4.2: Graph Linear Equations by Making a Table

Goals: *Understand what a linear equation is and be able to identify solutions
*Use a table to graph a linear equation
*Graph horizontal and vertical lines
*Choose appropriate x values
*Identify domain and range of a linear equation

Linear equation: Any equation whose graph is a straight line. Linear equations can be written in the form $Ax + By = C$, which is called "Standard Form." In this form, both A and B cannot be 0.

Solution:

1) Any ordered pair (x, y) that makes the equation true when substituted.

2) Any point on the line (Since a line continues on forever in both directions, and there are infinite points on a line, then a linear equation has infinite solutions.

THIS MEANS: Because a ***solution to a linear equation*** is both a point on the line ***and*** an ordered pair that works when substituted in, that if an order pair ***WORKS*** in the equation, then it would also be a ***POINT ON THE LINE***!

Ex: Which ordered pair is a solution to: $3x - y = 7$; (3, 4) or (1, –4)? Explain.

If you plug in (3, 4) then 3 replaces x and 4 replaces y. You would get:
$3(3) - 4 = 7$
$9 - 4 = 7$
$5 = 7$

So no, (3, 4) is **not** a solution. It does not work when substituted in.

If you plug in (1, −4), then 1 replaces x and −4 replaces y. You would get:
$3(1) - (-4) = 7$
$3 - (-4) = 7$
$3 + 4 = 7$
$7 = 7$

So yes, (1, −4) is a solution. When you substitute it in, it works.

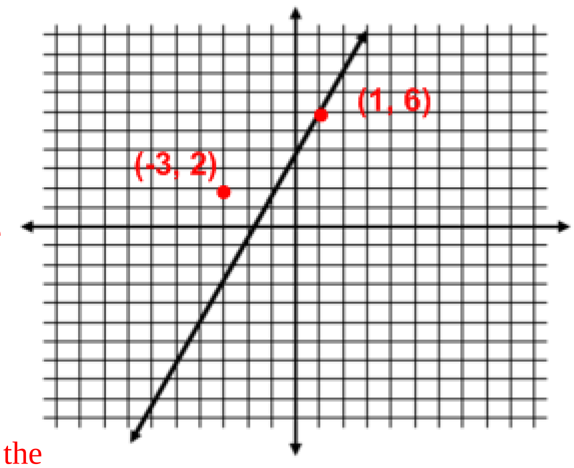
Ex: Tell whether (4, −1) is a solution to $x + 2y = 5$. Why or why not.

$$4 + 2(-1) = 5$$

$$4 + (-2) = 5$$

$2 = 5$ No, it is not a solution.

Ex: Are the following points solutions to the linear equation represented by the line graphed?



a) (1, 6) Yes, it is a point on the line

This means you would expect (1, 6) to work if substituted into the Equation of the line graphed. (even though we don't know what the equation is)

b) (–3, 2) No, it is not a point on the line

This means you would ***not*** expect (−3, 2) to work if substituted into the Equation of the line graphed. (even though we don't know what the equation is)

Graph a linear equation by making a table:

****MAKE SURE EQUATION IS IN _function____________ FORM!**

1. Rewrite the equation so it is in function form, which means to isolate __y___

Ex: $-2x + y = -3$

$\underline{+2x \qquad +2x}$

$y = -3 + 2x$

x	$y = -3 + 2x$	y
−2	$y = -3 + 2(-2)$	−7
−1	$y = -3 + 2(-1)$	−5
0	$y = -3 + 2(0)$	−3
1	$y = -3 + 2(1)$	−1
2	$y = -3 + 2(2)$	1

2. Choose 5 appropriate values for x. Typically these values are:
−2, −1, 0, 1, 2

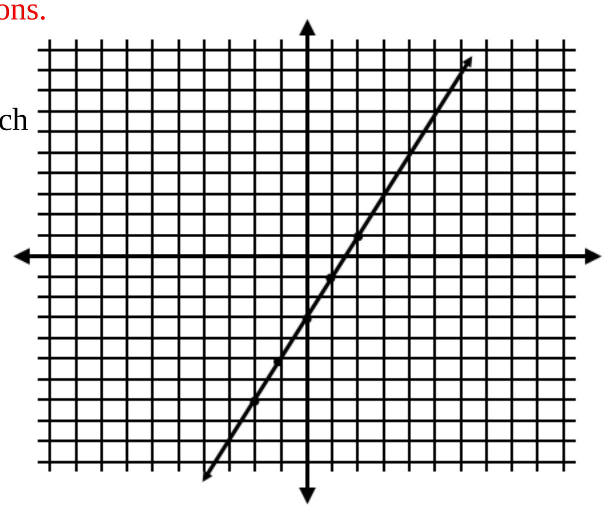
***You should not choose these five values in two cases:**

1. If there is a restriction on the domain. For example, if it is says $x \geq 0$, then you must choose only positive values, or if dealing with time, time cannot be negative

2. If after putting the equation in function form, the coefficient of x is a fraction, then it makes the most sense to choose multiples of the denominator to avoid fractions.

