4.3: Graph Linear Equations Using *x* and *y* Intercepts

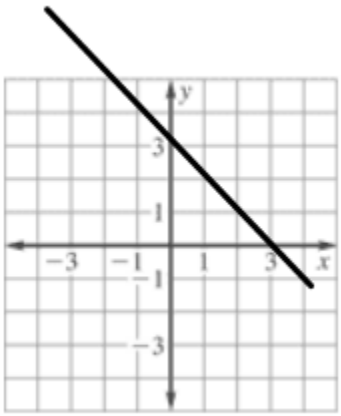
Goals: *Identify *x* and *y* intercepts on a graph
*Find *x* and *y* intercepts from a linear equation
***Graph lines using *x* and *y* intercepts
***Interpret the meaning of *x* and *y* intercepts

***x* – intercept:** the place where the line hits the *x*-axis. The *y*-coordinate is always 0.

***y* – intercept:** the place where the line hits the *y*-axis. The *x*-coordinate is always 0.

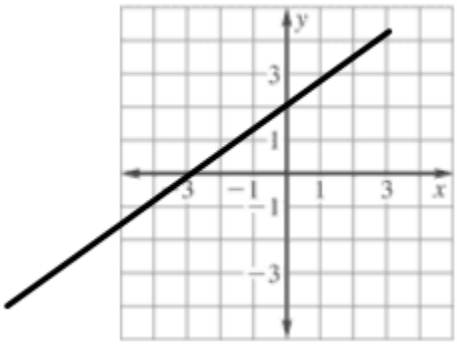
Identify the *x* and *y* intercepts of the lines graphed.

Ex:



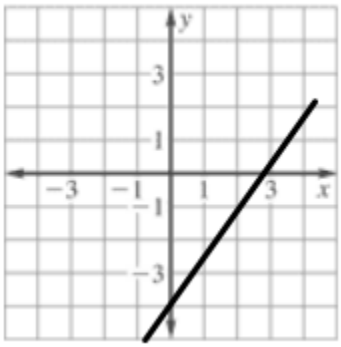
x-intercept: 3, *y*-intercept: 3

Ex:



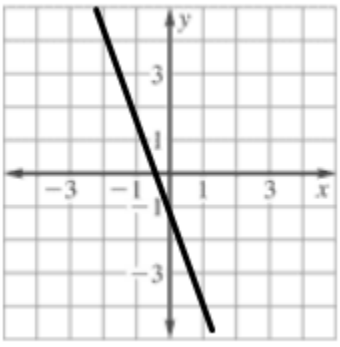
x-intercept: −3, *y*-intercept: 2

Ex:



x-intercep: 3, *y*-intercept: −4

Ex:



x-intercept: − ½ , *y*-intercept: −1

Graph each line using the *x* and *y* intercepts.

