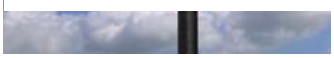
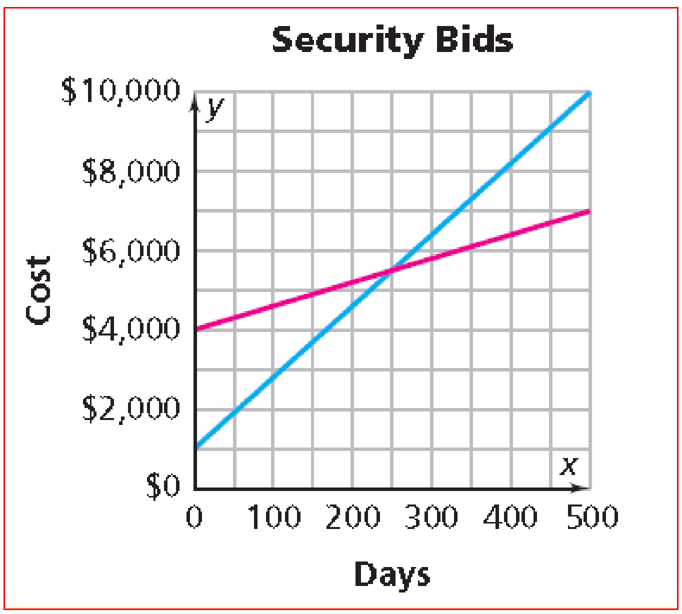
Topic 5
Beaumont Middle School
8th Grade, 2018-2019
Math8, Intro to Algebra

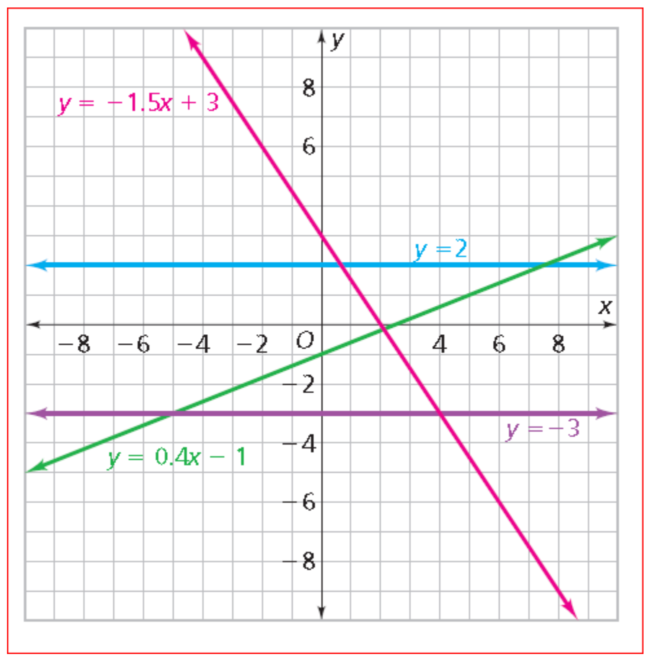
Name: ______________________________

Linear Systems

$$Ax + By = C$$
$$y = mx + b$$







n $y = mx + b$ form.
$x + By = C$ form.
n $y = mx + b$.
and analyzing intersection.
n $Ax + By = C$ form.
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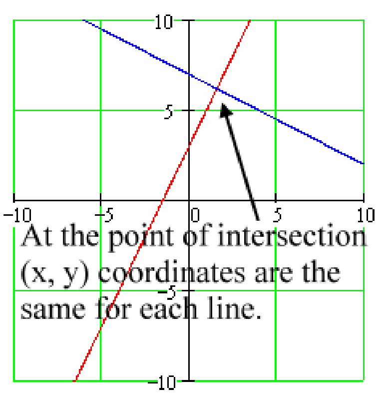


I can graph lines in $y = mx + b$ form using the slope and y-intercept.

Graphing Lines, $y = mx + b$ using y-intercept and slope

The formula *y = mx + b* is said to be a linear function. That is the graph of this function will be a straight line on the (x, y) plane. One could express this as a formal function definition with notation such as:

f(x) = mx + b

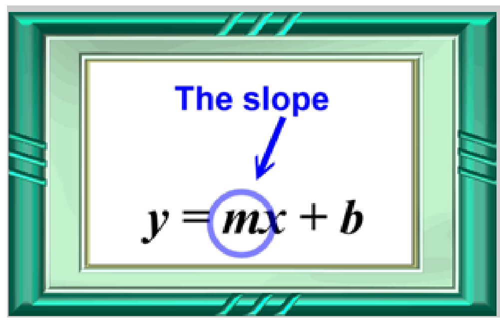
Since we will be graphing (x, y) points, though, we will do our thinking with the '*y = mx + b*' form for a while.

When the function for a line is expressed this way, we call it the *'slope-intercept form'*.

Where is the slope?

The slope of the line is the variable **m**.

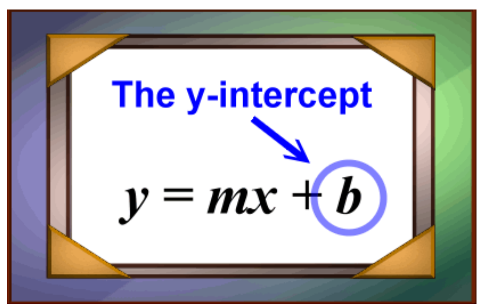
The slope describes the *slant* of the line.



Where is the intercept?

By *'intercept'* we mean *'y-intercept'*.
The y-intercept is held by the variable **b**.

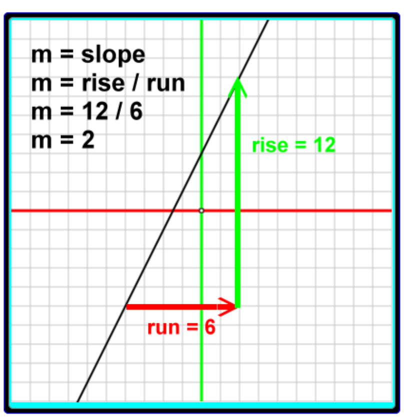
The y-intercept is the point where the line crosses the y-axis.

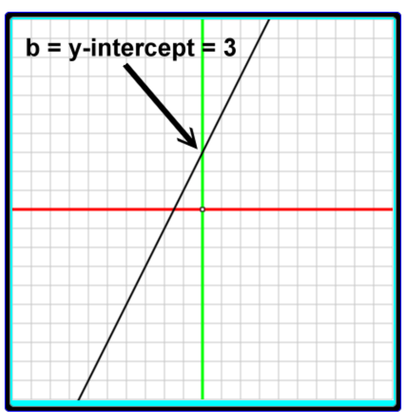


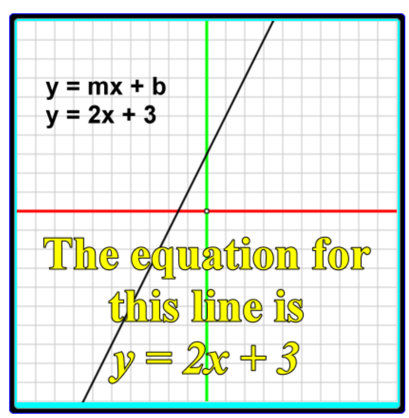
If you know the slope for the line....

and you know the y-intercept for the line....

then you can write the slope-intercept equation for the line.



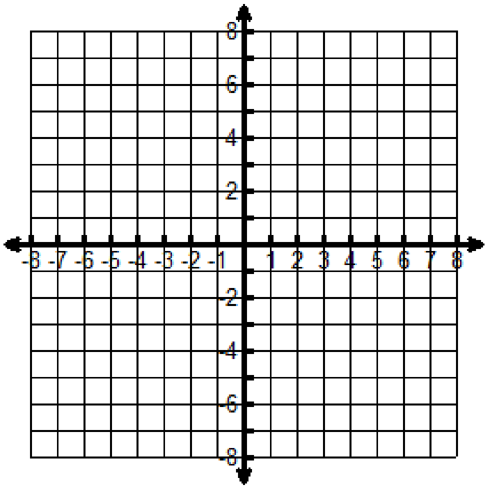




Graph the following lines using the y-intercept and slope.

