4.2: Graph Linear Equations

Goals: *Use a table to graph a linear equation
*Graph horizontal and vertical lines
*Choose appropriate x values

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

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 $\left(4, -\frac{1}{2}\right)$ is a solution to $x + 2y = 5$. Why or why not.

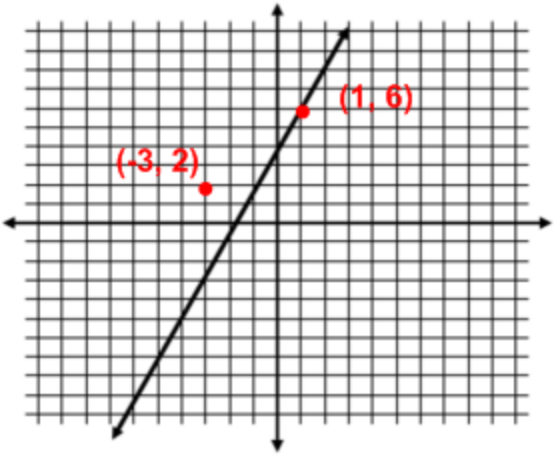
$$4 + 2\left(-\tfrac{1}{2}\right) = 5$$

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

$$3 = 5$$ 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
b) (–3, 2) No, it is not a point on the line



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: $-2x + y = -3$

$+2x \qquad +2x$

$y = -3 + 2x$

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

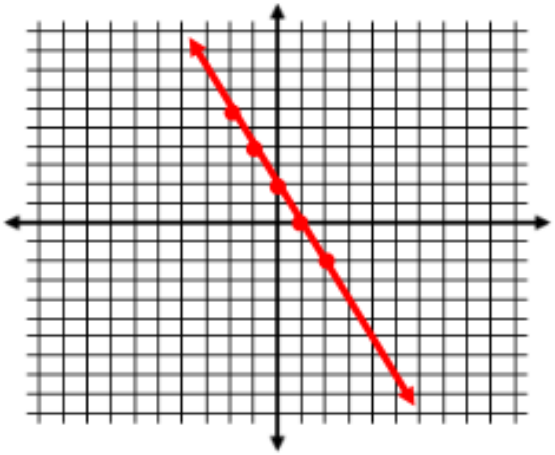
2. If after putting the equation in function form, the coefficient of *x* is a fraction, then it makes the most sense to choose multiples of the denominator to avoid fractions.

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 $y = 2 - 2x$

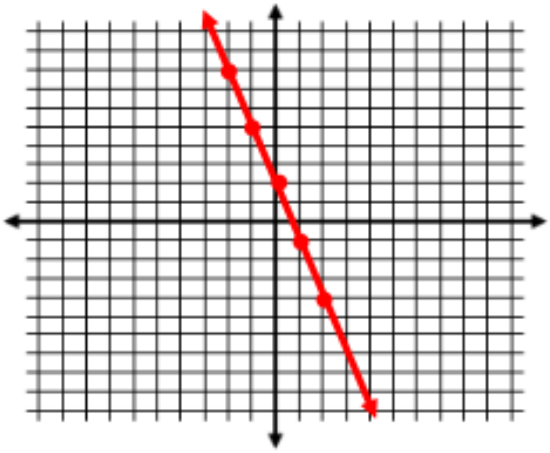
x	−2	−1	0	1	2
y	6	4	2	0	−2



Ex: Graph $y + 3x = 2$

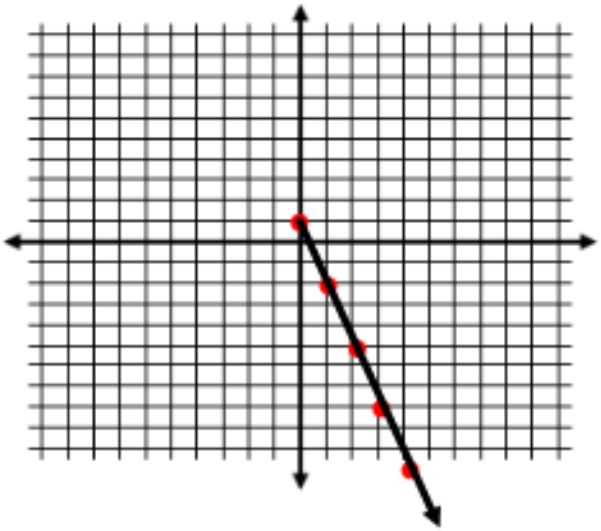
$y = 2 - 3x$

x	−2	−1	0	1	2
y	8	5	2	−1	−4



Ex: Graph $y = -3x + 1$ with a domain of $x \geq 0$

*which values can you **not** choose for x? Why? Cannot choose negative numbers because x must be greater than or equal to 0



