LESSON MAKER PRO

Function Shift Lab

Build new functions from coordinate changes.

HIGH SCHOOL · MA.912.F.2.5

MA.912.F.2.5 "Given a table, equation or graph that represents a function, create a corresponding table, equation or graph of the transformed function defined by adding a real number to the x- or y-values or multiplying the x- or y-values by a real..."

NAME _____ DATE _____

CHANGE THE COORDINATES

If you add k to every y-value, use g(x)=f(x)+k. If you multiply every y-value by a, use g(x)=af(x). If you add k to every x-value, use g(x)=f(x-k), and if you multiply every x-value by a, use g(x)=f(x/a).

WORKED EXAMPLE

The number line marks the input of point A on f(x)=3x+8. Add 6 to every y-value. Write the new equation and the new coordinate of A.



1. Find A's original y-value: f(11)=3(11)+8=41.
2. Add 6 to the y-value: 41+6=47.
3. Add 6 to the function rule: g(x)=3x+8+6=3x+14.

Answer: g(x)=3x+14; A moves to (11,47).

PRACTICE 4 problems

1 Add 5 to every y-value of f(x)=4x-9. Write g(x).

ANSWER _____

2 Multiply every x-value of $f(x)=x^2+2$ by -4. Write g(x).

ANSWER _____

3 Multiply every y-value of f(x)=-15x+1 by -4. Write g(x).

ANSWER _____

4 Subtract 2 from every x-value of $f(x)=(x+15)^2$. Write g(x) and name the horizontal shift.

ANSWER _____

APPLY IT Show your work

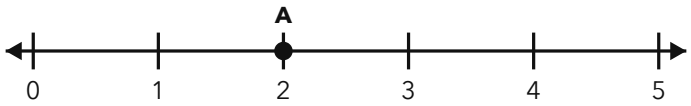
1 A student club tracks views of a music video. Views are in hundreds. A second promotion doubles every y-value. Create the new table.

MUSIC VIDEO VIEWS

Day, x	Views, y
0	16
1	18
2	20
4	22

ANSWER _____

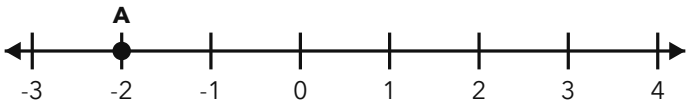
2 A game designer models a character's height with h(x)=4x+1, where x is time in seconds. The number line marks point A's input. The designer doubles every x-value. Write g(x) and the new coordinate of A.



ANSWER _____

CHALLENGE One step up

The number line marks the input of point A on $f(x)=x^2-1$. First multiply every x-value by -2. Then add 4 to every y-value. Write g(x), give A's new coordinate, and explain the coordinate changes.



WORK SPACE AND ANSWER

ANSWER KEY # Function Shift Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Add 5 to every y-value of f(x)=4x-9. Write g(x).	**g(x)=4x-4**
2	Multiply every x-value of $f(x)=x^2+2$ by -4. Write g(x).	**$g(x)=x^2/16+2$**
3	Multiply every y-value of f(x)=-15x+1 by -4. Write g(x).	**g(x)=60x-4**
4	Subtract 2 from every x-value of $f(x)=(x+15)^2$. Write g(x) and name the horizontal shift.	**$g(x)=(x+17)^2$; shift left 2 units**

PART 2 · APPLY IT

1. **Day x: 0, 1, 2, 4; new views y: 32, 36, 40, 44** Multiply each views value by 2. The x-values stay the same.
2. **g(x)=2x+1; A moves to (4,9)** Doubling x-values gives g(x)=h(x/2)=2x+1. Point A starts at (2,h(2))=(2,9), so its x-coordinate doubles to 4.

CHALLENGE

$g(x)=x^2/4+3$; A moves from (-2,3) to (4,7). The x-coordinate is multiplied by -2, and the y-coordinate increases by 4.

Accept equivalent equation forms, such as g(x)=f(x/(-4)) before simplification. For horizontal changes, accept correct coordinate rules and descriptions such as left 2 units.