<u>7.1: Solve Linear Systems by Graphing</u>:

Goals: *Solve a system of equations by graphing
*Find a solution to system of equations

RECALL

A **<u>solution</u>** to a linear equation is: any ordered pair that when substituted in makes the equation true. (Any point on the line!)

Ex: $2x + 5y = 9$, is (2, 1) a solution? Yes, because if you substitute in, it works.

If you were to graph the line, would (2, 1) be a point on it? Why or why not?

Yes, it would be a point on the line because since it is a solution, solutions are also points on the line.

<u>System of Equations</u> – two (or more) linear equations with the same variables

<u>Solution to a system of equations</u> – any ordered pair that is a solution to **<u>BOTH</u>** equations.

Eventually we will know 3 ways to solve a linear system. The first is by graphing. It is the least convenient, but the best visually. This is a method you would use if giving an office presentation, for example.

**Since we already know that a solution to a single linear equation is also a point on the line, then we infer from this definition of a solution to a system of equations, that when graphed the solution must be a point on:

Both Lines!

(so then this would be where the lines intersect)

Decide if the given point is a solution to the system of equations:

Ex: $x + y = -2$
$x + 5y = 2$
(–3, 1)

$-3 + 1 = -2$ $-3 + 5(1) = 2$
$-2 = -2$ $-3 + 5 = 2$
$2 = 2$
Since it works for both, then yes it is a solution to the system.

Ex: $2x - 3y = 4$
$2x + 8y = 11$
(5, 2)

No, it doesn't work for both

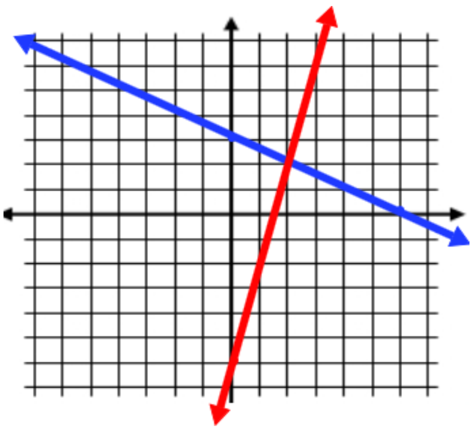
Ex: $6x + 5y = -7$
$x - 2y = 0$
(–2, 1)

No, it doesn't work for both

Solve by graphing:

Ex: Graph the following lines in the same coordinate plane. Identify the solution to the system:

$x + 2y = 6$ and $8x - 2y = 12$



*remember that in order to graph the lines you can use a table, intercepts or slope – intercept. Choose the most appropriate method when graphing.

Graph the first line using x and y intercepts (which are 6 and 3 respectively)

The second line you can use either intercepts (1.5 and −6) or you can use slope-intercept form.

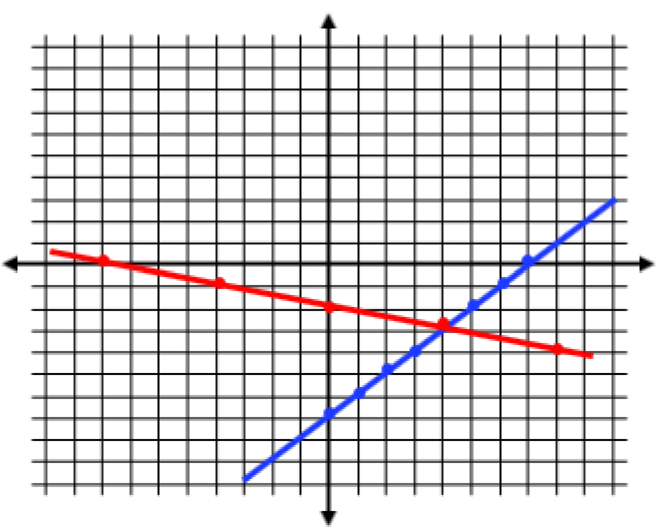
*Hint: Often times if you graph multiple (more than two points) you will be able to see the solution more easily.

What is the solution to the system? How do you know?

