

# Translations - Ch.6-1

Think Slide --  
Just a bit more complicated now :)

## Objective:

You will be able to graph translations on the coordinate plane.

# Warm-Up

Graph the ordered pairs. Then find the distance between the points. Round to the nearest tenth if necessary.

1.  $(1, 1), (3, 3)$

2.  $(0, 4), (3, 2)$

3.  $(-3, 2), (-1, -1)$

4.  $(-1.5, -2), (0.5, 2)$

5.  **TEST PRACTICE** Andy played a game with coordinates. Andy was at the point  $(-10, -5)$ . His opponent was at the point  $(10, 5)$ . What was the distance between Andy and his opponent?

A. 0 units

C. 17.3 units

B. 5 units

D. 22.4 units

# Warm-Up - Answers

Graph the ordered pairs. Then find the distance between the points. Round to the nearest tenth if necessary.

1.  $(1, 1), (3, 3)$

2.  $(0, 4), (3, 2)$

3.  $(-3, 2), (-1, -1)$

4.  $(-1.5, -2), (0.5, 2)$

5.  **TEST PRACTICE** Andy played a game with coordinates. Andy was at the point  $(-10, -5)$ . His opponent was at the point  $(10, 5)$ . What was the distance between Andy and his opponent?

**A.** 0 units

**C.** 17.3 units

**B.** 5 units

**D.** 22.4 units

## ANSWERS

1. 2.8 units

2. 3.6 units

3. 3.6 units

4. 4.5 units

5. D

## What Is a Transformation/ Translation?

Translations are a type of transformation. Transformations take an original geometric figure, the PREIMAGE, and transform it through translation, reflection, rotation, or dilatation into the new figure, called the IMAGE. Translations SLIDE a preimage to the image without turning it or changing its size.

# Essential Information - Notes



## Essential Question

HOW can we best show or describe the change in position of a figure?



## Vocabulary

transformation

preimage

image

translation

congruent

**Math Symbols**

$(x, y) \rightarrow (x + a, y + b)$

$A'$  is read  $A$  prime

Essential Question:

At the end of this lesson, go back to your essential question and reflect on how translations can be used to describe a change.

**Vocabulary:**

**Transformation** - An operation that maps a geometric figure (preimage) into a new figure (image).

**Preimage:** Original figure before transformation.

**Image:** Figure after transformation.

**Translation:** A transformation that slides a figure (preimage) from the original position to another (image) without turning or changing size.

**Congruent:** Same shape and same size

## Try This

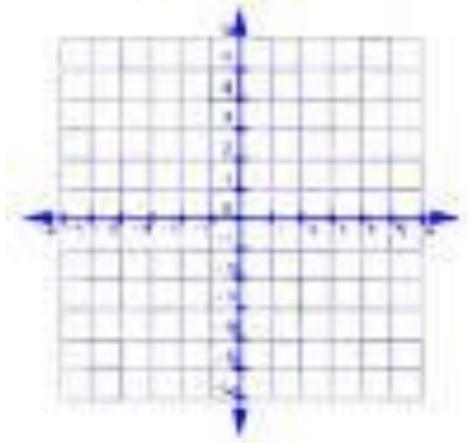
Create a 10 x 10 graph. Now graph these points:

Figure 1:  $A(-3,4)$ ,  $B(0,1)$ ,  $C(1,3)$  -- the Preimage

Figure 2:  $J(-1,1)$ ,  $K(2,-2)$ ,  $L(3,0)$  -- the Image

What figures were formed?

What do you notice about the figures?

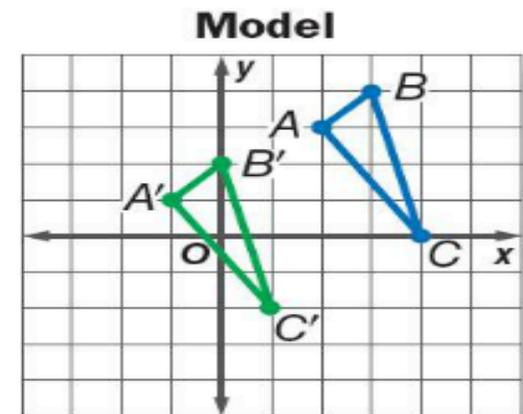


# Notes - pg. 454

## Key Concept → Translations in the Coordinate Plane

**Words** When a figure is translated, the x-coordinate of the preimage changes by the value of the horizontal translation  $a$ . The y-coordinate of the preimage changes by the vertical translation  $b$ .