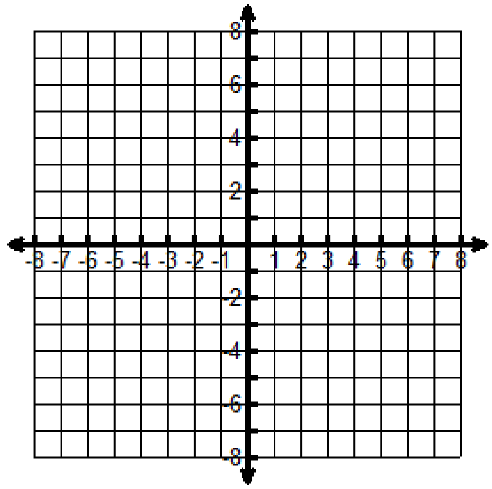
1) $y = 3x + 4$

y-intercept: ____ slope: _____



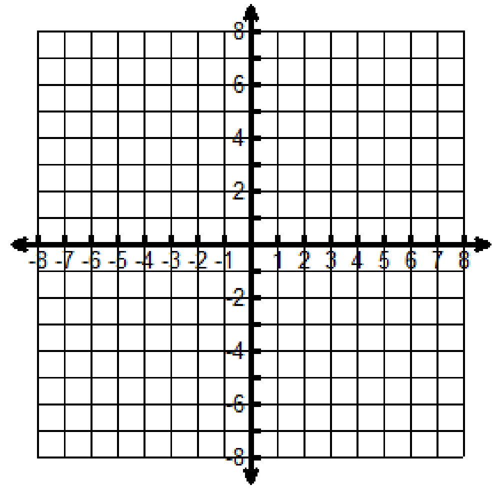
2) $y = 3$

y-intercept: ____ slope: _____



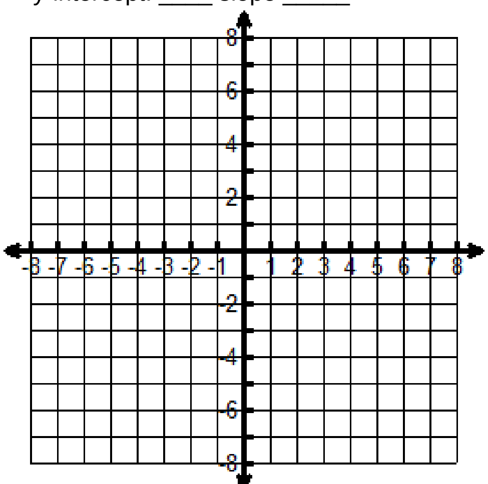
3) $y = -2x$

b: ____ m: _____



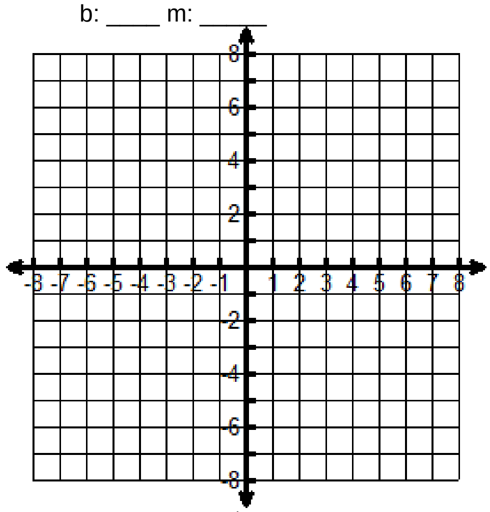
4) $y = -\frac{2}{5}x + 3$

y-intercept: ____ slope _____



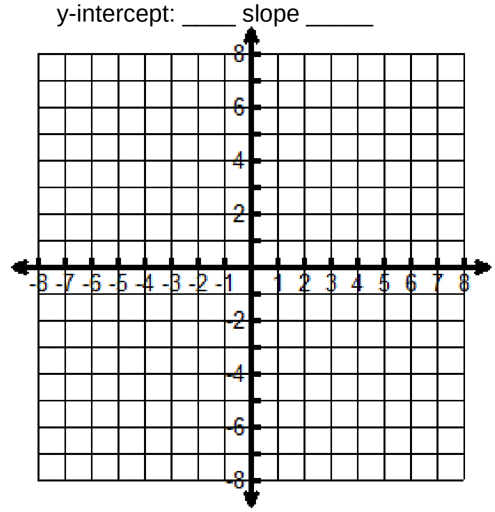
5) $y = \frac{1}{2}x + 4$

b: ____ m: _____



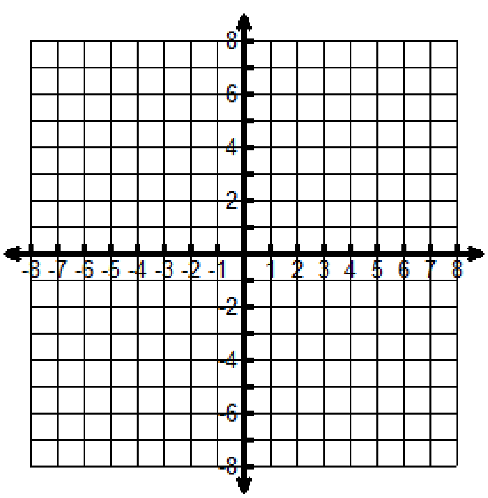
6) $y = x - 4$

y-intercept: ____ slope _____



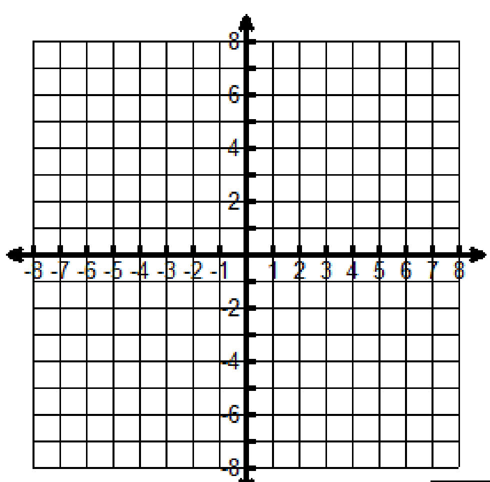
7) $y = -\frac{1}{2}x + 3$

b: ____ m: _____



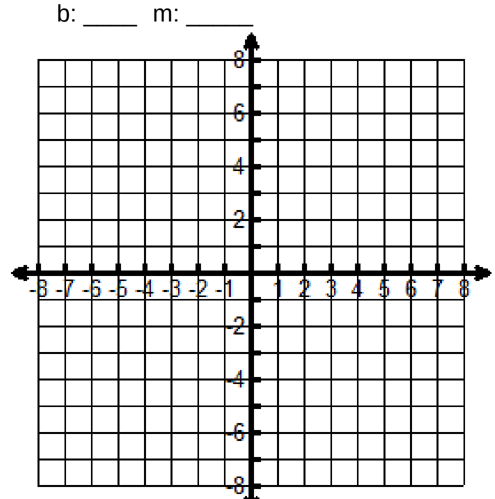
8) $y = \frac{1}{3}x - 4$

y-intercept: ____ slope _____



9) $y = -x + 3$

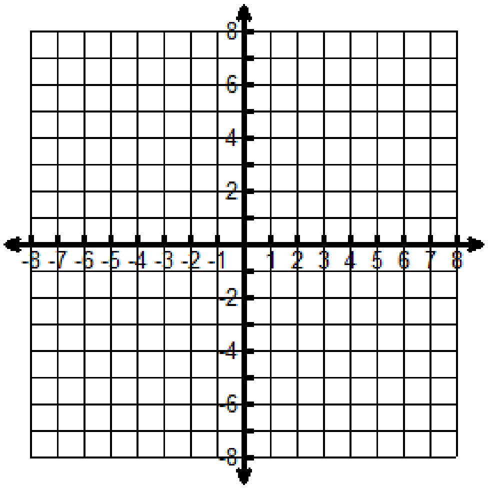
b: ____ m: _____



Homework is continued

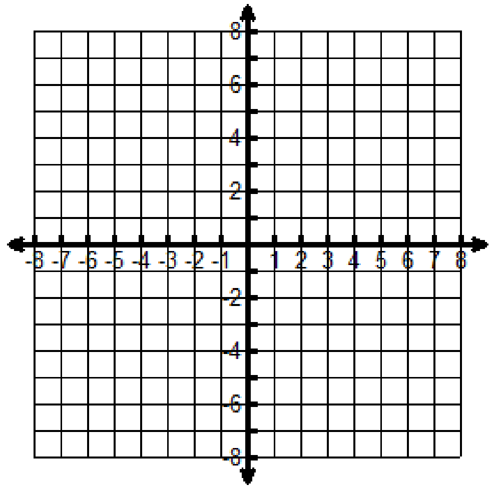
10) $y = 3x - 4$

y-intercept: ____ slope ______



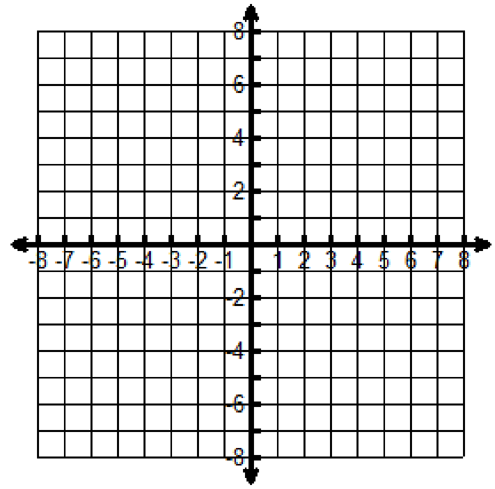
11) $y = -5$

b: ____ m: ______



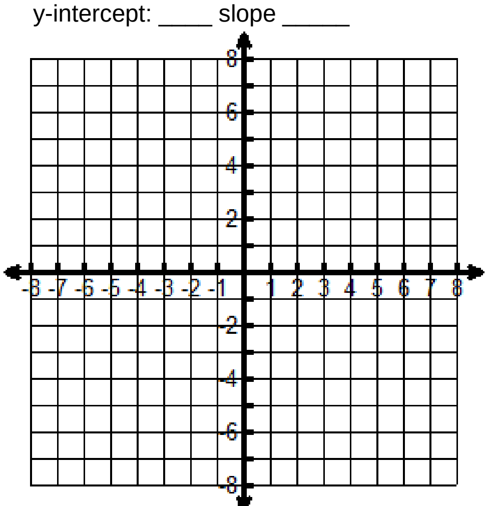
12) $y = -2x - 3$

y-intercept: ____ slope ______



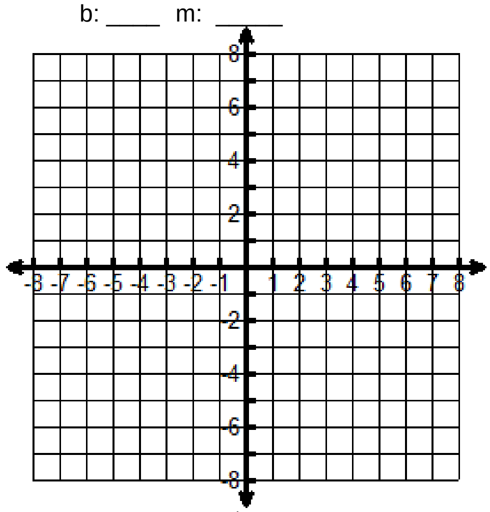
13) $y = -\frac{2}{5}x + 5$

y-intercept: ____ slope ______



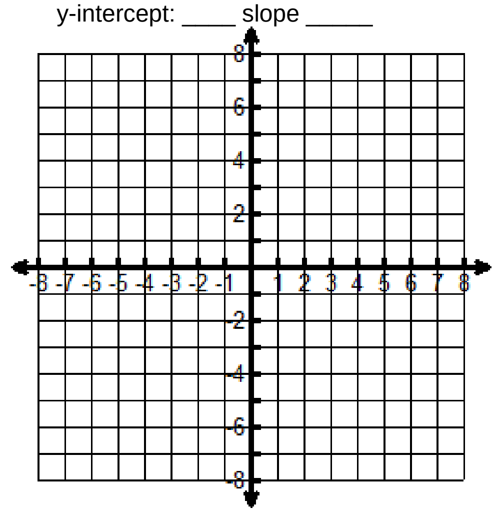
14) $y = \frac{1}{2}x - 2$

b: ____ m: ______



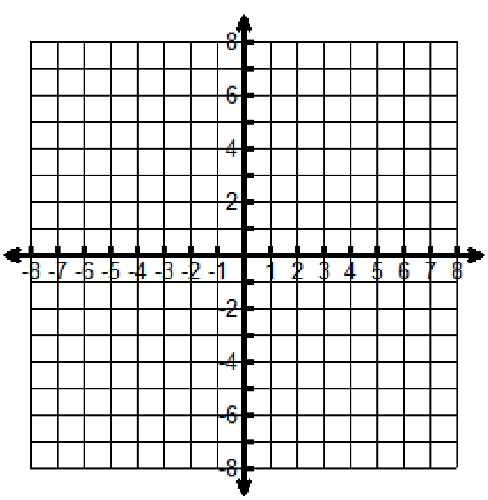
15) $y = -x + 6$

y-intercept: ____ slope ______



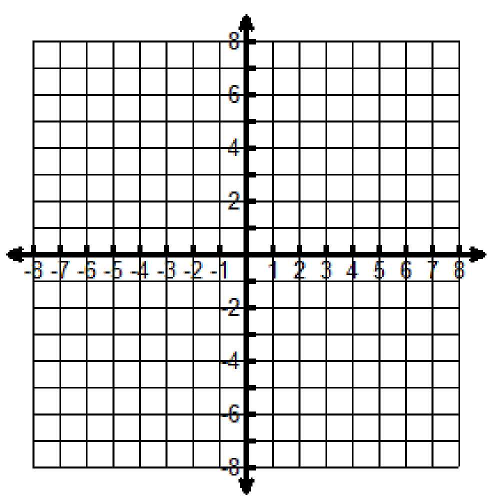
16) $y = -\frac{1}{2}x - 2$

b: ____ m: ______



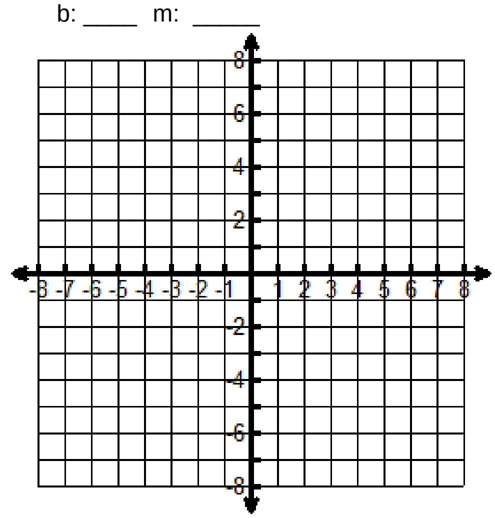
17) $y = \frac{1}{3}x + 4$

y-intercept: ____ slope ______



18) $y = x$

b: ____ m: ______



I can graph lines in $Ax + By = C$ form using the x and y-intercepts.

Graphing L ines, $Ax + By = C$ with x and y intercepts

Equations that are written in $Ax + By = C$ form are easier to graph using the x-intercept and y-intercepts. Before we begin, let's see what standard form looks like.

What is Standard Form?

Standard form is presented as:

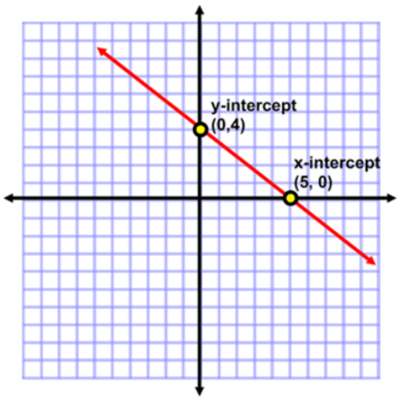
$$Ax + By = C$$

Where A and B are coefficients and C is a constant.

Examples:

$2x + 4y = 8$
$5x - 7y = 12$
$3x - 9y = -18$

Now let's review what the term **intercepts** means. An intercept is where your line crosses an axis. We have an x intercept and a y intercept.



The point where the line touches the x axis is called the **x intercept**.

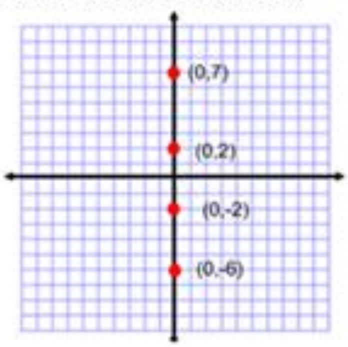
The point where the line touches the y axis is called the **y intercept**.

If we can find the points where the line crosses the x and y axis, then we would have two points and we'd be able to draw a line.

When equations are written in standard form, it is pretty easy to find the intercepts. Take a look at this diagram, as it will help you to understand the process.

Y Intercept:

Any point on the y axis is going to have an x coordinate of 0. Take a look!

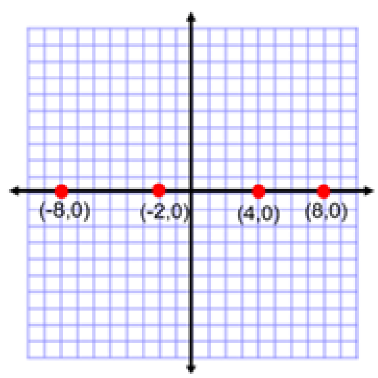


All of these points are y intercepts.

So, to find the y intercept within an equation, we are going to let x = 0.

X Intercept:

Any point on the x axis is going to have a y coordinate of 0. Take a look!



All of these points are x intercepts.

So, to find the x intercept within an equation, we are going to let y = 0.

Now, let's apply this. Just remember:

To find the x intercept: Let y = 0

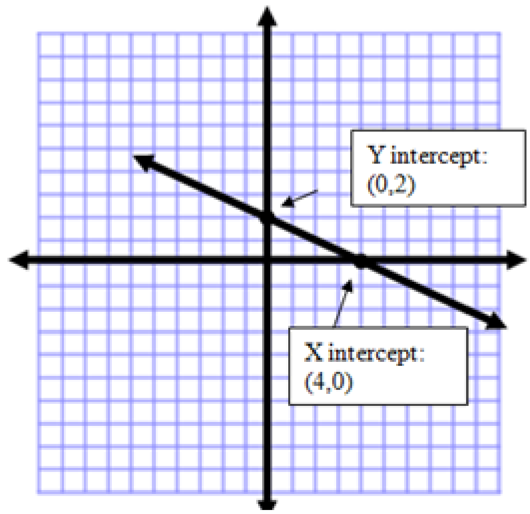
To find the y intercept: Let x = 0

Example 1

2x +4y = 8

Let y = 0	Let x = 0
2x +4y = 8	2x +4y = 8
2x +4(0) = 8	2(0) +4y = 8
2x + 0 = 8	0 + 4y = 8
$\frac{2x}{2} = \frac{8}{2}$	$\frac{4y}{4} = \frac{8}{4}$
x = 4	y= 2
The x intercept is: (4,0)	**The y intercept is: (0, 2)**

The x intercept is: (4,0) **The y intercept is: (0, 2)**



You can also represent the x and y intercepts in a table.

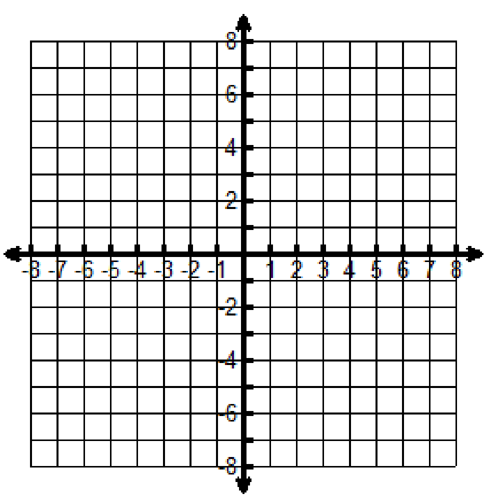
x	y
4	0
0	**2**

Use the x and y intercepts to graph the equations.

