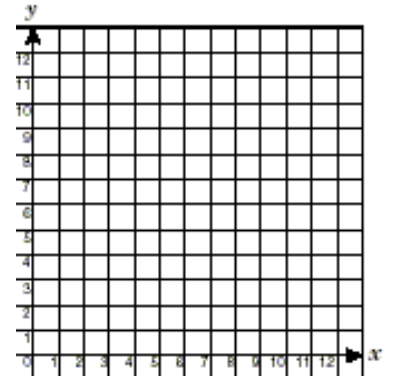
A character in a new animated movie will move from the point $(4, -5)$ first to the point $(16, 3)$, then to point $(13, -2)$. Find the vectors the animators need to apply to the character to make these two translations.

SOLUTION

You Try!!!!

a. A line segment has endpoints $A(11, 5)$ and $B(4, 9)$. It is translated 5 units up. What are the coordinates of A' and B' ?

b. A triangle has vertices $K(2, 5)$, $L(1, 11)$ and $M(5, 7)$. Find the image of $\triangle KLM$ after the translation. $T: (x, y) \rightarrow (x - 2, y + 1)$ Show the preimage and image on the same coordinate grid.



c. Find the coordinates of the vertices of the image of parallelogram $ABCD$ after translation by the vector $\langle 3, 1 \rangle$.

d. In an animated cartoon, the UFO shown will move across the screen to the right. The animator translates two points of the UFO from $(1, 3)$ and $(4, 3)$ to an image at $(9, 4)$ and $(12, 4)$. Give the component form of the vector that describes this translation.