**Symbols**  $(x, y) \rightarrow (x + a, y + b)$



# Key Concepts for Translations

## Prime Symbols

Use prime symbols for vertices in a transformed image.

$A \rightarrow A'$

$B \rightarrow B'$

$B \rightarrow B'$

$A'$  is read  $A$  prime.

When translating a figure, every point of the preimage is moved the same distance and in the same direction. The image and the preimage are congruent. **Congruent** figures have the same shape and same size. So, line segments in the preimage have the same length as line segments in the image. Angles in the preimage have the same measure as angles in the image.

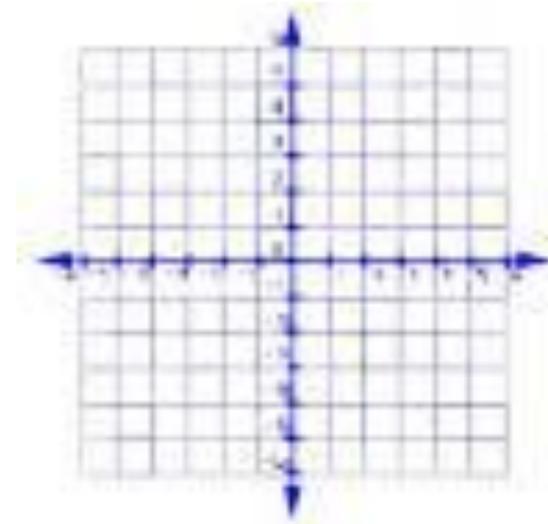
Here is a video that shows how Translations work:

<http://www.youtube.com/watch?v=bW30F7SdOE4>

Note: The short video does not show the prime symbol correctly -- they show a sub 1 instead of a prime. Otherwise, it is a good video.

## Example One - Problem

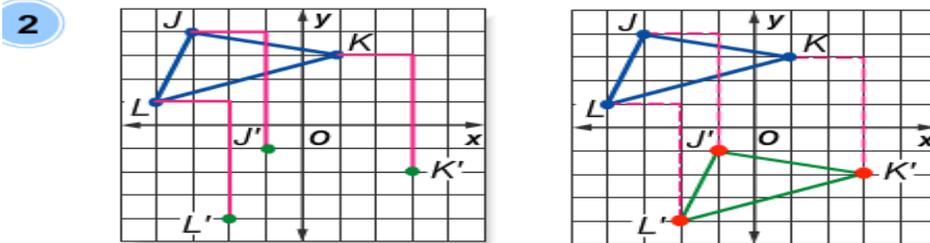
Graph  $\triangle ABC$  with vertices  $A(-2, 2)$ ,  $B(3, 4)$ , and  $C(4, 1)$ . Then graph the image of  $\triangle ABC$  after a translation 2 units left and 5 units down. Write the coordinates of its vertices.



# Example One - Answered

1. Graph  $\triangle JKL$  with vertices  $J(-3, 4)$ ,  $K(1, 3)$ , and  $L(-4, 1)$ . Then graph the image of  $\triangle JKL$  after a translation 2 units right and 5 units down. Write the coordinates of its vertices.

- 1 Move each vertex of the triangle 2 units right and 5 units down. Use prime symbols for the vertices of the image.



- 3 From the graph, the coordinates of the vertices of the image are  $J'(-1, -1)$ ,  $K'(3, -2)$ , and  $L'(-2, -4)$ .

## Example Two - Problem (Use a Table)

Using a table can help to quickly determine what the IMAGE coordinates can be. Try a table

Vertices of  PREIMAGE XYZ	X + (left (-) or right (+) # of units) Y + (up (+) or down (-) # of units)	Vertices of  IMAGE X'Y'Z'
X (-1,-2)		
Y (6, -3)		
Z (2, -5)		

**Triangle  $XYZ$  has vertices  $X(-1, -2)$ ,  $Y(6, -3)$  and  $Z(2, -5)$ . Find the vertices of  $\triangle X'Y'Z'$  after a translation of 2 units left and 1 unit up.**

## Example Two - Answered

Triangle  $XYZ$  has vertices  $X(-1, -2)$ ,  $Y(6, -3)$  and  $Z(2, -5)$ . Find the vertices of  $\triangle X'Y'Z'$  after a translation of 2 units left and 1 unit up.