1) $x + y = -6$

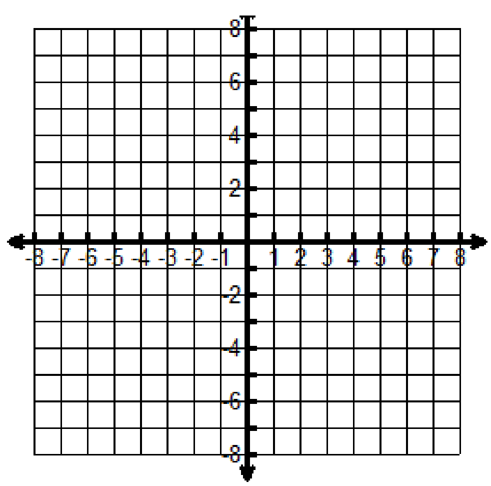
y-intercept: (0 , ______)

x-intercept: (______ , 0)



2) $6x - 3y = 24$

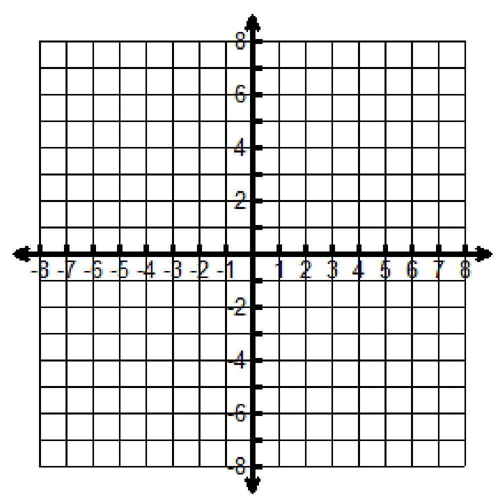
x	y
0	
	0



3) $-2x + y = -8$

y-intercept: (0 , ______)

x-intercept: (______ , 0)



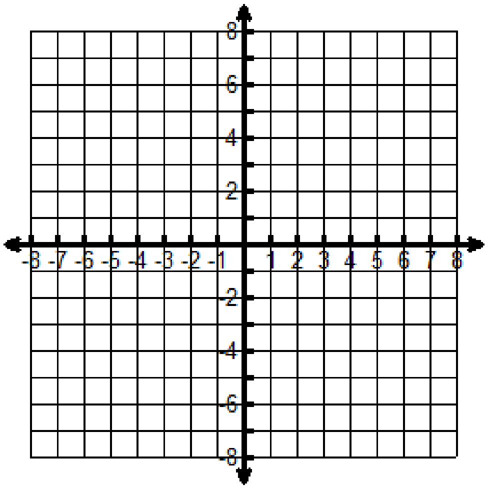
On Your Own…

Use the x and y intercepts to graph the equations.

1) $x + y = 4$

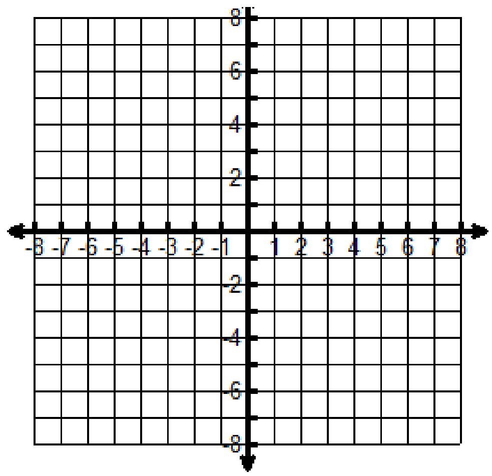
y-intercept: (0 , ____)

x-intercept: (____ , 0)



2) $2x - 3y = 12$

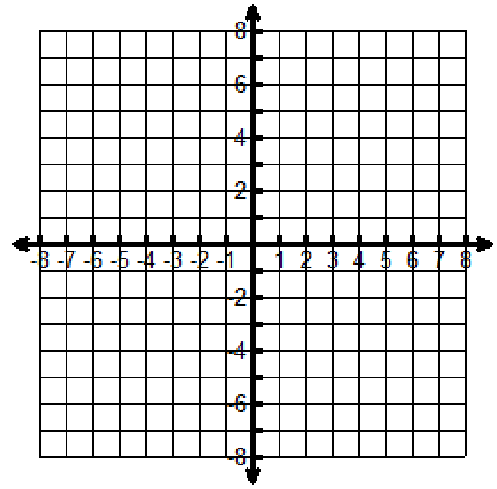
x	y
0	
	0



3) $-2x + y = -4$

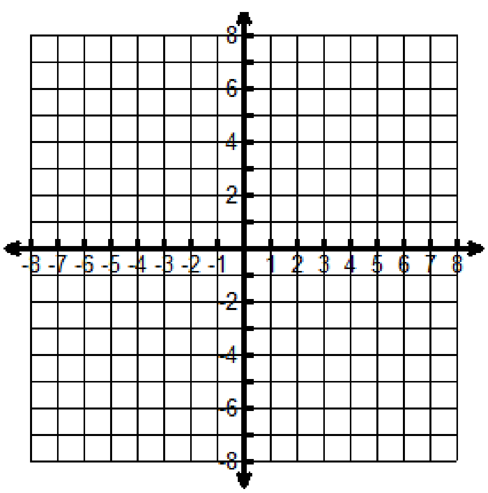
y-intercept: (0 , ____)

x-intercept: (____ , 0)



4) $x - y = -2$

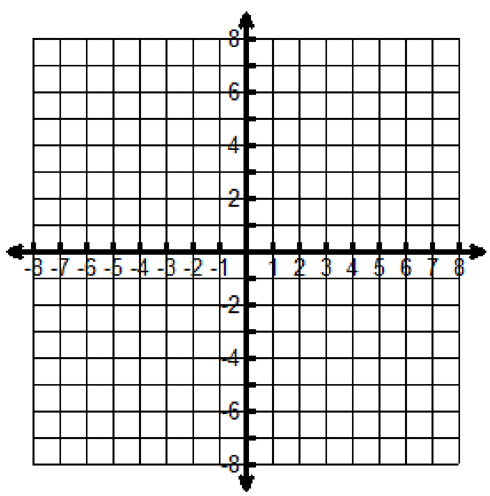
x	y
0	
	0



5) $x + 3y = 6$

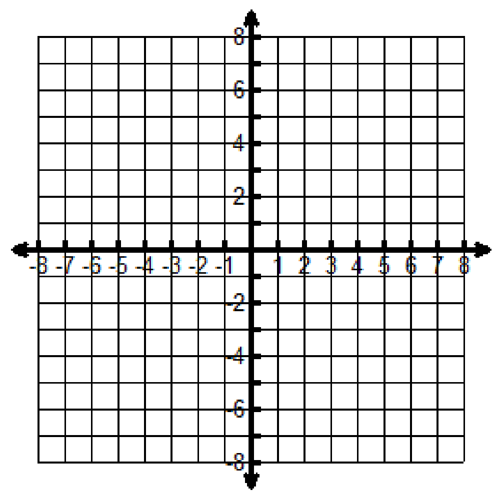
y-intercept: (0 , ____)

x-intercept: (____ , 0)



6) $2x + y = 8$

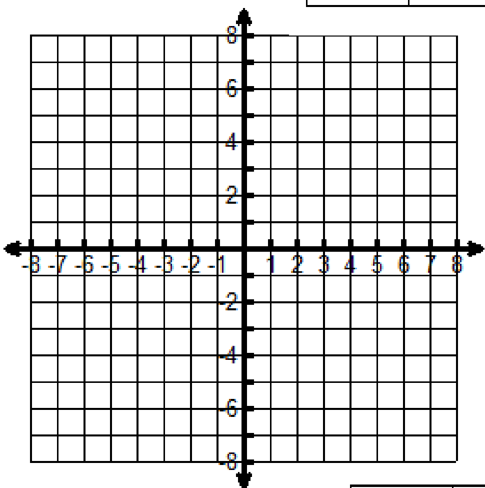
x	y
0	
	0



Homework is continued

7) $2x - 7y = 14$

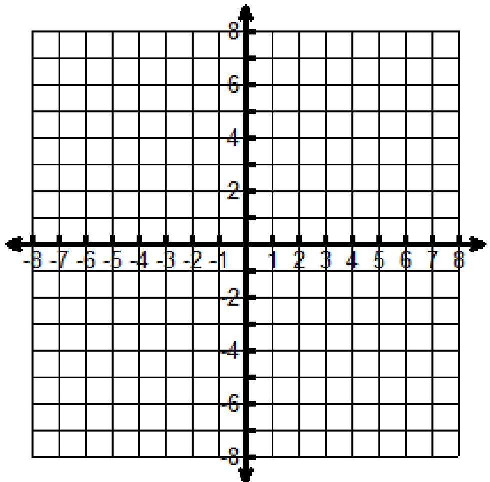
x	y
0	
	0



8) $-10x - 4y = 20$

y-intercept: (0 , ____)

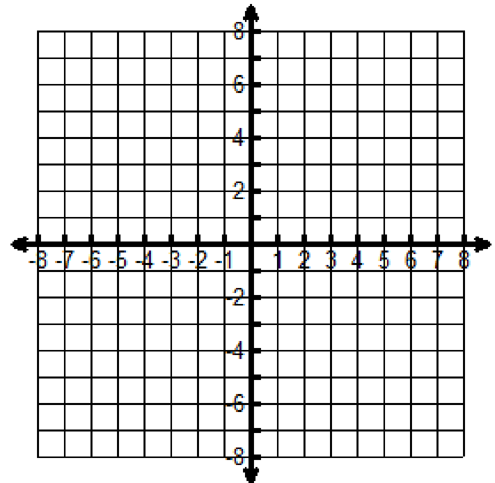
x-intercept: (____ , 0)



9) $-2x + 8y = -8$

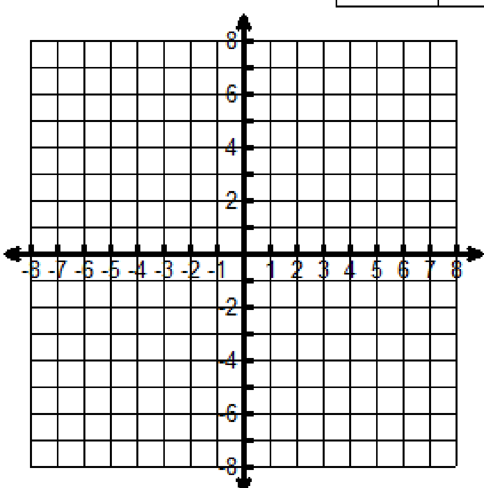
y-intercept: (0 , ____)

x-intercept: (____ , 0)



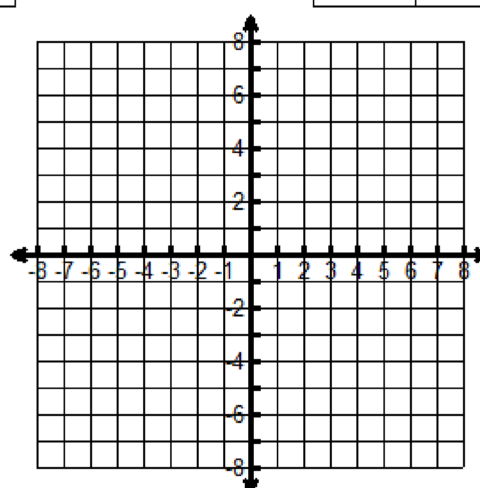
10) $6x - 9y = -18$

x	y
0	
	0



11) $12x + 8y = 24$

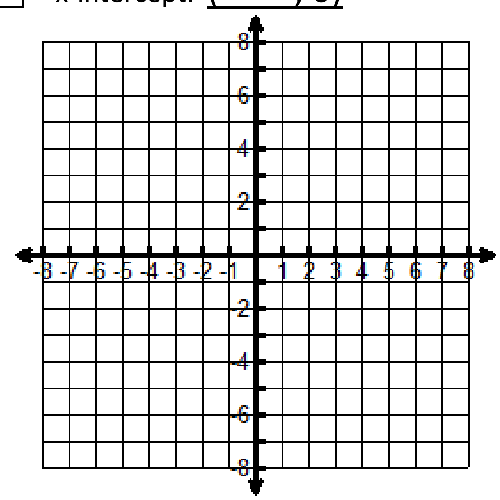
x	y
0	
	0



12) $-2x + y = -6$

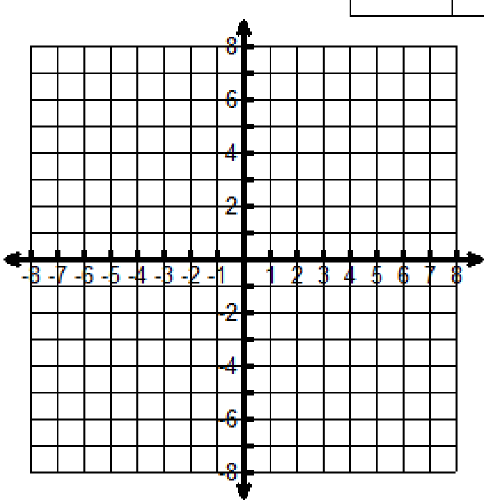
y-intercept: (0 , ____)

x-intercept: (____ , 0)



13) $-6x - 3y = 12$

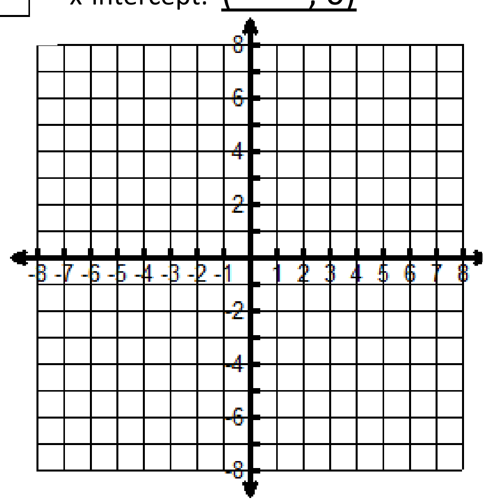
x	y
0	
	0



14) $9x + 6y = -36$

y-intercept: (0 , ____)

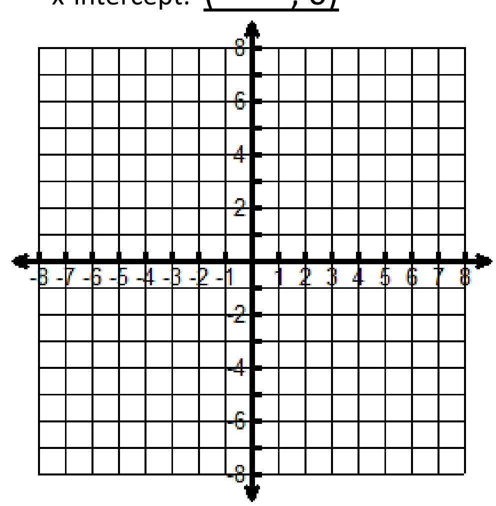
x-intercept: (____ , 0)



15) $2x + 8y = -16$

y-intercept: (0 , ____)

x-intercept: (____ , 0)



I can graph a system of lines to find the solution.