Ex: $2x + 7y = 28$

To find the *x*-intercept, let $y = 0$

$2x + 7(0) = 28$

$2x + 0 = 28$

$2x = 28$

$x = 14$

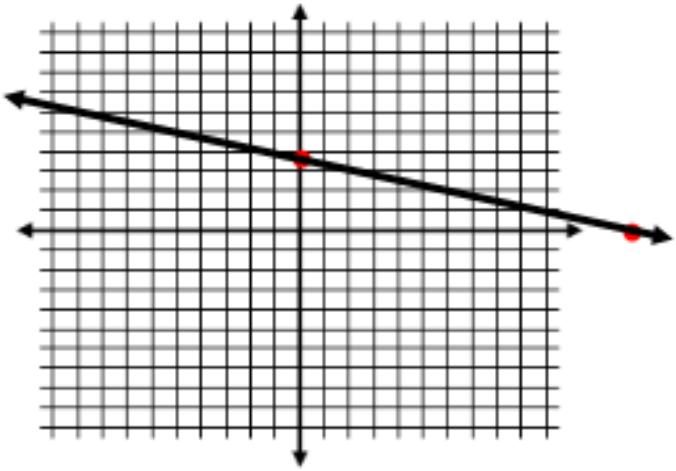
To find the *y*-intercept, let $x = 0$

$2(0) + 7y = 28$

$0 + 7y = 28$

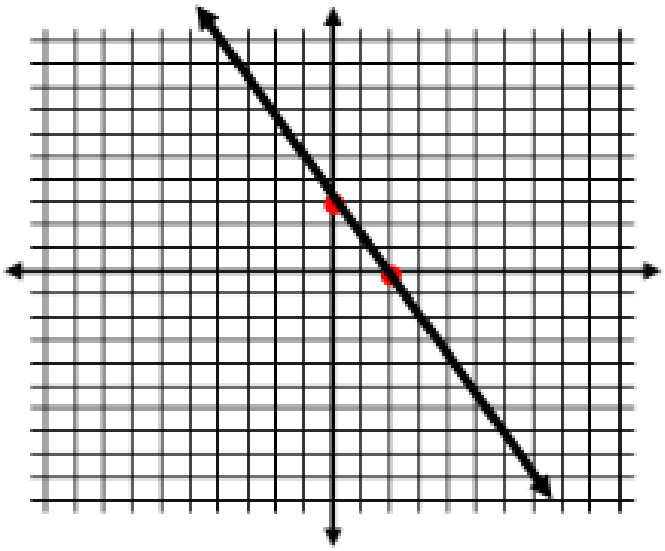
$7y = 28$

$y = 4$



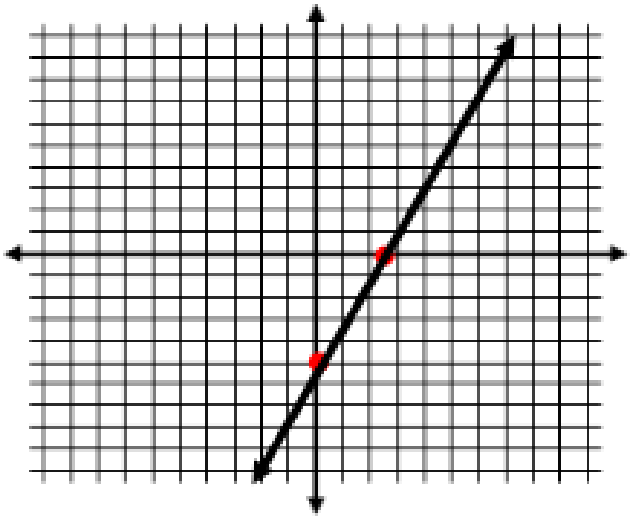
Ex: $3x + 2y = 6$

x-int: 2, *y*-int: 3



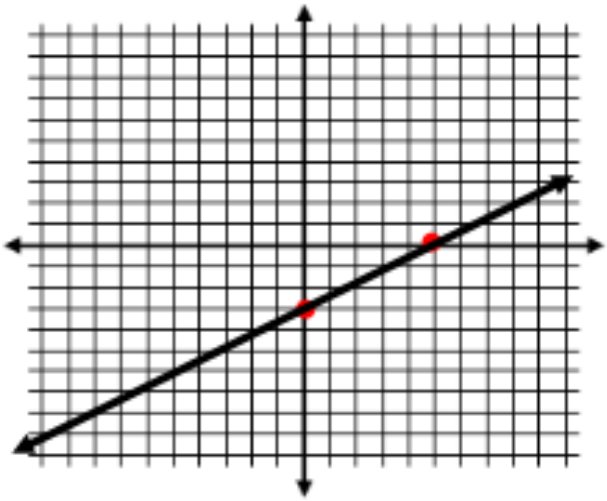
Ex: $4x - 2y = 10$

x-int: 2.5, *y*-int: −5



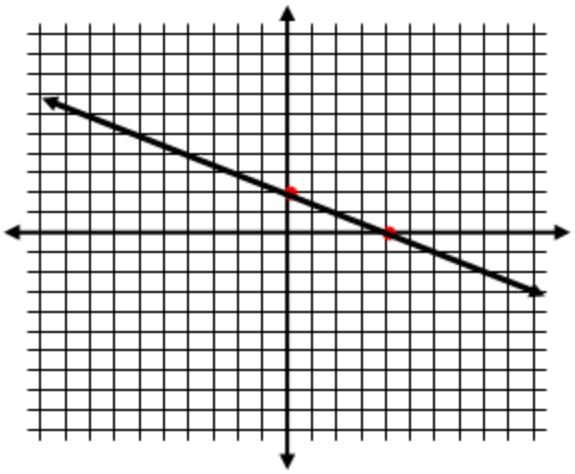
Ex: $-3x + 5y = -15$

x-int: 5, *y*-int: −3



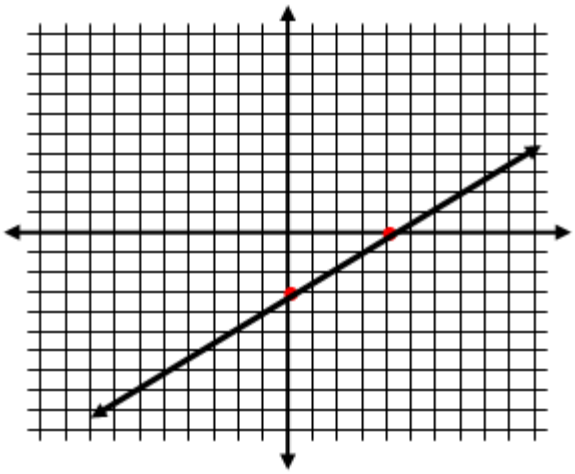