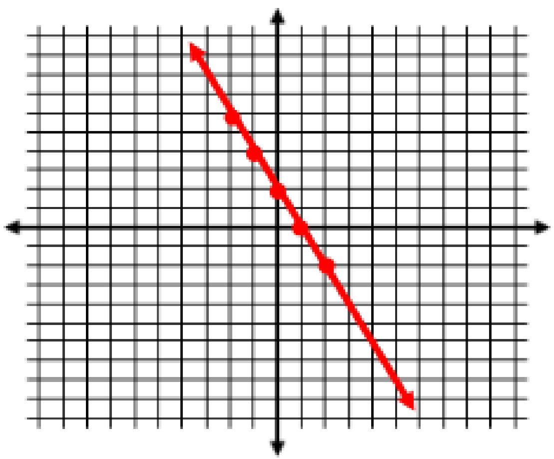
3. Plug your 5 values into the function for x, find out what y is for each to complete your table.

4. Graph the ordered pairs you now have from your table.



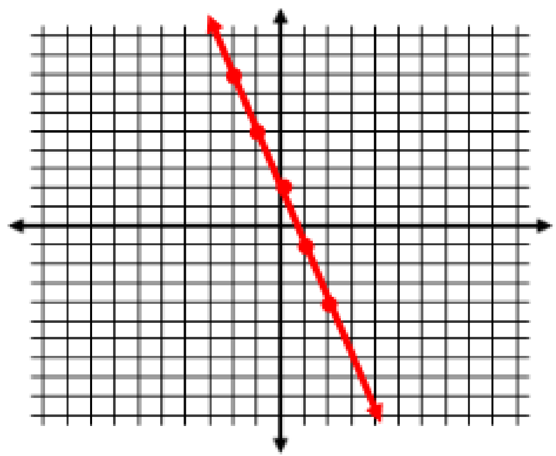
Ex: Graph $y = 2 - 2x$

x	$y = 2 - 2x$	y
-2	$y = 2 - 2(-2)$	6
-1	$y = 2 - 2(-1)$	4
0	$y = 2 - 2(0)$	2
1	$y = 2 - 2(1)$	0
2	$y = 2 - 2(2)$	-2

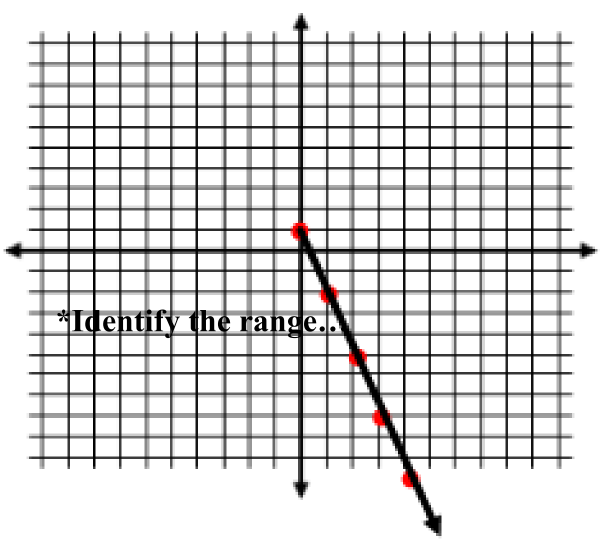


Ex: Graph $y = 2 - 3x$

x	$y = 2 - 3x$	y
-2	$y = 2 - 3(-2)$	8
-1	$y = 2 - 3(-1)$	5
0	$y = 2 - 3(0)$	2
1	$y = 2 - 3(1)$	-1
2	$y = 2 - 3(2)$	-4



Ex: Graph $y = -3x + 1$ with a domain of $x \geq 0$ *which values can you **<u>not</u>** choose for x? Why? Cannot choose negative numbers because x must be greater than or equal to 0



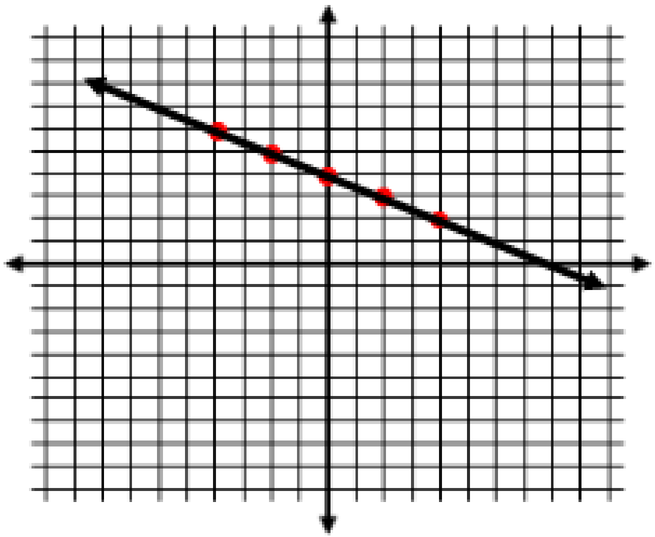
x	$y = -3x + 1$	y
0	$y = -3(0) + 1$ $y = 0 + 1$	1
1	$y = -3(1) + 1$ $y = -3 + 1$	-2
2	$y = -3(2) + 1$ $y = -6 + 1$	-5
3	$y = -3(3) + 1$ $y = -9 + 1$	-8
4	$y = -3(4) + 1$ $y = -12 + 1$	-11

Range: $y \leq 1$

Notice on the graph there is only an arrow on one end because the line cannot extend into the second quadrant. There, x would be negative.