Graphing Systems of Lines

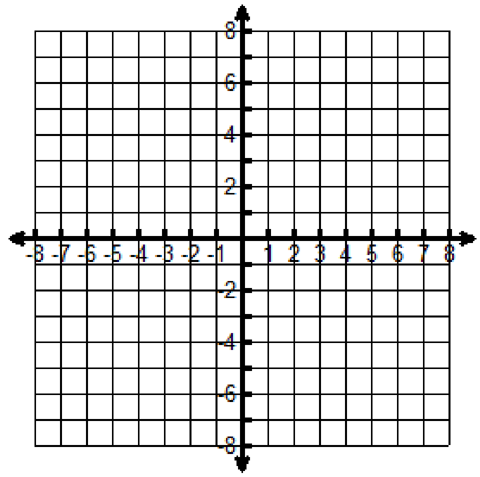
A system of linear equations contains two or more equations e.g. . $x - 2y = -4$ and $y = x - 2$. The solution of such a system is the ordered pair that is a solution to both equations. To solve a system of linear equations graphically we graph both equations in the same coordinate system. The solution to the system will be in the point where the two lines intersect.

Graph the two lines on the same coordinate grid.

. $x - 2y = -4$ and $y = x - 2$

x	y
0	
	0

b: ____ m: _____



Where the two lines intersect is your solution to the system which means the point works in both equations.

Solution: _____________

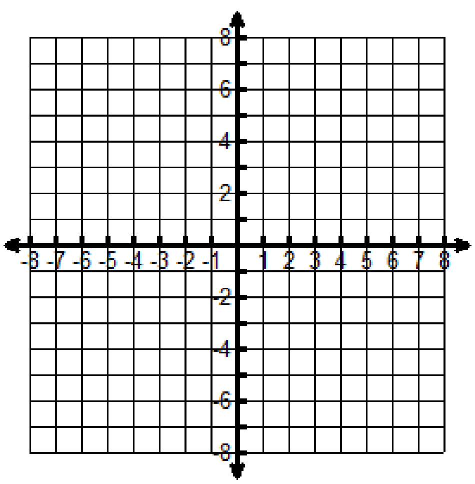
Show how the point satisfies both equations.

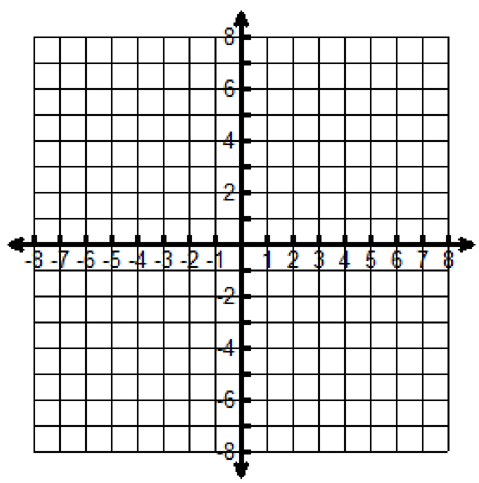
$x - 2y = -4$ and $y = x - 2$

Graph the following systems of equations to find their solution.

1) $\begin{cases} 2x + y = 2 \\ y = x - 4 \end{cases}$

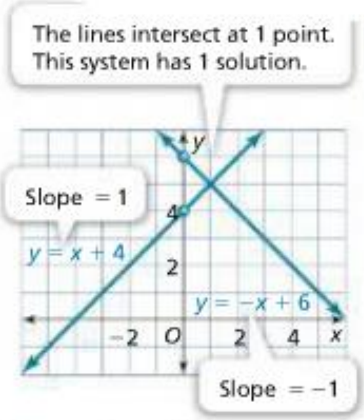
2) $\begin{cases} y = -x + 3 \\ 2x - y = 6 \end{cases}$





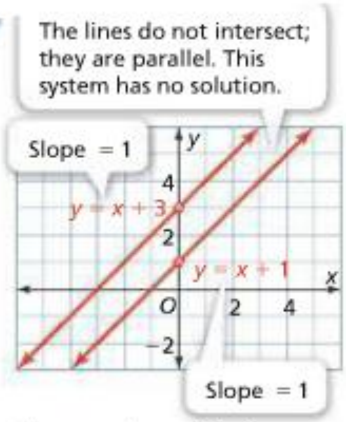
Solution: ____________

Solution: ____________



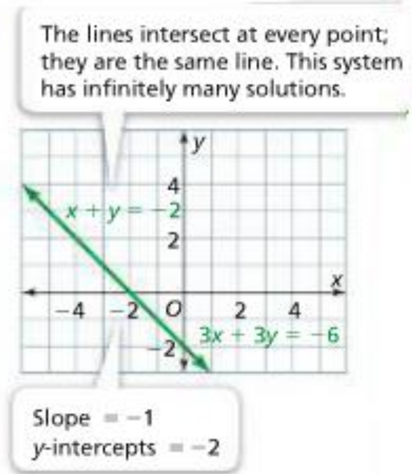
The equations of the linear system
$y = x + 4$
$y = -x + 6$
have different slopes.

The system has *1 solution* (1, 5).



The equations of the linear system
$y = x + 3$
$y = x + 1$
have the same slopes and different *y*-intercepts.

The system has *no solution.*

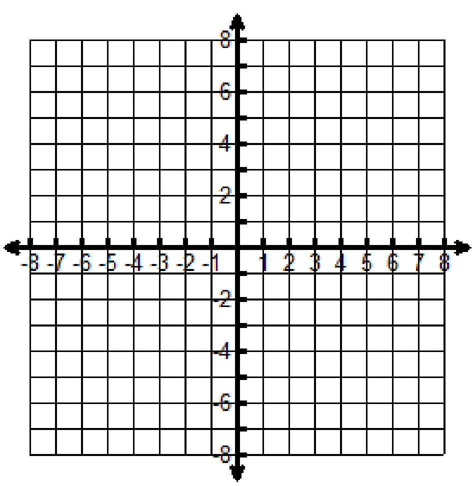


The equations of the linear system
$x + y = -2$
$3x + 3y = -6$
have the same slopes and the same *y*-intercepts. They represent the same line.

The system has *infinitely many solutions.*

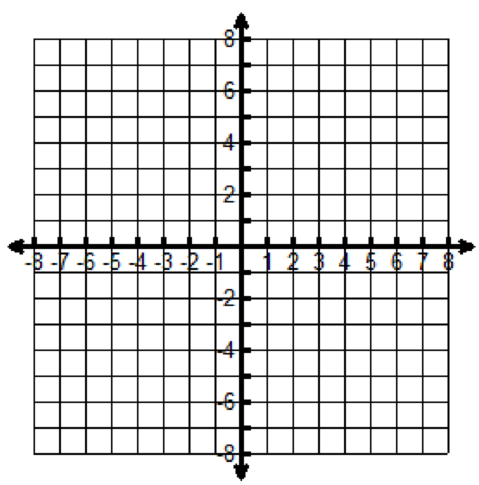
Graph the following systems of equations to find their solution.

3) $\begin{cases} 3x - y = -6 \\ y = 3x + 1 \end{cases}$



Solution: ___________

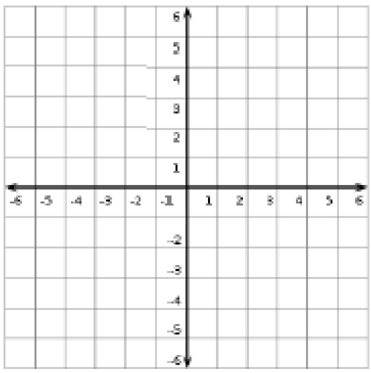
4) $\begin{cases} y = -\frac{2}{3}x + 4 \\ 2x + 3y = 12 \end{cases}$



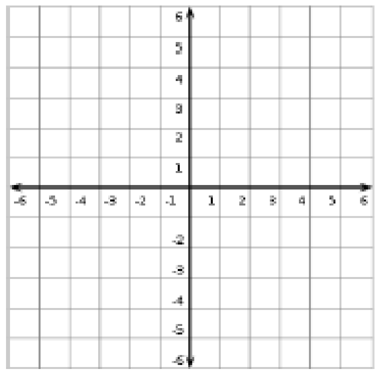
Solution: ___________

Solve each system of equations by graphing.

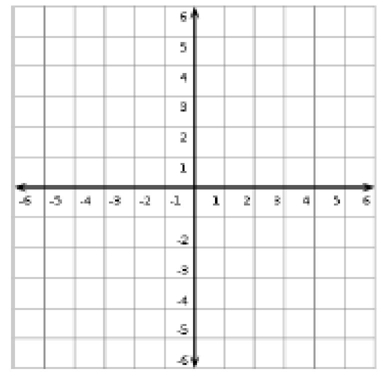
1. $x + y = 5$
   $x - y = 1$



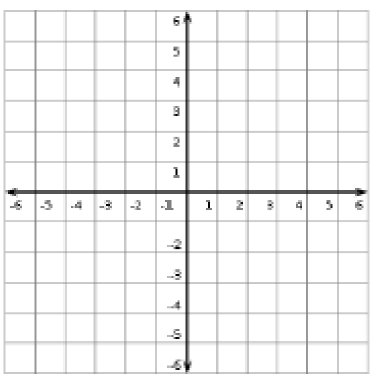
2. $4x - 2y = -8$
   $y = 2x + 4$



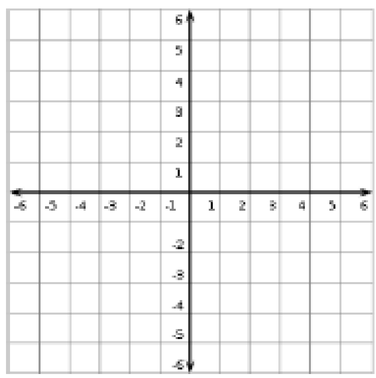
3. $y = -3x + 2$
   $y = 2x - 3$



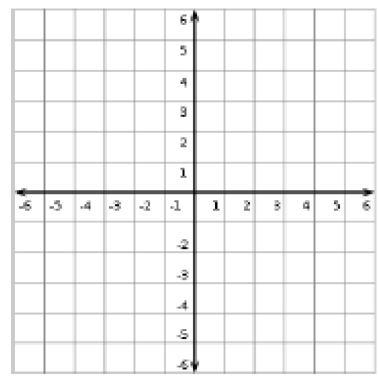
4. $y = -\frac{3}{2}x + 1$
   $y = \frac{1}{2}x - 3$



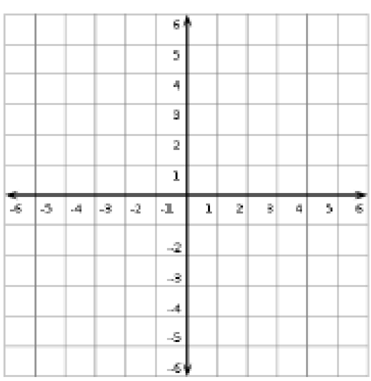
5. $4x - 6y = 12$
   $2x + 2y = 6$



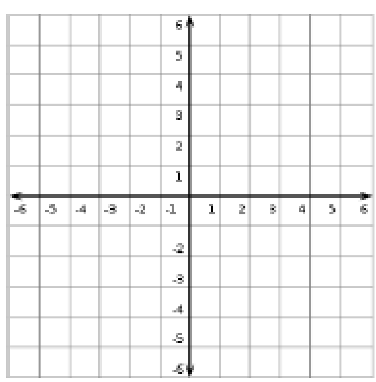
6. $y = 3$
   $x - y = -4$



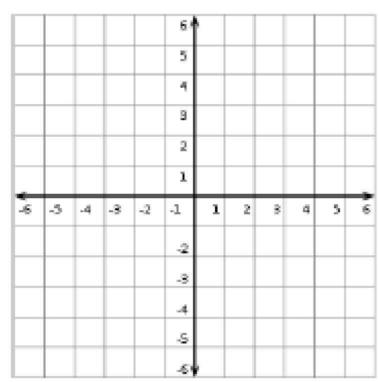
7. $y = \frac{1}{3}x + 2$
   $y = -x - 2$



8. $4x + 6y = -12$
   $2x + 3y = 6$



9. $y = -\frac{1}{2}x + 4$
   $y = \frac{3}{2}x$



I can write and evaluate an equation in slope-intercept form given a real life situation.

Equations of Lines (slope-intercept form)

When you have a real world (word problem) that requires you to write an equation in slope intercept form, there are two things that you want to look for:

1. **A Rate.** The rate is your slope in the problem. The following are examples of a rate
   - $3 per day
   - $2 an hour
   - 60 mph
   - 2 m/s
   - $6 a minute
   - 45 words per minute

   This number is always related to the x-value.

   Per is a key word that is often associated with slope.

2. **A Flat Fee.** A flat fee or starting value is your y-intercept. This value is a constant. It never changes.

Use the chart below to help you organize your information as you analyze each word problem. This will help you to write your equation!

Flat Fee (starting #)	b (y-intercept)	__?___
Rate	m (slope)	__?___

Take a look at the examples below to better clarify how this chart can help you!

Example 1

You are visiting Baltimore MD, and a taxi company charges a flat fee of $3.00 for using the taxi and an additional $0.75 per mile. Write an equation that you could use to find the cost of a taxi ride in Baltimore, MD. Let ____ represent the number of miles and ____ represent the total cost.

- How much would a taxi ride for 8 miles cost?

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

_______ = ____(______) + ____

- The equation could be used to find the cost of a taxi ride in Baltimore, MD is ________________
- To find out the cost for an 8 mile ride, substitute 8 for x.

_______ = _____ (_____) + _______

A taxi ride would cost _________ for 8 miles.

Example 2

A plumber charges a fee of $120 to make a house call. He also charges $10.00 an hour for labor. Write an equation that you could use to find the amount a plumber charges for a house call based on the number of hours of labor. Let ______ represent the number of hours of labor and ______ represent the total cost.

- How much would a house call cost that requires 2.5 hours of labor?

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

_______ = ____ (______) + ____

- The equation could be used to find the amount a plumber charges is

____

- To find out the cost for the 2.5 hours, substitute 2.5 for x.

_______= _____ (_____) + ______

A plumber would cost ________ for 2.5 hours.

Your Turn…

1. Hannah's electricity company charges her $0.10 per kWh (kilowatt-hour) of electricity, plus a basic connection charge of $15.00 each month. Write a linear function that models her monthly electricity bill as a function of electricity usage. Let ____ represent the cost and ____ represent the amount of electricity.
   - How much would her bill be if she used 500kWh of electricity?

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

____ = ____(_____) + ____

- The equation could be used to find the charge on her electric bill is ________________
- To find out the cost for the electricity, substitute 500 for x.

____ = ____(_____) + ____

A bill would be ________ for 500kWh.

