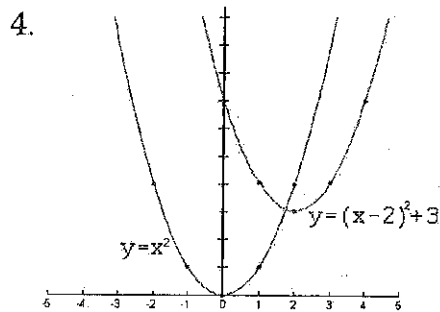
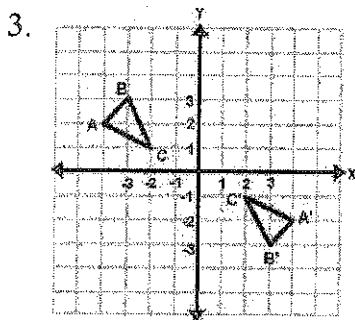
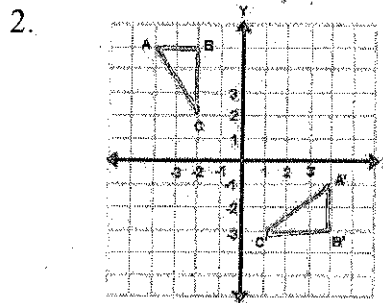
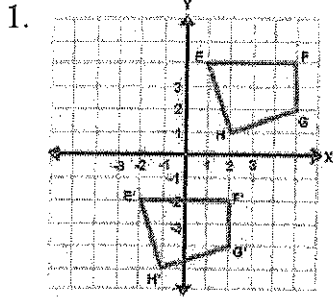


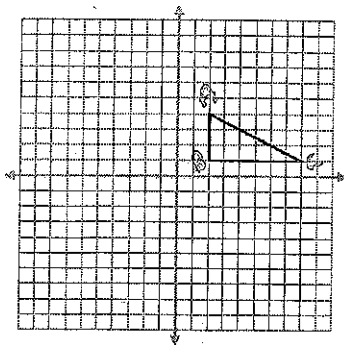
Translations Notes

A translation, or shift, is a transformation that moves each point of a figure the same distance in the same direction.

Determine if the following represents a translation. Explain your reasoning.



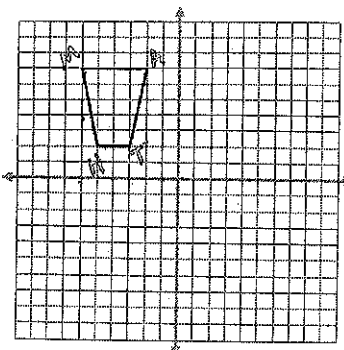
Examples: Graph the image of the figure using the transformation given:



1. Translate 5 units to the left and 1 unit down

Coordinates of Pre-Image: \_\_\_\_\_

Coordinate of Image: \_\_\_\_\_



2. Translate 7 units to the right and 2 units up

Coordinates of Pre-Image:  $M(6, 7)$   $T(3, 2)$   
 $A(-2, 7)$   $H(-5, 2)$

Coordinate of Image:  $M'(1, 9)$   $T'(4, 4)$

$A'(5, 9)$   $H'(2, 4)$

Horizontal Translation:

-In a horizontal translation, the  $x$ -coordinate changes, but the  $y$ -coordinate stays the same.

-A horizontal translation of " $a$ " units can be represented by the function:  $(x \pm a, y)$ .

-If  $a$  is more positive than zero, the figure slides to the right.

-If  $a$  is less negative than zero, the figure slides to the left.

Vertical Translation:

-In a vertical translation, the  $y$ -coordinate changes, but the  $x$ -coordinate stays the same.

-A vertical translation of " $b$ " units can be represented by the function:  $(x, y \pm b)$ .

-If  $b$  is more than zero, the figure slides up.

-If  $b$  is less than zero, the figure slides down.

