

## Lesson 7 – Translations of Graphs

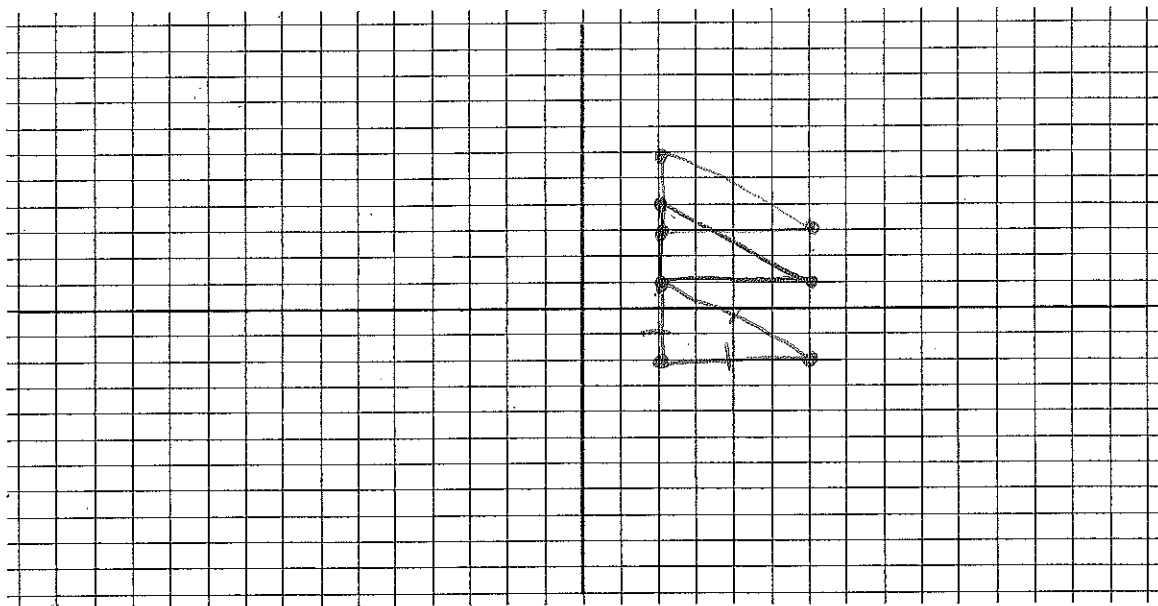
Objective:

I will investigate how a graph is translated, moved, on a coordinate plane.

Investigation  
on  
Translating a  
Graph

What do you think the word **translation** means to a figure on a coordinate plane?

Step 1: On the given graph, plot the points  $(2, 1)$ ,  $(2, 4)$  and  $(6, 1)$ . Connect the points to create a shape.



Step 2: Using the points from step 1, keep the same x-values and create new y-values by subtracting 3 from the previous y-values. Graph your new points in a new color and connect the three new points.

$(2, 1)$	$(2, 4)$	$(6, 1)$
$(2, 1-3)$	$(2, 4-3)$	$(6, 1-3)$
$(2, -2)$	$(2, 1)$	$(6, -2)$

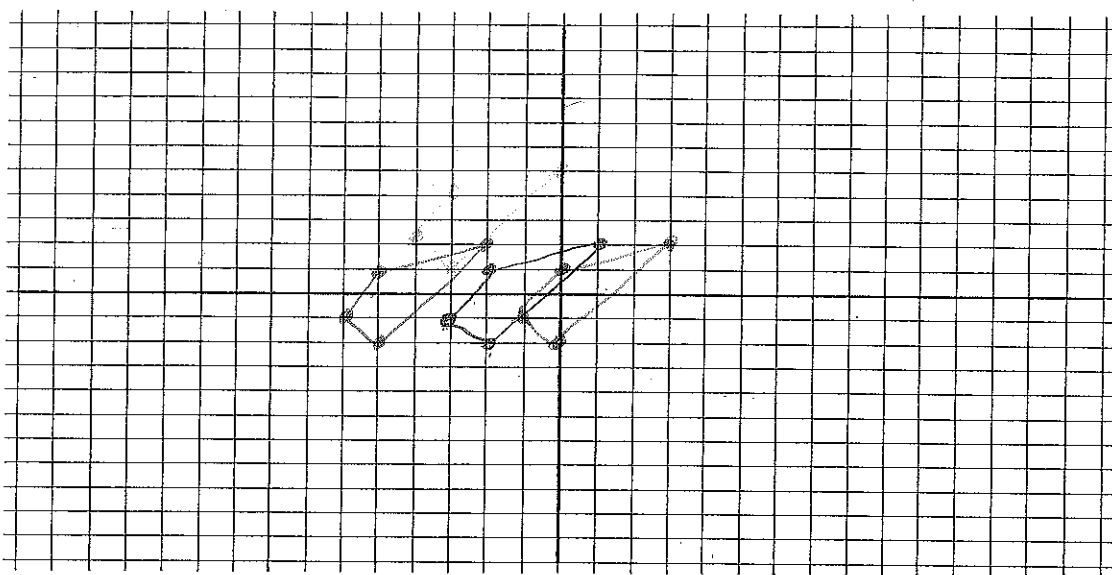
Step 3: Using the points from step 1, keep the same x-values and create new y-values by adding 2 to the original y-values. Graph your new points in a new color and connect the three new points.