Homework is continued ⇨

2. Joe is throwing a party. The clubhouse charges $500 to rent the space and $25 per person. Write a linear function that models the total bill as a function of the number of guests. Let ____ represent the cost and ____ represent the number of people attending.

- How much would the bill be if there were 40 attendees?

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

____ = ____(_____) + ____

- The equation could be used to find the charge on Joe's party bill is _______________
- To find out the cost for the clubhouse, substitute 40 for x.

____ = ____(_____) + ____

A bill would be ________ for 40 people

3. Savannah is driving on a trip. She is going an average speed of 70mph. She has already gone 100 miles today. Write a linear function that models the total distance as a function of the number of hours left to travel. Let ____ represent the distance and ____ represent the number of hours.

- How many miles would she have travelled in 6 more hours.

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

_____ = _____(_____) + _____

- The equation could be used to find the distance travelled is _______________
- To find out the distance travelled in 6 more hours, substitute 6 for x.

______ = _____ (_____) + ______

The distance would be ________ for 6 hours.

4. Jordan is buying a new TV. She can make a down payment of $100, and then will pay $60 per month. Write a linear function that models the total amount paid as a function of the number of months. Let _____ represent the amount paid and ____represent the number of months.

- How much money will Jordan have paid in 12 months?

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

____ = ____(_____) + ____

- The equation could be used to find the total paid is _______________
- To find out the total paid in 12 months, substitute 12 for x.

______ = _____ (_____) + ______

The total paid would be ________ for 12 months.

Homework is continued ⇨

5. Kallie is conditioning for try-outs. She has already run 10 miles. She will run 2 miles per day. Write a linear function that models the total she has run as a function of the number of days. Let ____ represent the total number of miles and ____ represent the number of days.

- How many miles will Kallie have run in 20 days?

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

____ = ____(_____) + ____

- The equation could be used to find the total number of miles is _______________
- To find out the total number of miles, substitute 20 for x.

_____ = _____ (_____) + ______

The total run would be ________ in 20 days.

6. Bethany is renting a cabin in Tennessee. They charge a $200 cleaning fee and $100 per night. Write a linear function that models the total amount charged as a function of the number of nights of the vacation. Let ____represent the total charged and ____ represent the number of nights.

- How much would be charged for a 4 night stay?

Flat Fee (starting #)	b (y-intercept)	
Rate	m (slope)	

y= m x + b

____ = ____(_____) + ____

- The equation could be used to find the total amount charged is _______________
- To find out the total amount charged, substitute 4 for x.

_____ = _____ (_____) + ______

The total bill would be ________ for 4 nights.

Homework is continued ⇨

Review.

Simplify the following expressions. Show work without a calculator.

1) $2+5(-12)$ 2) $-10+2(5-9)$ 3) $4+5*4^2$ 4) $10 \div 5 * 2$

Evaluate the following expressions if x = 4, y = –2, and z = 10. Show work.

5) $2x-z$ 6) $-3yz+2x$ 7) $\frac{z+y}{x}$ 8) $z-\frac{xz}{y}$

Solve each of the following. Show work.

9) $-5+\frac{x}{7}=-8$ 10) $\frac{2}{5}x+8=-10$ 11) $\frac{x+3}{4}=5$

12) $3(x-7)=-12$ 13) $3x+5x=56$ 14) $-5+6x=-30$

15) $-8+\frac{x}{3}=-6$ 16) $6-(x+2)=12$ 17) $\frac{x-6}{4}=-9$

I can create a math model for a real life situation using system of equations in slope intercept form and a graph.

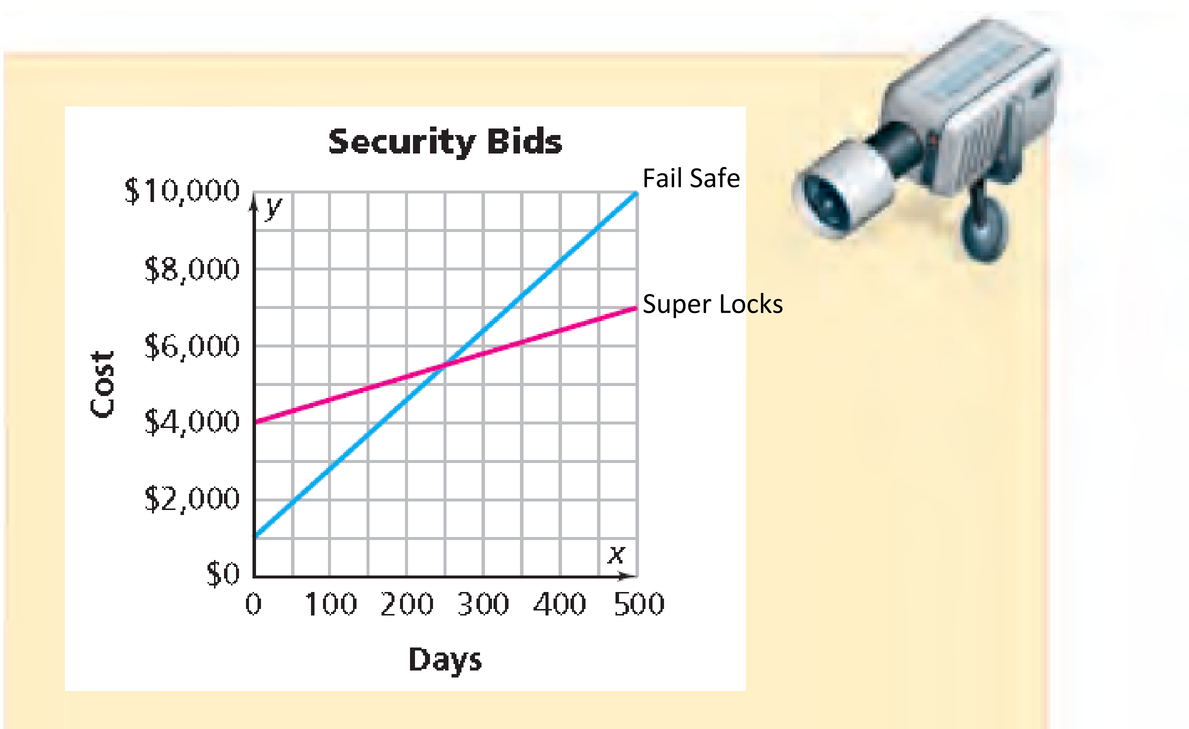
Graphs of Linear Systems (slope-intercept form; $y = mx + b$)

Suppose the managers of a shopping center want to upgrade their security system. Two providers bid for the job.

- Super Locks will charge \$3,975 to install the equipment and then \$6.00 per day to monitor the system and respond to alerts.
- Fail Safe will charge \$995 to install the equipment and then \$17.95 per day to monitor the system and respond to alerts.

Both companies are reliable and capable, so the choice comes down to cost.

The cost of the security services from Super Locks and Fail Safe depends on the number of days the company provides service. The graph below shows the bids for both companies.



A. Use the graphs to estimate the answers to these questions.

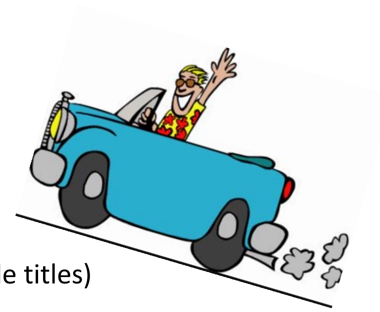
1. For what number of days will the costs for the two companies be the same?____ What is the cost? ____
2. For what number of days will Super Locks cost less than Fail Safe? _______
3. For what number of days will Superlocks cost more than Fail Safe? _______
4. For what number of days will Super Locks cost less than $6000? ______
5. What is the cost of one year of service from Fail Safe? _________

B. For each company, write an equation for the cost, *c*, for *d* days of security services.

Super Locks: ___________________ Fail Safe: ______________________

Sometimes it is easier to graph equations of lines using two points. The following problem asks you to fill in the first and last values for x and find the y-values.

Sam needs to rent a car for a one-week trip in Oregon. He is considering two companies. A+ Auto Rental charges $160 plus $0.10 per mile. Zippy Auto Rental charges $80 plus $0.20 per mile.



Define your variables: rental cost: ____ Miles driven: ____

Equation for A+ Auto Rental: ______________________________

Equation for Zippy Auto Rental: _____________________________

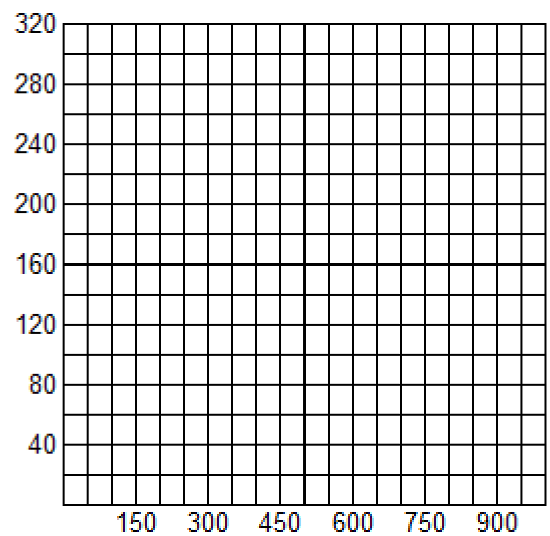
b. Complete the missing values in the table and then graph the equations. (include titles)

A+ Auto Rental

Miles	Cost
0	
1000	

Zippy Auto Rental

Miles	Cost
0	
1000	



1) Approximate the point of intersection: _______
2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more miles are travelled and what it means if fewer miles are traveled.)

____

____

____

Example 1:

Taxi Company A

You are visiting Baltimore MD, and Taxi Company A charges a flat fee of $3.00 for using the taxi and an additional $0.75 per mile. Write an equation that you could use to find the cost of a taxi ride in Baltimore, MD.

_____ = the # of miles _____ = the cost.

Equation:

x	y
0	
8	

Taxi Company B

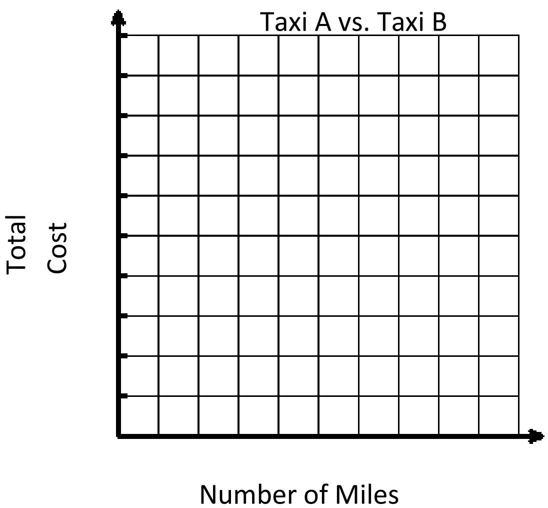
You are visiting Baltimore MD, and Taxi Company B charges a flat fee of $5 for using the taxi and an additional $0.50 per mile. Write an equation that you could use to find the cost of a taxi ride in Baltimore, MD.

_____ = the # of miles and _____ = the cost.

Equation:

x	y
0	
10	

Graph both equations on the following grid. Use an interval of 1 on both axes.



1) Name the point of intersection: ________
2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more miles are travelled and what it means if less miles are traveled.)

____

____

____

____

Example 2:

Brady the Plumber

Brady, a plumber, charges a fee of $120 to make a house call. He also charges $10.00 an hour for labor. Write an equation that you could use to find the amount Brady charges for a house call based on the number of hours of labor.

_______ = # of hours _______ = the cost.

Equation:

x	y
0	
4	

Valeria the Plumber

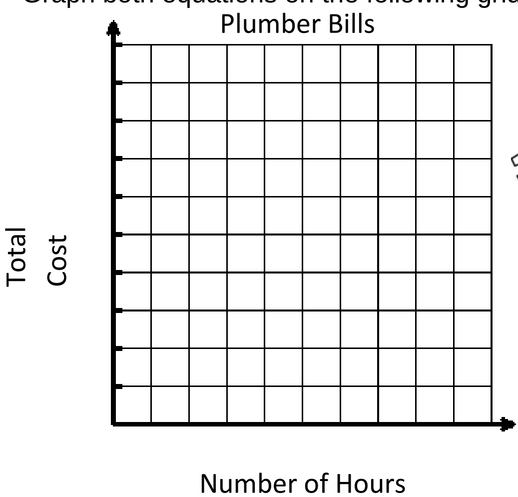
Valeria, a plumber, charges a fee of $100 to make a house call. She also charges $15.00 an hour for labor. Write a equation that you could use to find the amount Valeria charges for a house call based on the number of hours of labor.

_______ = # of hours _______ = the cost.

Equation:

x	y
0	
5	

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 20 on the y-axis.



1) Name the point of intersection: ________
2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more hours are needed and what it means if fewer hours are needed.)

____

____

____

On your own; #1

Hannah's Electricity

Hannah's electricity company charges her $0.10 per kWh (kilowatt-hour) of electricity, plus a basic connection charge of $15.00 per month. Write a linear function that models her monthly electricity bill as a function of electricity usage.

_____= the cost and _____ = kWh of electricity.

Equation: ______________________

x	y
0	
200	

Kerry's Electricity

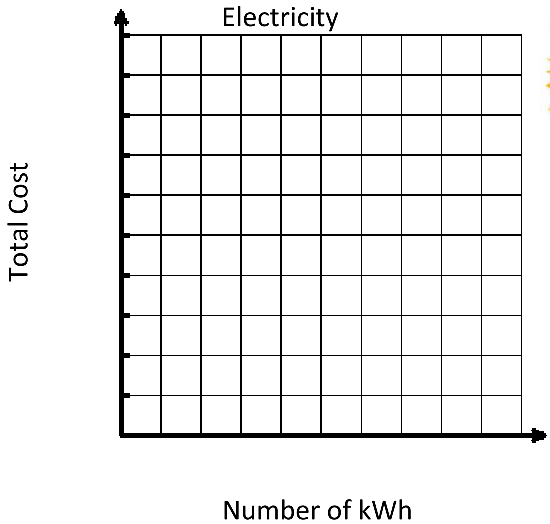
Kerry's electricity company charges her $0.15 per kWh (kilowatt-hour) of electricity, plus a basic connection charge of $10.00 per month. Write a linear function that models her monthly electricity bill as a function of electricity usage.

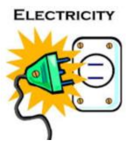
_____= the cost and _____ = kWh of electricity.

Equation: ______________________

x	y
0	
200	

Graph both equations on the following grid. Use an interval of 20 on the x-axis and 5 on the y-axis.