Use a table. Add  $-2$  to the  $x$ -coordinates and 1 to the  $y$ -coordinates.

<b>Vertices of <math>\triangle XYZ</math></b>	<b><math>(x + (-2), y + 1)</math></b>	<b>Vertices of <math>\triangle X'Y'Z'</math></b>
$X(-1, -2)$	$(-1 + (-2), -2 + 1)$	$X'(-3, -1)$
$Y(6, -3)$	$(6 + (-2), -3 + 1)$	$Y'(4, -2)$
$Z(2, -5)$	$(2 + (-2), -5 + 1)$	$Z'(0, -4)$

# Watch Khan Videos

Here are two quick video where Khan reviews translations:

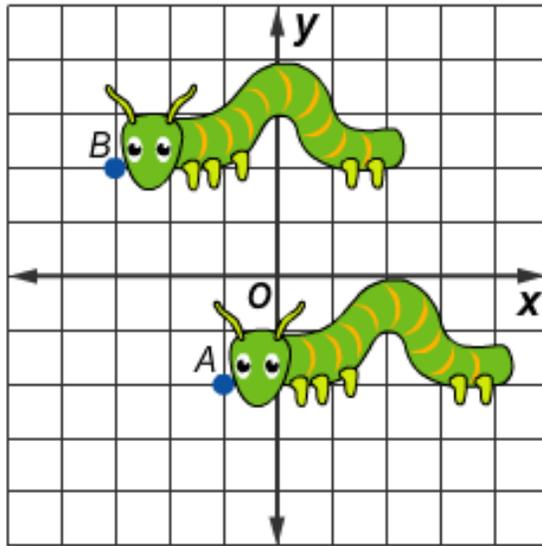
<https://www.khanacademy.org/math/geometry/transformations/exploring-rigid-transformations/v/translations-of-polygons>

and

<https://www.khanacademy.org/math/geometry/transformations/exploring-rigid-transformations/v/determining-a-translation-for-a-shape>

# Final Example

The character below was translated from point *A* to point *B*. Use translation notation to describe the translation.



Translation notation is in the form of :

( $x +$  or  $-$  # of units right or left)  
and ( $y +$  or  $-$  # of units up or down)

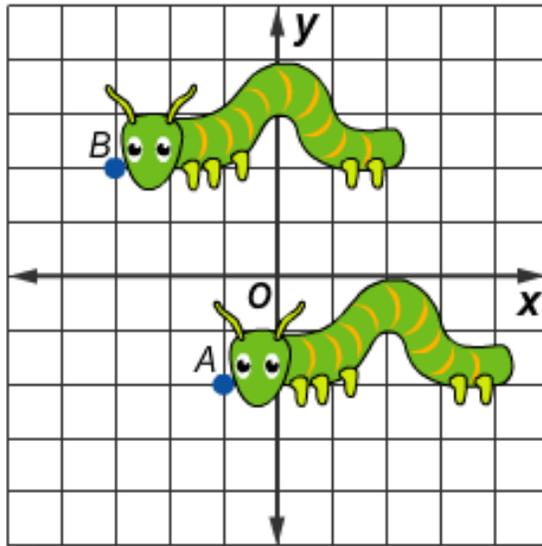
So, it would look like:

( $x \pm \#$ ,  $y \pm \#$ ) For example  
(not correct answer)

( $x + 3$ ,  $y - 4$ ) -- That's  
translation notation :)

# Final Example Answered

The character below was translated from point  $A$  to point  $B$ . Use translation notation to describe the translation.



We moved the caterpillar to the left (negative) two and up (positive) four.

The answer is:

$(x - 2, y + 4)$

**TICKET**  
Out the Door

If point  $P(-3, 2)$  is translated 3 units right and 2 units down, what are the coordinates of  $P'$  ?

# Homework Time!

Update your response for the essential question based upon what we learned about translations:

**“How can we best show or describe the change in position of a figure.”**

Please look over the homework: Pg. 457 -460

Problems 1-11 all and 13 - 25 odd only

Are there any questions before you begin?