x	0	1	2	3	4
y	1	−2	−5	−8	−11

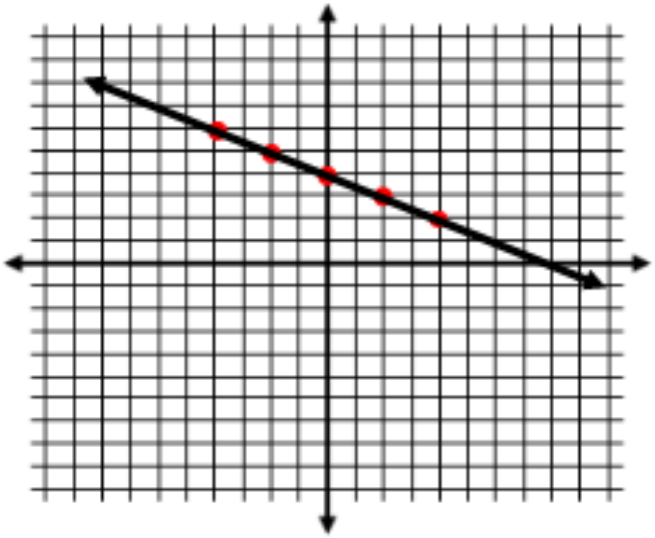
***Identify the range…**

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.

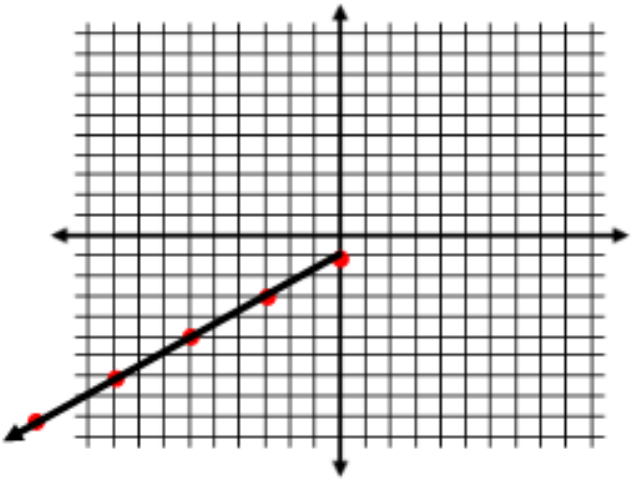
Ex: Graph $y = -\frac{1}{2}x + 4$ **which values should you pick for x? Why?

You should choose multiples of 2 to cancel out fractions.



x	−4	−2	0	2	4
y	6	5	4	3	2

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

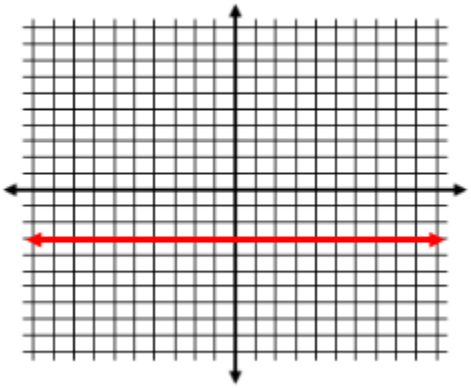


x	−12	−9	−6	−3	0
y	−9	−7	−5	−3	−1

Range: __ $y \leq -1$ _____

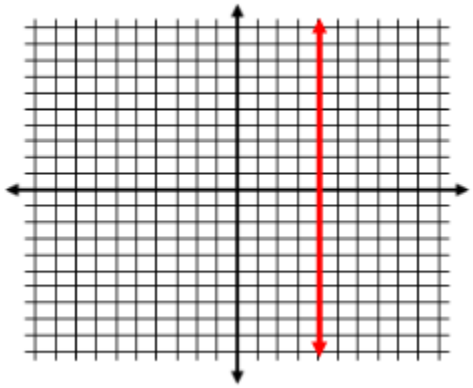
Ex: Graph $y = -3$

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: $0 \leq C \leq 10$