1) Name the point of intersection: ________

2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more kWh are needed and what it means if fewer kWh are needed.)

____

____

____

____

On your own; #2

Joe's Party

Joe is throwing a party. The clubhouse charges $500 to rent the space and $25 per person.

______ = cost and _____ = # of people

Equation: ______________________

x	y
0	
20	

Jack's Party

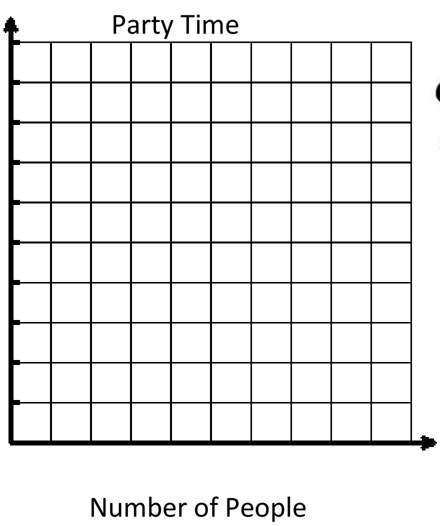
Jack is throwing a party. The clubhouse charges $600 to rent the space and $15 per person.

______ = cost and _____ = # of people

Equation: ______________________

x	y
0	
20	

Graph both equations on the following grid. Use an interval of 2 on the x-axis and 100 on the y-axis.



1) Name the point of intersection: ________

2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more people attend and what it means if fewer people attend.)

____

____

____

____

Homework is continued ⇨

On your own; #3

Savannah's Trip

Savannah is driving on a trip. She is going an average speed of 70mph. She has already gone 100 miles today.

______ = distance and _____ = # hours

Equation:

x	y
0	
10	

Amy''s Trip

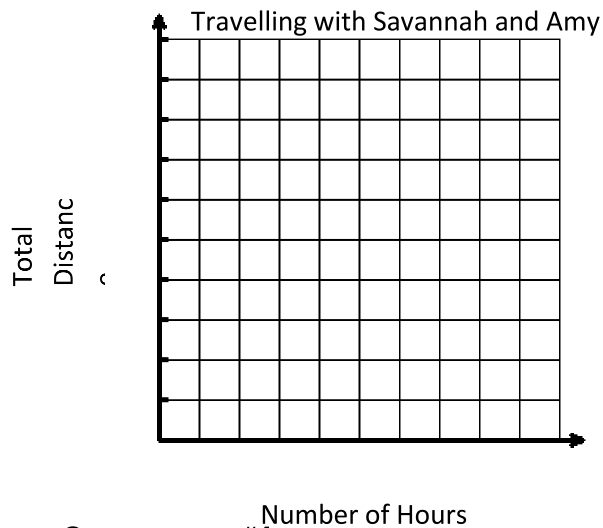
Amy is driving on a trip. She is going an average speed of 50mph. She has already gone 200 miles today.

______ = distance and _____ = # hours

Equation:

x	y
0	
10	

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 100 on the y-axis.



1) Name the point of intersection: ________

2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more hours are travelled and what it means if fewer hours are travelled.)

____

____

____

____

On your own; #4

Jordan's TV

Jordan is buying a new TV. She can make a down payment of $100, and then will pay $60 per month.

______ = $ paid _____ = # of months

Equation:

x	y
0	
10	

Perla's TV

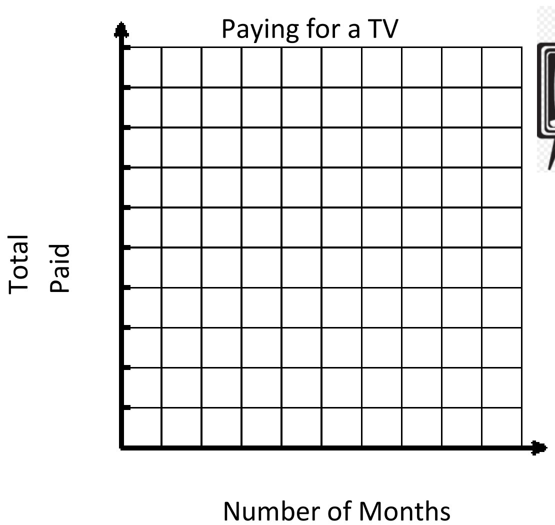
Perla is buying a new TV. She can make a down payment of $200, and then will pay $40 per month.

______ = $ paid _____ = # of months

Equation:

x	y
0	
10	

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 100 on the y-axis.



1) Name the point of intersection: ________

2) What does the point of intersection mean to the situation? (Include what each value means, what it means if they pay more months and what it means if they pay fewer months.)

____

____

____

____

I can write a system of equations in standard form given a real life situation.

Equations of Lines (standard form, $Ax + By = C$)

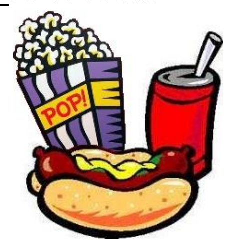
We've studied word problems that allow for you to write an equation in slope intercept form. How do we know when a problem should be solved using an equation written in standard form?

In standard form, there *appears* to be 2 rates! These two numbers are the number per x and the number per y. Each of these is multiplied to x and y, respectively. There is no beginning amount, nor are there points given. However, there may be a TOTAL involved. In this case, the equation can be written in $Ax + By = C$ form with C being the total amount. *Neither variable is dependent on the other in this case!*

As you are reading and analyzing the word problem, if you find that you can set up two addition problems, and you have two set totals (constant)…one tells you the value and the other the total number, then you will be able to write equations in standard form.

Example 1: You are running a concession stand at the basketball game. You sell hotdogs for $1 and sodas for $2.

Let your variables be the number of each of the items. ________: # of hotdogs ________: # of sodas



You sold a total of 120 items. At the end of the night, you made $200.

Write an equation for the number of items you sold: ______________________________

Write an equation for the value of the items you sold: ____________________________

Example 2: Beaumont is sponsoring a pancake dinner to raise money for a field trip. Each adult ticket will cost $20 and each child's ticket will cost $10.

Let your variables be the number of each type of ticket. ________: # of adults ________: # of children

You estimate a total of 70 tickets to be sold. At the end of the night, you made $900.

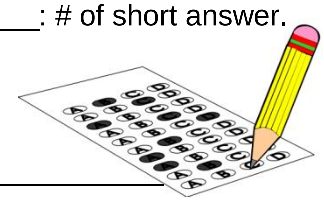
Write an equation for the number of tickets you sold: ______________________________

Write an equation for the value of the tickets you sold: ____________________________

Your turn.

1) A test has *multiple choice* questions worth 2 points apiece and *short answer* questions worth 4 points apiece.

Let your variables be the # of each type of question. ______: # of multiple choice; ______: # of short answer.



There are a total of 30 questions. The test is worth a total of 100 points.

Write an equation for the number of questions that may be on the test: ________________________

Write an equation for the value of the test questions: ____________________________

Homework is continued

2) Justin has saved five dollar bills and singles.

Let your variables be the # of each type of bills. ______: # of $5 bills; ______: # of $1.

Justin has a total of 35 bills. His savings are worth a total of $75.

Write an equation for the number of bills Justice has. ______________________

Write an equation for the value of the bills: ___________________________

3) Claire bought sandwiches and drinks at the ballgame. The sandwiches cost $4 each and the drinks were $2 each.

Let your variables be the number of each type of item. ____: # of sandwiches; _____: # of drinks

Claire bought 9 items for a total of $28.

Write an equation for the number of items Claire bought: __________________________

Write an equation for the value of the items: __________________________

4) The store at which Michael usually shops is having a sale. Roast beef costs $4 a pound and shrimp costs $10 a pound. He bought 16 pounds of meat for a total cost of $100.

Let your variables be the #r of pounds of each type of meat: ____: # of Lbs of roast beef; ____: # Lbs of shrimp

Write an equation for the number of pounds that Michael bought: __________________

Write an equation for the value of the meat: __________________________

5) It will take 20 points to make the playoffs, the hockey team coach told the players. "We get 2 points for a win and 1 point for a tie." The team has 12 games left in the season.

Let your variables be the # of each type of outcome: _______: # of wins; _______: # of ties

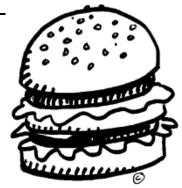
Write a system of equations: ______________________________

____

Homework is continued ⇨

6) You are in charge of buying the hamburger and chicken for a party. You have $60 to spend. The hamburger costs $2 per pound and chicken is $3 per pound.   You bought 25 pounds of meat.

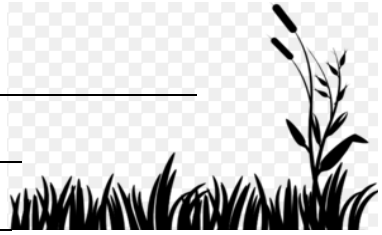
Define your variables: ______________________________ and ______________________________



Write a system of equations: ____

____

7) You are buying $48 worth of lawn seed that consists of two types of seed. One type is a quick-growing rye grass that costs $4 per pound, and the other type is a higher-quality seed that costs $6 per pound.   You need a total of 11 pounds of seed.



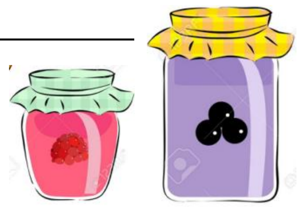
Define your variables: ______________________________ and ______________________________

Write a system of equations: ____

____

8) Your grandmother made 240 oz. of jelly. You have two types of jars. The smaller holds 10 oz. And the larger holds 12 oz. Your grandmother wants to fix 22 jars.

Define your variables: ______________________________ and ______________________________



Write a system of equations: ____

____

9) You are buying $30 worth of birdseed that consists of two types of seed. Thistle seed attracts finches and costs $2 per pound. Dark oil sunflower seed attracts many kinds of sunbirds and costs $1.50 per pound You are buying 18 pounds of birdseed.

Define your variables: ______________________________ and ______________________________

Write a system of equations: ____

____

I can create a math model for a real life situation using system of equations in standard form and a graph.

<u>Graphs of Linear Systems</u> (Standard Form: $Ax + By = C$)

1. At a school band concert, Christopher and Celine sell memberships for the band's booster club. An adult membership costs $10, and a student membership costs $5.

At the end of the evening, the students had sold 50 memberships for a total of $400. The club president wants to know how many of the new members are adults and how many are students.

A. Let x stand for the number of $10 adult memberships and y for the number of $5 student memberships.

1. What equation relates x and y to the $400 income? ___________________________________

2. Give two solutions for your equation from part (1). _______________and ________________

3. What equation relates x and y to the total of 50 new members? ______________________________

Are the solutions you found in part (2) also solutions of this equation? _______________

B. 1. Graph the two equations from Question A on the grid.

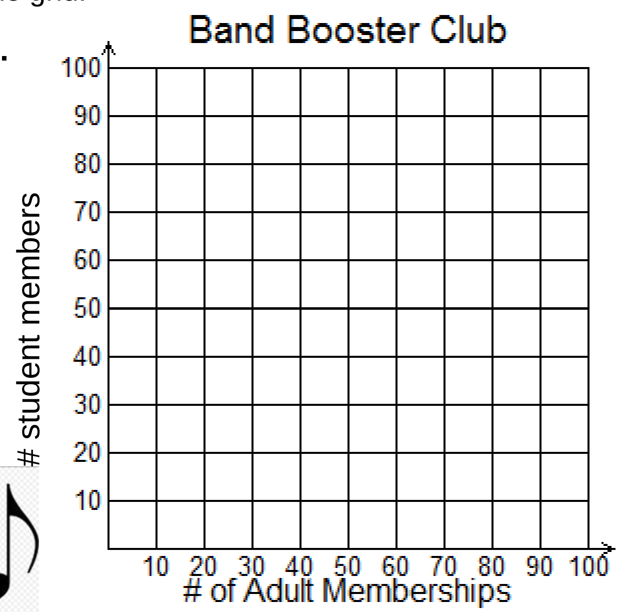
These charts will help you find the x and y intercepts.

Income Equation: ______________________

# of Adults	# of Students
0	
	0

# of Members Equation: __________________

# of Adults	# of Students
0	
	0



2. Estimate the coordinates of the point where the graphs intersect. ___________ Explain what the coordinates tell you about the situation. (Include both values and what it means to both equations.)

____

____

In Question A, you wrote a system of equations. One equation represents all (x, y) pairs that give you a total income of $400, and the other represents all (x, y) pairs that give you a total of 50 memberships. The coordinates of the intersection point satisfy both equations, or conditions. These coordinates are the solution to the system.

2. For a fundraiser, students sell calendars and posters. Each calendar will profit them $3 and each poster will profit them $2. Their goal is to earn $600. 250 items have been donated by a generous corporation.

p = #of posters

c = # of calendars

a. Write an equation to represent earning the $600.____________________________________

b. Write an equation to represent the donation of 250 items. ______________________________

c. Graph both equations on the same coordinate grid. (c, p) Use an interval of 25 on the x-axis and 50 on the y-axis.

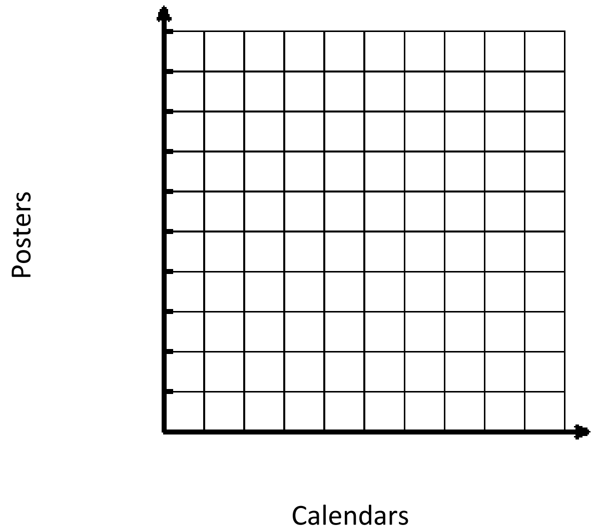
These charts will help you find the x and y intercepts.

Value Equation: ______________________

x	y
0	
	0

# of Items Equation: _________________

x	y
0	
	0



d. State the coordinates of intersection. Explain what these coordinates tell you about the situation. (Include both values and what it means to both conditions.)

____

____

3. Neema has a collection of quarters and dimes. She has a goal of $10. Suppose she collects 70 coins.

q = #of quarters

d = # of dimes

a. Write an equation that relates q and d to her goal of $10. _____________________

b. Write an equation that relates q and d to the 70 coins that she collected. _______________________

c. Graph both equations on the same grid. (q, d) Use an interval of 10 on both axes.