So, if  $f$  is a function in the coordinate plane such that  $f$  of  $(x, y)$  is  $(x+2, y-1)$ , which can be written as:  $f(x, y) = (x+2, y-1)$

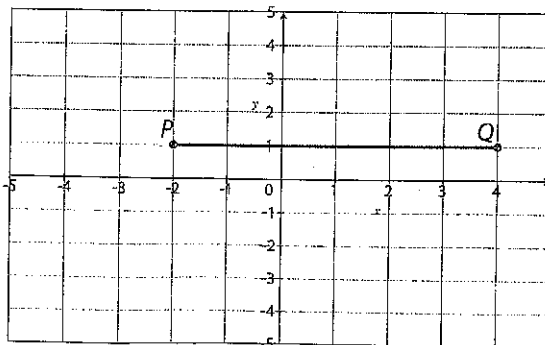
Example 1: Given the point  $P(5, 3)$  and  $T(x, y) = (x + 2, y + 3)$ , answer the following questions:

a.) How will the point be shifted horizontally? Shift Right 2

b.) How will the point be shifted vertically? Shift UP 3

c.) What are the coordinates of  $T(x, y)$ ?  $P'(5+2, 3+3) = P'(7, 6)$

Example 2: Given line segment  $PQ$  and the transformation  $T(x, y) = (x + 5, y - 3)$ , transform the image.



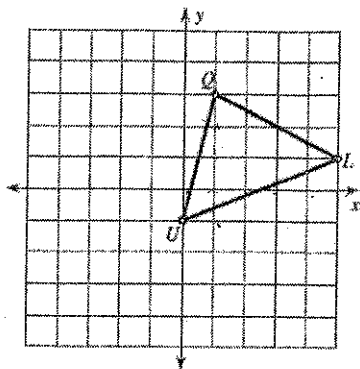
$$P(-2, 1) \rightarrow P'(3, -2)$$

$$Q(4, 1) \rightarrow Q'(9, -2)$$

What are the coordinates of the new endpoints?

Example 3: Given the figure  $\triangle QUL$  shown below, translate the figure according to the rule below:

$$T(x, y) = (x - 2, y)$$



State the coordinates of the vertices before the transformation:

$$Q(1, 3) \quad U(0, -1) \quad L(5, 1)$$

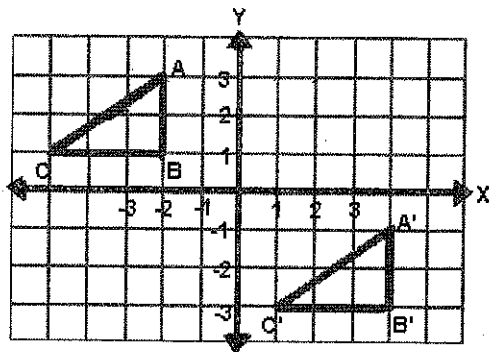
State the rule performed on the figure in words:

horizontal shift left 2, no change to y

State the coordinates of the vertices after the transformation:

$$Q'(-1, 3) \quad U'(-2, -1) \quad L'(-3, 1)$$

Example 4: Answer the following questions given the transformation below:



a.) What are the coordinates of the vertices of the pre-image?

$$A(-2, 3) \quad B(-2, 1) \quad C(-5, 1)$$

b.) What are the coordinates of the vertices of the image?

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

c.) Explain in words how the triangle was transformed?

Right 6, Down 4

d.) Write the function to describe how the triangle was transformed.

$$T(x, y) = (x + 6, y - 4)$$

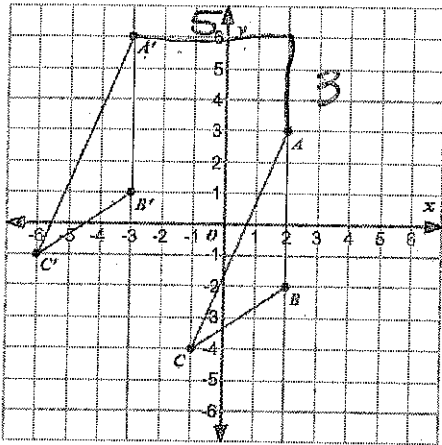
Example 5: Translate the points by  $T(x, y) = (x - 8, y + 2)$

a.)  $C(-2, 4) \rightarrow C'(-10, 6)$

b.)  $A(0, -8) \rightarrow A'(-8, -6)$

c.)  $T(-3, 5) \rightarrow T'(-11, 7)$

Example 6: Write a rule to describe the transformation:



$$T(x, y) = (x - 5, y + 3)$$

Example 7: Use the translation  $T(x, y) = (x + 5, y - 9)$  for questions a-e.

a. What is the image of  $A(-6, 3)$ ?

$$A'(-1, -6)$$

b. What is the image of  $A'$ , which would be called  $A''$ ?

$$A''(4, -15)$$

c. What is the pre-image of  $B'(12, 7)$ ? \* do the transformation backward

$$B(7, -2)$$

d. What is the pre-image of  $C'(-4, -8)$ ?

$$C(-9, 1)$$