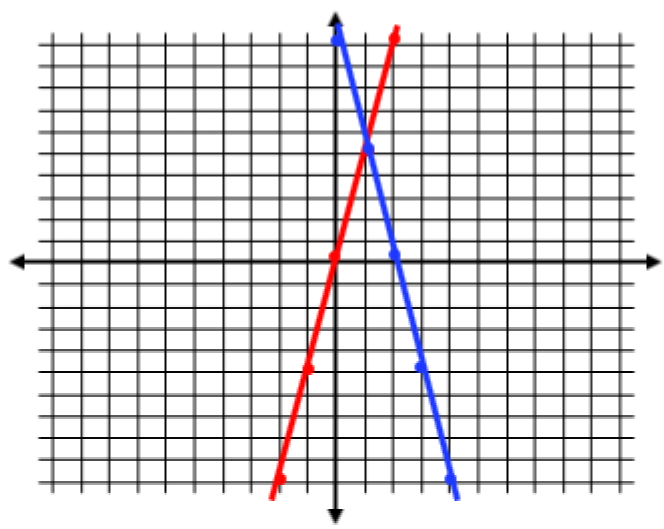
The solution is (2, 2). This is where they intersect. And you can check it's accurate by plugging the point into both equations. When you do, it works.

Solve each of the following systems by graphing. Be sure to state the solution.

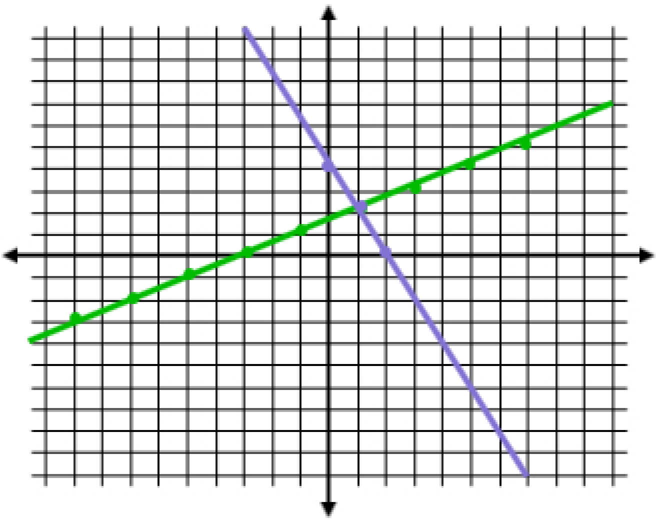
Ex: $-x + y = -7$
$x + 4y = -8$ (4, –3)



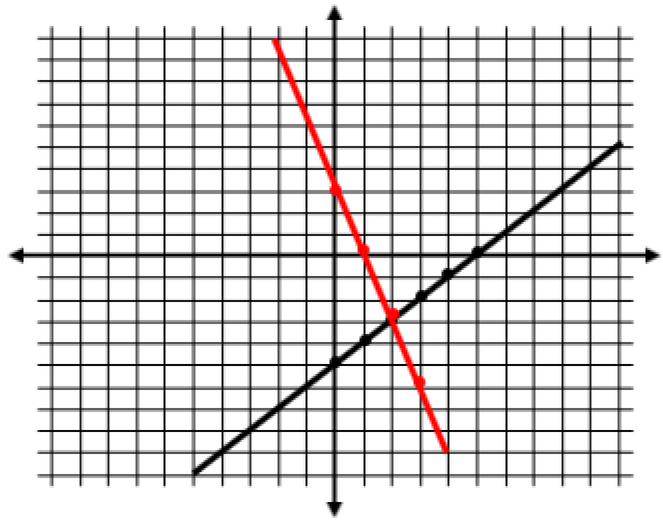
Ex: $-5x + y = 0$
$5x + y = 10$ (1, 5)



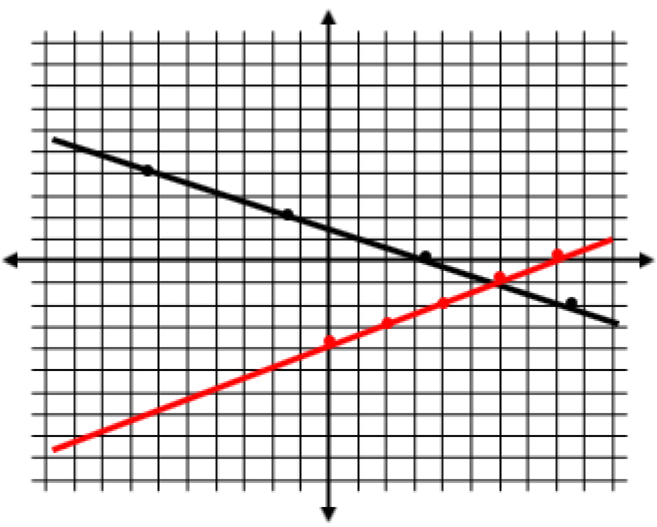
Ex: $-x + 2y = 3$
$2x + y = 4$ (1, 2)