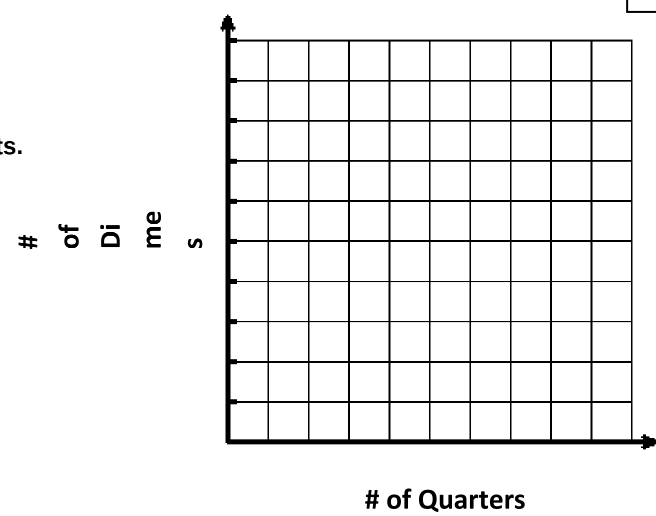
These charts will help you find the x and y intercepts.

Value Equation: ______________________

x	y
0	
	0

# of Items Equation: _________________

x	y
0	
	0



d. State the coordinates of intersection. Explain what these coordinates tell you about the situation. (Include both values and what it means to both conditions.)

____

____

Homework is continued

4. Student's in Eric's gym class must cover a distance of 1,600 meters by running or walking. Most students run part of the way and walk part of the way. Eric can run at an average speed of 200 meters per minute and walk an average of 80 meters per minute. He will spend a total of 14 minutes exercising. (time spent running = x, time spent walking = y)

a. Write an equation that relates the time Eric spends running and walking to his goal of covering 1,600 meters.

____

b. Write an equation that relates x and y to Eric's total time. ____________________________________

c. Graph both equations on the same grid.
Use an interval of 2 on the x-axis and 2 on the y axis.

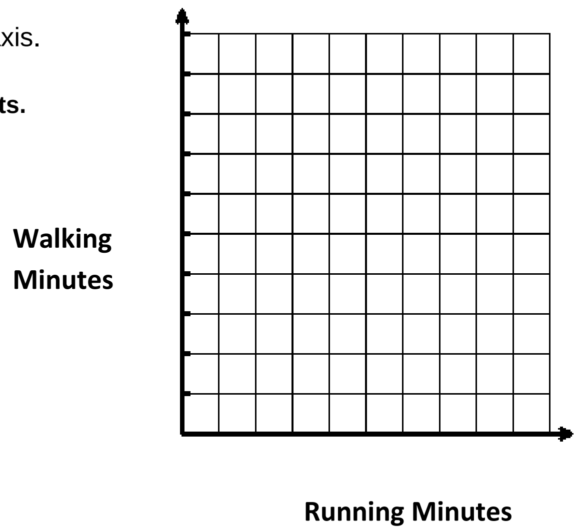
These charts will help you find the x and y intercepts.

Distance Equation: ______________________

x	y
0	
	0

Time Equation: __________________

x	y
0	
	0



d. State the coordinates of intersection. Explain what these coordinates tell you about the situation. (Include both values and what it means to both conditions.)

____

____

Use graphic methods to solve each system. In each case, substitute the solution values into the equations to see if your solution is correct.

1) $x + y = 4$

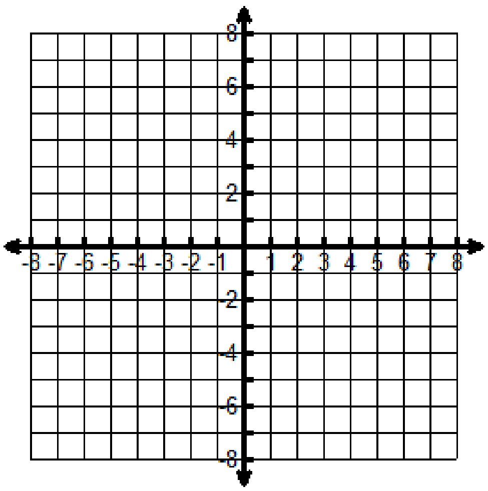
y-intercept: (0 , ____)

x-intercept: (____ , 0)

$x - y = -2$

y-intercept: (0 , ____)

x-intercept: (____ , 0)



Solution: ________

Check Equation 1: $x + y = 4$

Check Equation 2: $x - y = -2$

2) $x - y = 2$

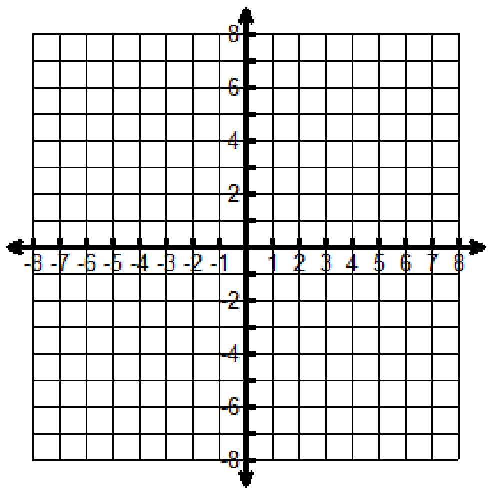
y-intercept: (0 , ____)

x-intercept: (____ , 0)

$x + 3y = 6$

y-intercept: (0 , ____)

x-intercept: (____ , 0)



Solution: ________

Check Equation 1: $x - y = 2$

Check Equation 2: $x + 3y = 6$

3) $-2x + y = -4$

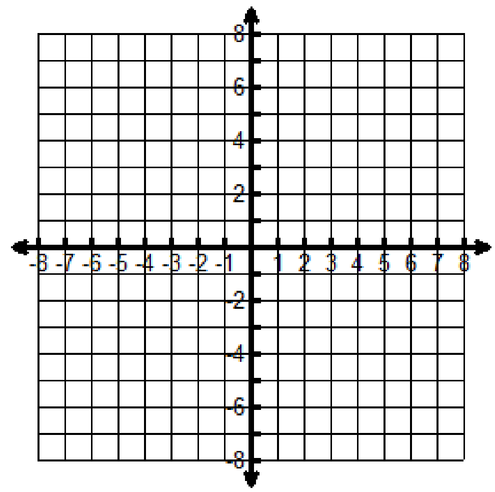
y-intercept: (0 , ____)

x-intercept: (____ , 0)

$2x + y = 8$

y-intercept: (0 , ____)

x-intercept: (____ , 0)



Solution: ________

Check Equation 1: $-2x + y = -4$

Check Equation 2: $2x + y = 8$

Homework is continued ⇨

On your own; #4 (Refer to page 12, #5 for help.)

Kallie's Work-outs

Kallie is conditioning for try-outs. She has already run 10 miles. She will run 2 miles per day.

_____ = distance and ____ = #days

Equation:

x	y
0	
20	

Blake's Work-outs

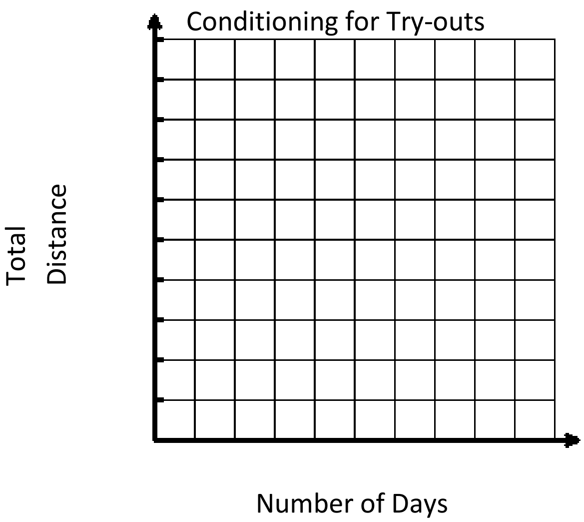
Blake is conditioning for try-outs. He has already run 15 miles. He will run 1.5 miles per day.

_____ = distance and ____ = #days

Equation:

x	y
0	
20	

Graph both equations on the following grid. Use an interval of 2 on the x-axis and 5 on the y-axis.



1) Name the point of intersection: _______

2) What does the point of intersection mean to the situation? (Include what each value means, what it means if they exercise more days and what it means if they exercise fewer days.)

____

____

____

____

On your own; #5 (Refer to page 12, #6 for help.)

Bethany's Cabin

Bethany is renting a cabin in Tennessee. They charge a $200 cleaning fee and $100 per night.

_____ = total cost and ____ = #nights

Equation:

x	y
0	
8	

Mandy's Hotel

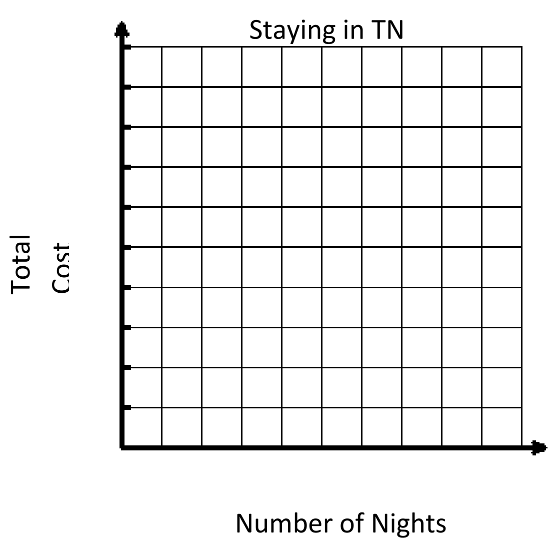
Mandy is renting a hotel room at the Lodge in Tennessee. They don't charge a cleaning fee and $150 per night.

_____ = total cost and ____ = #nights

Equation:

x	y
0	
6	

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 100 on the y-axis.



1) Name the point of intersection: _______

2) What does the point of intersection mean to the situation? (Include what each value means, what it means if they stay more nights and what it means if they stay fewer nights.)

____

____

____

____

____

I can create a math model for a real life situation using system of equations in standard form and a graph.

More Graphs of Linear Systems (Standard Form: $Ax + By = C$)

We are going to revisit some situations where you have already written the equations. You can refer back to your previous assignments to help you.

Example 1: You are running a concession stand at the basketball game. You sell hotdogs for $1 and sodas for $2. You sold a total of 120 items. At the end of the night, you made $200.

Define your variables: ____________ ______________

Write a system of equations: _________________________

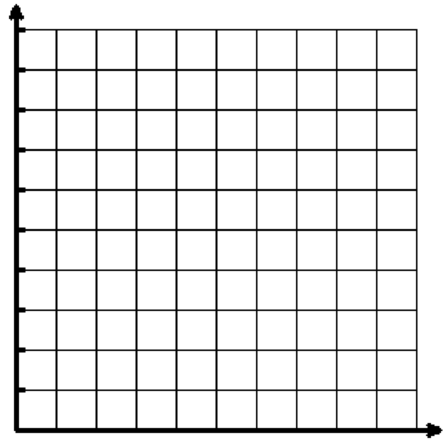
____

Find the x-intercept and y intercept for both equations.

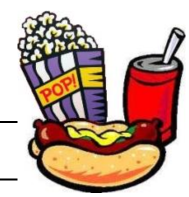
Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(Hotdogs, Sodas) Use an interval of 20 on the x-axis and 20 on the y-axis)



State the coordinates of intersection. Explain what these coordinates tell you about the situation.



____

____

Example 2: Beaumont is sponsoring a pancake dinner to raise money for a field trip. Each adult ticket will cost $20 and each child's ticket will cost $10. You estimate a total of 70tickets to be sold. At the end of the night, you made $900.

Define your variables: ____________ ______________

Write a system of equations: _________________________

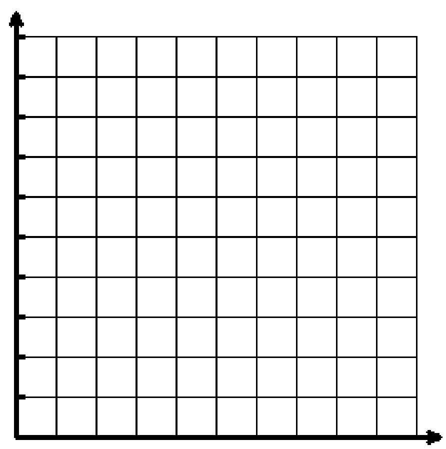
____

Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(Adults, Children) Use an interval of 10 on the x-axis and 10 on the y-axis)



State the coordinates of intersection. Explain what these coordinates tell you about the situation.

____

____

Your turn.

1) **A test has *multiple choice* questions worth 2 points apiece and *short answer* questions worth 4 points apiece. There are a total of 30 questions. The test is worth a total of 100 points.**

Define your variables: ____________ ______________

Write a system of equations: _________________________

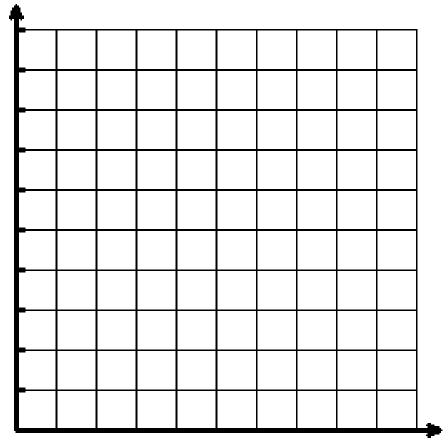
____

Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(MC Questions, SA Questions) Use an interval of 5 on the x-axis and 5 on the y-axis)

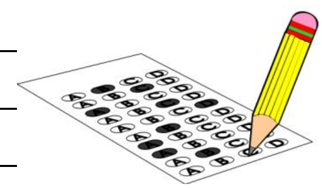


State the coordinates of intersection. Explain what these coordinates tell you about the situation.

____

____

____



2) **Justin has saved five dollar bills and singles. Justin has a total of 35 bills. His savings are worth a total of $75.**

Define your variables: ____________ ______________

Write a system of equations: _________________________

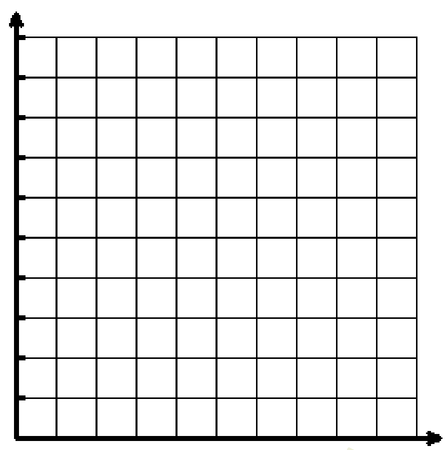
____

Find the x-intercept and y intercept for both equations.