Ex: $x + 2y = 4$

x-int: 4, y-int: 2



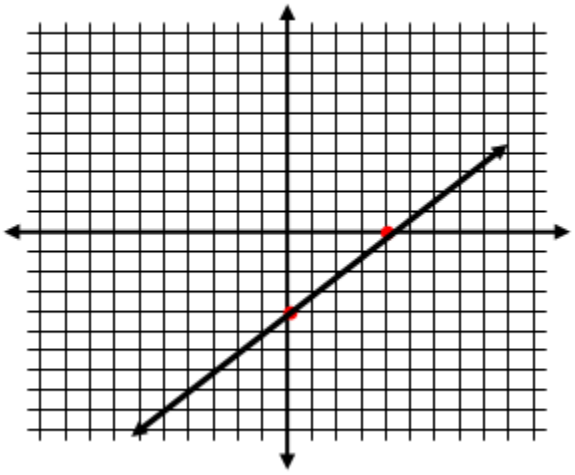
Ex: $3x - 4y = 12$

x-int: 4, y-int: -3



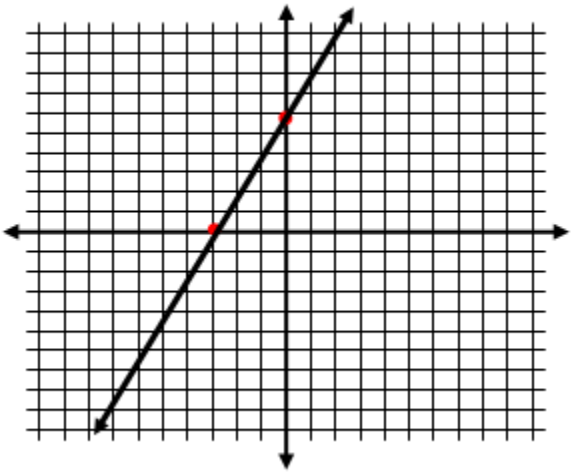
Ex: $y = x - 4$

x-int: 4, y-int: -4



Ex: $y = 2x + 6$

x-int: -3, y-int: 6



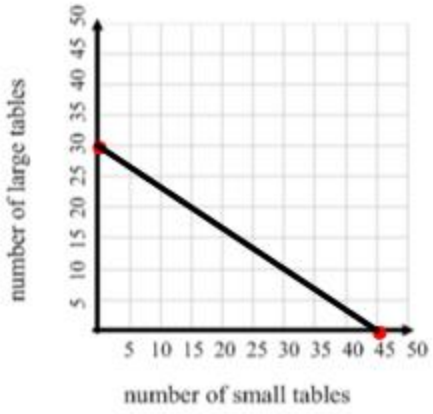
Ex: You are helping plan an awards banquet for your school and you need to rent tables to seat 180 people. Tables come in two sizes. Small tables seat 4 people and large tables seat 6 people.

a) Let x equal the number of small tables and y equal the number of large tables. Write an equation to represent the situation.