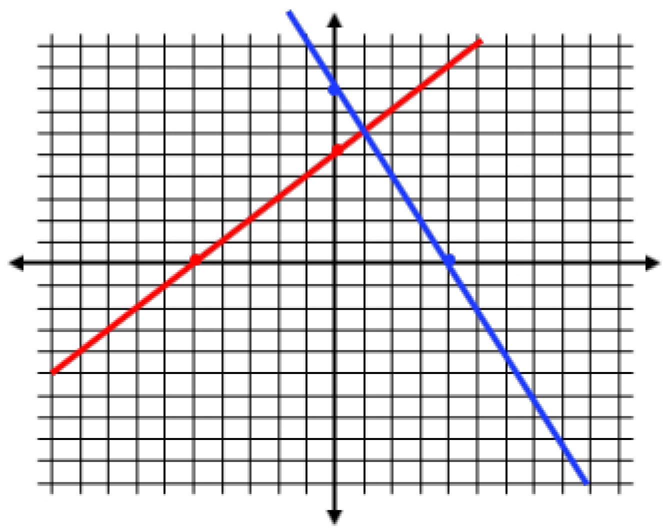
Ex: $x - y = 5$
$3x + y = 3$ (2, –3)



Ex: $2x + 5y = 7$
$-x + 2y = -8$ (6, –1)



Ex: $-x + y = 5$
$2x + y = 8$ (1, 6)



Ex: The parks and rec. department offers a seasons pass for \$90. With a pass you pay \$4 per session to use the tennis courts and without the pass you pay \$13 per session.

a. Write a system of linear equations to describe the situation. (The total cost with and without a based on the number of times you use the tennis courts)

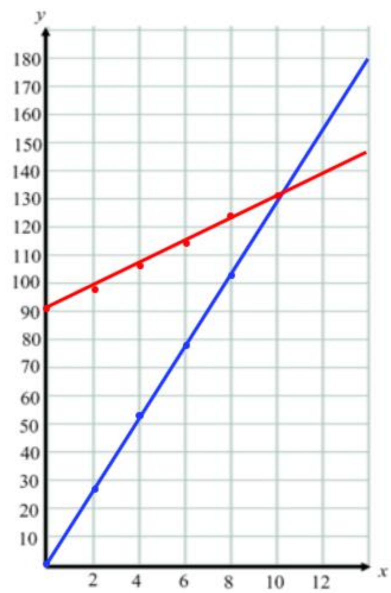
y = total cost, x = # of times you play tennis

$y = 13x$

$y = 90 + 4x$

b. Solve the system by graphing.

(10, 130)



c. *Explain*, what the solution means. Be sure to include what you know about **both** variables.

It would take 10 times playing tennis for the costs to be the same. The cost for 10 times is \$130.

d. For how many sessions would you choose to **not** buy a season pass? For how many sessions Would you choose to buy a season pass?

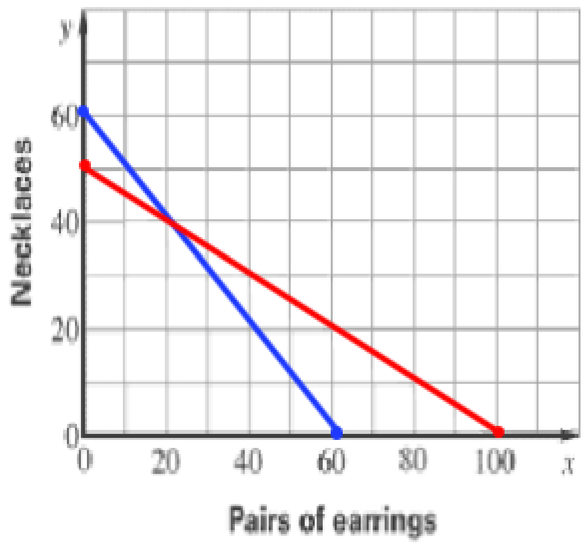
You would not choose to buy a season pass if you wanted to play tennis between 0 and 9 times. After 10 times, it makes sense to buy a season pass.

Ex: You sell earrings for \$5 and necklaces for \$10 and want to make \$500. You also want to sell 60 items total. Write a system of equations to describe the total number of necklaces and earrings sold.

$5x + 10y = 500$
$x + y = 60$

20 pairs of earrings, 40 necklaces

When you sell 20 pairs of earrings and 40 necklaces, you sell 60 items and make \$500.



Ex: A business rents inline skates for \$15 per day and bicycles for \$30 per day. During one day the business does a total of 25 rentals and makes \$450. Write and solve a system of equations by graphing to find the number of in-line skates and bicycles rented.

Let x = the number of inline skates rented.
Let y = the number of bikes rented

$x + y = 25$
$15x + 30y = 450$

20 inline skates, 5 bikes