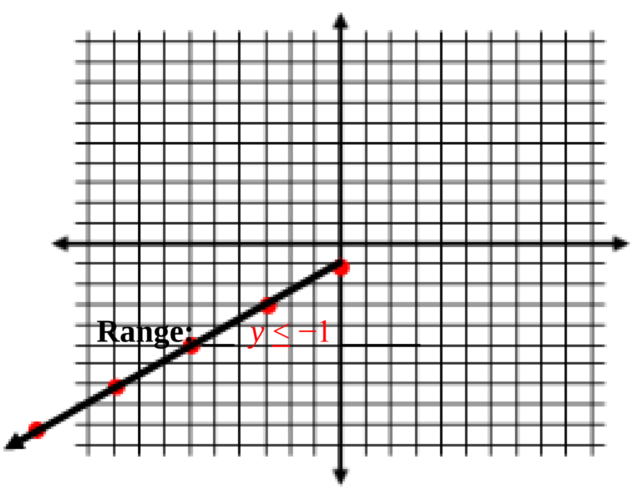
Ex: Graph $y = \frac{1}{2}x + 4$ **which values should you pick for x? Why?

You should choose multiples of 2 to cancel out fractions.



x	$y = \frac{1}{2}x + 4$	y
-4	$y = \frac{1}{2}(-4) + 4$ $y = -2 + 4$	2
-2	$y = \frac{1}{2}(-2) + 4$ $y = -1 + 4$	3
0	$y = \frac{1}{2}(0) + 4$ $y = 0 + 4$	4
2	$y = \frac{1}{2}(2) + 4$ $y = 1 + 4$	5
4	$y = \frac{1}{2}(4) + 4$ $y = 2 + 4$	6

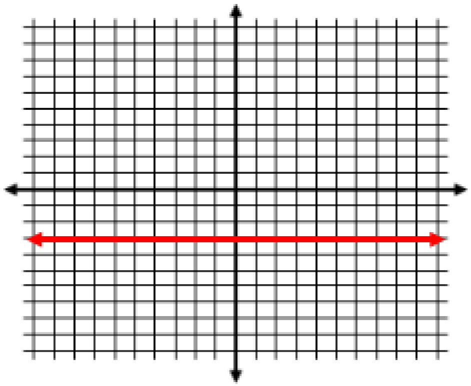
Ex: Graph $y = \frac{2}{3}x - 1$ with a domain of $x \le 0$ then identify the range.



x	$y = \frac{2}{3}x - 1$	y
-12	$y = \frac{2}{3}(-12) - 1$ $y = -8 - 1$	-9
-9	$y = \frac{2}{3}(-9) - 1$ $y = -6 - 1$	-7
-6	$y = \frac{2}{3}(-6) - 1$ $y = -4 - 1$	-5
-3	$y = \frac{2}{3}(-3) - 1$ $y = -2 - 1$	-3
0	$y = \frac{2}{3}(0) - 1$ $y = 0 - 1$	-1

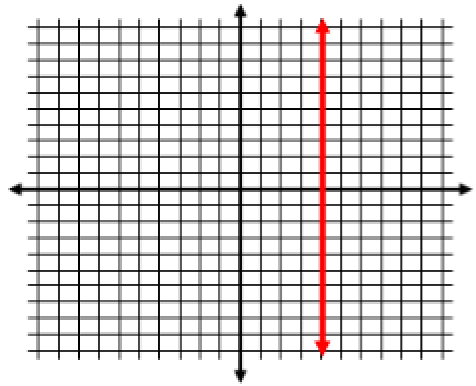
Ex: Graph $y = -3$

x	-2	-1	0	1	2
y	-3	-3	-3	-3	-3



Ex: Graph $x = 4$

x	4	4	4	4	4
y	-2	-1	0	1	2



Ex: The distance, d, in miles, that a runner travels is given by the function $d = 6t$ where t is the time (in hours) spent running. The runner plans to go for a 1.5 hour run. Set up a table and identify the domain and range of the function. Choose at least 4 values for t.

t	0	0.5	1	1.5
d	0	3	6	9

Domain: $t \geq 0$
Range: $d \geq 0$

Ex: Suppose the same runner decides he wants to run 12 miles. Set up a new table with at least 3 values and identify the new domain and range.

t	0	1	2
d	0	6	12

Domain: $0 \leq t \leq 2$
Range: $0 \leq d \leq 12$

Ex: For gas that costs \$2 per gallon, the equation $C = 2g$ gives the cost, C, in dollars for g gallons of gas. You plan to pump \$10 worth of gas. Set up a table and identify the domain and range.

g	0	1	2	3	4	5
C	0	2	4	6	8	10

Domain: $0 \leq g \leq 5$
Range: $0 \leq C \leq 10$