$4x + 6y = 180$

b) Graph the equation.

x-int: 45; y-int: 30



c) What do the intercepts mean?

If using 0 small tables, then needs 30 large
If using 0 large tables, then need 45 small

d) Give 4 possible combinations of small and large tables you could use. Look at the graph for easily identifiable points on the graph

30 large, 0 small
45 small, 0 large
30 small, 10 large
15 small, 20 large

e) Identify the domain and range of the function.

Domain: $\underset{\text{(min)}}{0} \leq x \leq \underset{\text{(max)}}{45}$

Range: $\underset{\text{(min)}}{0} \leq y \leq \underset{\text{(max)}}{30}$

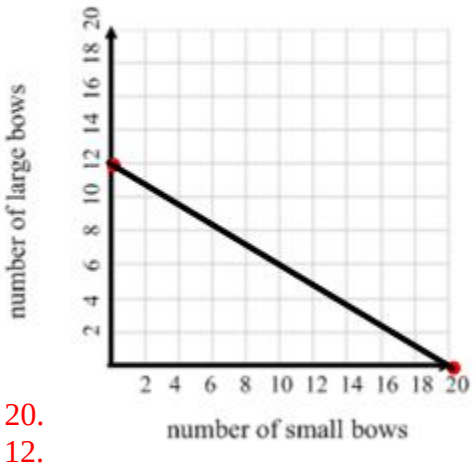
Ex: You make and sell decorative bows. You sell small bows for \$3 and large bows for \$5. You want to earn \$60.

a) Write an equation to represent the situation

$3x + 5y = 60$

b) Graph the equation

x-int: 20, y-int: 12



c) What do the intercepts mean?

If you wanted to sell *all* small bows and 0 large, you would need to sell 20.
If you wanted to sell *all* large bows and 0 small, you would need to sell 12.

d) Give 3 possible combinations of small and large bows you could sell.

10 small, 6 large
20 small, 0 large
0 small, 12 large

e) Identify the domain and range of the function.

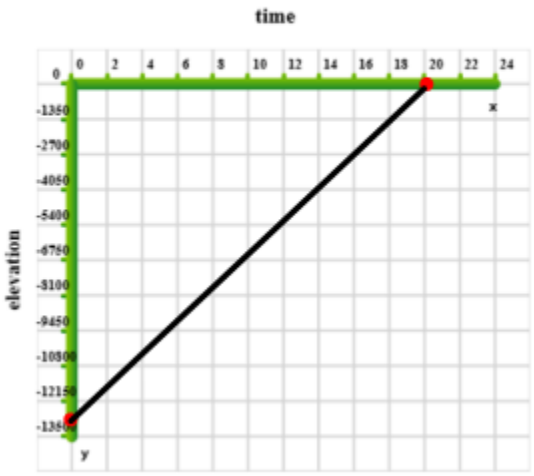
Domain: $0 \le x \le 20$
Range: $0 \le y \le 12$

Ex: A submersible is designed to explore the ocean floor at –13,000 feet. The submersible ascends to the surface at a rate of 650 feet/minute. The equation:

$$e = 650t - 13000$$

models this situation, where e is elevation and t is time (in minutes) since it began to ascend.

a) Graph the equation.



b) Explain the meaning of the x and y intercepts.

When time is 0 (start of ascent) the depth is −13000 feet. When elevation is 0, the time is 20 minutes. So it takes 20 minutes to reach the surface of the water

c) Identify the domain and range.

$0 \le t \le 20$
$-13000 \le e \le 0$