$(2, 1)$	$(2, 4)$	$(6, 1)$
$(2, 1+2)$	$(2, 4+2)$	$(6, 1+2)$
$(2, 3)$	$(2, 6)$	$(6, 3)$

Step 4: What happens to your graph when you do steps 2 and 3?

When we subtracted a value from our  $y$  the graph shifted down, when we added to our  $y$ -value it shifted up.

Step 5: On the new graph, plot the points  $(-3, -1)$ ,  $(-2, 1)$ ,  $(1, 2)$  and  $(-2, -2)$ . Connect the points to create a shape.



Step 6: Using the points from step 5, keep the same  $y$ -values and create new  $x$ -values by subtracting 3 from the previous  $x$ -values. Graph the new points in a new color and connect the points.

$(-3, -1)$	$(-2, 1)$	$(1, 2)$	$(-2, -2)$
$(-3-3, -1)$	$(-2-3, 1)$	$(1-3, 2)$	$(-2-3, -2)$
$(-6, -1)$	$(-5, 1)$	$(-2, 2)$	$(-5, -2)$

Step 7: Using the points from step 5, keep the same  $y$ -values and create new  $x$ -values by adding 2 to the original  $x$ -values. Graph your new points in a new color and connect the new points.

$(-3, -1)$	$(-2, 1)$	$(1, 2)$	$(-2, -2)$
$(-3+2, -1)$	$(-2+2, 1)$	$(1+2, 2)$	$(-2+2, -2)$
$(-1, -1)$	$(0, 1)$	$(3, 2)$	$(0, -2)$

Step 8: What happens to your graph when you do steps 6 and 7?

When we subtract from  $x$  the graph shifts left, when we add to  $x$  we shift right.

Step 9: Using the points from step 5, subtract 1 from your original x-values and add 3 to your original y-values, plot your new points.

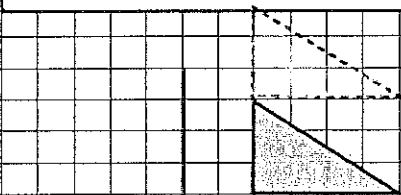
$(-3, -1)$      $(-2, 1)$      $(1, 2)$      $(-2, -2)$   
 $(-3-1, -1+3)$      $(-2-1, 1+3)$      $(1-1, 2+3)$      $(-2-1, -2+3)$   
 $(-4, 2)$      $(-3, 4)$      $(0, 5)$      $(-3, 1)$

What happens to your graph when you do this?

This graph shifted left 1 unit and up 3 units

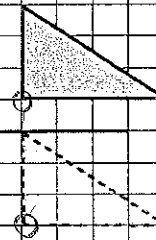
# Practice

Given the graphs below, write a rule for each translation. The original graph is a solid line, the new graph is a dotted line.

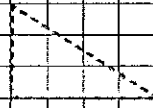


Rule: Shift up 3 units  
 $(x, y+3)$

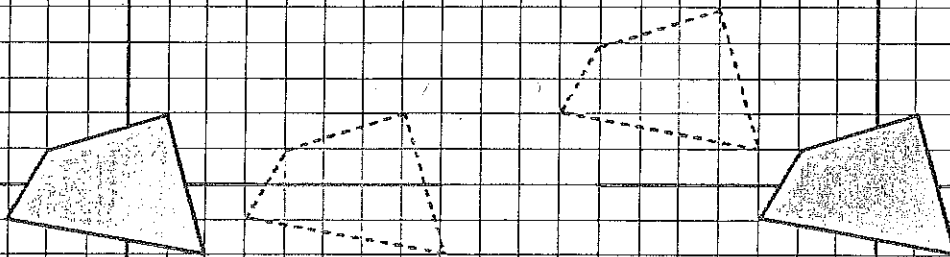
Rule: Shifted down 4 units  
 $(x, y-4)$



Rule: Shifted down 5 units  
 $(x, y-5)$



Given the graphs below, write a rule for each translation. The original graph is a solid line, the new graph is a dotted line.



Rule: Shifts right 6 units

$$(x+6, y)$$

Rule: left 5 units up 3 units

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