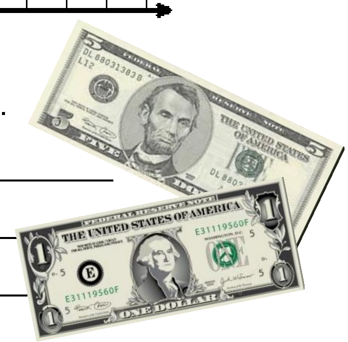
Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(Fives, Singles) Use an interval of 5 on the x-axis and 10 on the y-axis)



State the coordinates of intersection. Explain what these coordinates tell you about the situation.



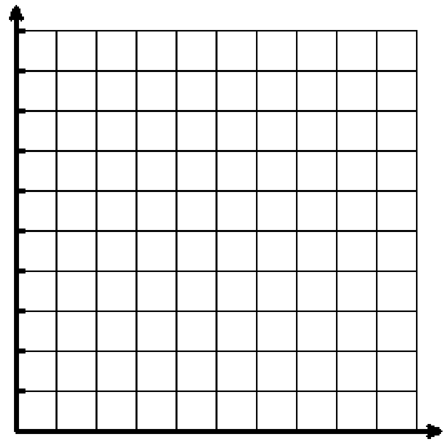
____

____

____

Homework is continued

3) Claire bought sandwiches and drinks at the ballgame. The sandwiches cost $4 each and the drinks were $2 each. Claire bought 9 items for a total of $28.



Define your variables: ____________ ______________

Write a system of equations: _________________________

____

Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

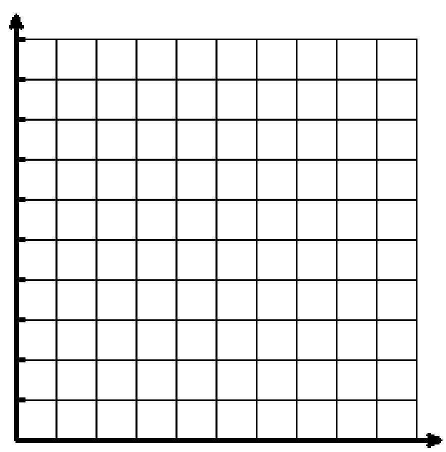
Graph your system on the same coordinate grid. (Sandwiches, Drinks) Use an interval of 1 on the x-axis and 2 on the y-axis)

State the coordinates of intersection. Explain what these coordinates tell you about the situation.

____

____

4) The store at which Michael usually shops is having a sale. Roast beef costs $4 a pound and shrimp costs $10 a pound. He bought 16 pounds of meat for a total cost of $100.



Define your variables: ____________ ______________

Write a system of equations: _________________________

____

Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid. (Roastbeef, shrimp) Use an interval of 2.5 on the x-axis and 2 on the y-axis)

State the coordinates of intersection. Explain what these coordinates tell you about the situation.

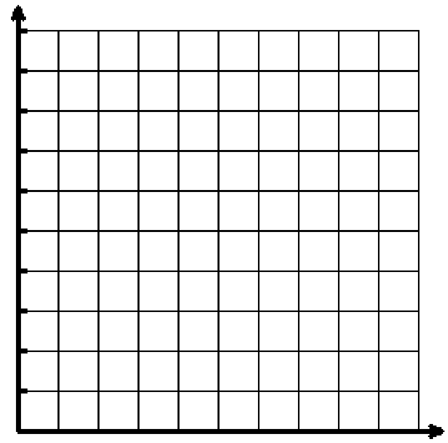
____

____

____

Homework is continued

5) It will take 20 points to make the playoffs, the hockey team coach told the players. "We get 2 points for a win and 1 point for a tie." The team has 12 games left in the season.



Define your variables: ____________ ______________

Write a system of equations: _________________________

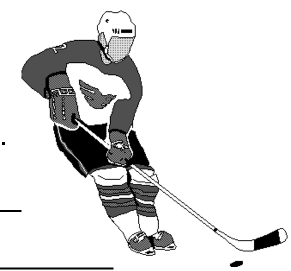
____

Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(Wins, Ties) Use an interval of 2 on the x-axis
and 2 on the y-axis)



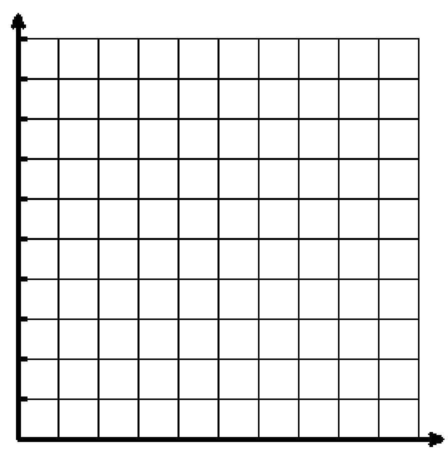
State the coordinates of intersection. Explain what these coordinates tell you about the situation.

____

____

____

6) You are in charge of buying the hamburger and chicken for a party. You have $60 to spend. The hamburger costs $2 per pound and chicken is $3 per pound. You bought 25 pounds of meat.



Define your variables: ____________ ______________

Write a system of equations: _________________________

____

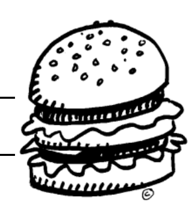
Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(Hamburger, Chicken) Use an interval of 5 on the x-axis
and 5 on the y-axis)

State the coordinates of intersection. Explain what these coordinates tell you about the situation.



____

____

Review Writing Systems of Equations & Solving by Graphing

#1

Heather's Bunny

Heather has a bunny that weighs 5 pounds and gains 3 pounds per year.

______ = weight and _____ = time

Equation:

x	y
0	
3	

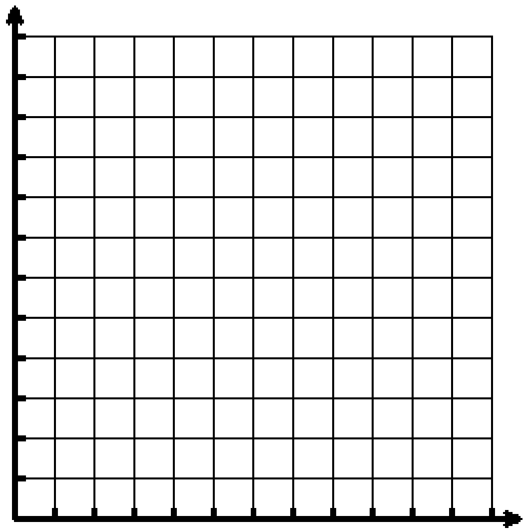
Heather's Cat

Heather has a cat that weighs 15 pounds and gains 1 pound per year.

Equation:

x	y
0	
7	

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 2 on the y-axis.



1) Name the point of intersection: _______

2) What does the point of intersection mean to the situation?

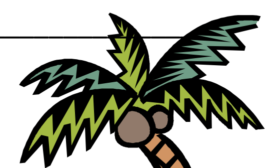
____

____

____

____

____



#2

Fertilizer A

You are testing two fertilizers on palm trees. Palm tree A is 8 cm tall growing at a rate of 6cm/day.

______ = height _____ = # of days

Equation:

x	y
0	
4	

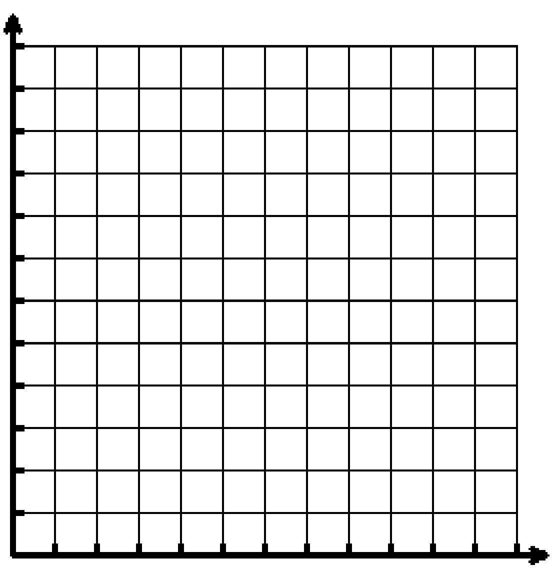
Fertilizer B

You are testing two fertilizers on palm trees. Palm tree B is 20 cm tall growing at a rate of 4cm/day.

Equation:

x	y
0	
4	

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 4 on the y-axis.



1) Name the point of intersection: _______

2) What does the point of intersection mean to the situation?

____

____

____

____

____

Homework is continued

#3

DISH TV

Jonathan is getting Dish TV installed. It costs $200 for the installation and $30 per month for the channels he wants.

______ = cost _____ = # of months

Equation:

x	y
0	
5	

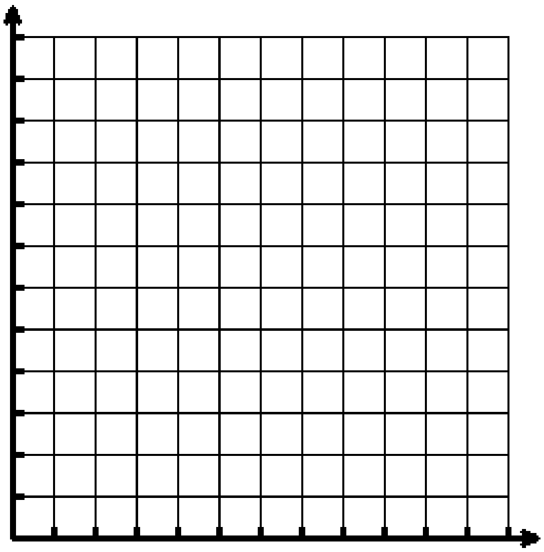
Cable TV

Anthony is getting cable TV. There is no installation fee and he will have to pay $50 per month for the channels he wants.

Equation:

x	y
0	
5	

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 50 on the y-axis.



1) Name the point of intersection: _______

2) What does the point of intersection mean to the situation?

____

____

____

____

____

#4 **A class of 270 students went on a field trip. They took 8 vehicles, some buses and vans. Find the number of buses and the number of vans they took if each bus holds 45 students and each van holds 15students.**

Define your variables: ___________________ _____________________

Write a system of equations: ____________________________

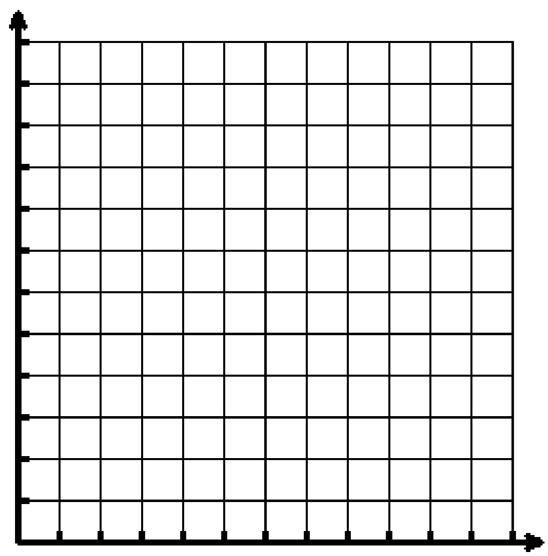
____

Find the x-intercept and y intercept for both equations.

Eq. 1: ___________ and ___________

Eq 2: ___________ and ___________

Graph your system on the same coordinate grid. (Buses, Vans) Use an interval of 1 on the x-axis and 1.5 on the y-axis)



State the coordinates of intersection. Explain what these coordinates tell you about the situation.

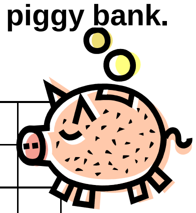
____

____

____

Homework is continued

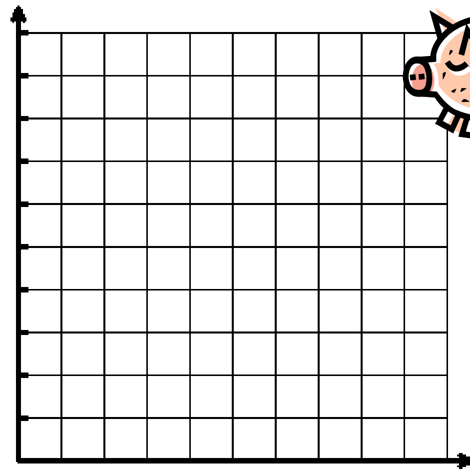
#5 Colin has saved quarters and dimes. Colin has a total of 50 coins. He has $8.00 in his piggy bank.



Define your variables: _________________ ___________________

Write a system of equations: _________________________

____



Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(Quarters, Dimes) Use an interval of 5 on the x-axis
and 10 on the y-axis)

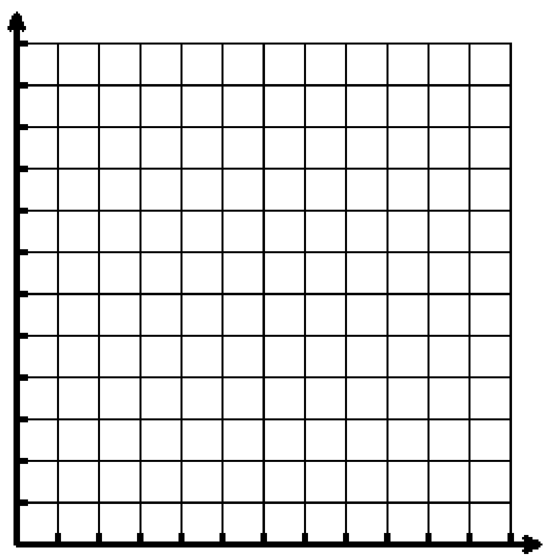
State the coordinates of intersection. Explain what these coordinates tell you about the situation.

____

____

____

#6 **The Lakers scored a total of 96 points in a basketball game against the Bulls. The Lakers made a total of 40 two-point and three-point baskets. How many two-point shots did the Lakers make? How many three-point shots did the Lakers make?**



Define your variables: _________________ ___________________

Write a system of equations: _________________________

____

Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

Graph your system on the same coordinate grid.
(Two-point Shots, Three-Point Shots)
Use an interval of 4 on the x-axis
and 4 on the y-axis)

State the coordinates of intersection. Explain what these coordinates tell you about the situation.

____

____

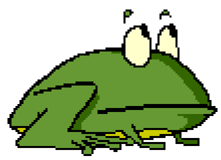
I can solve a system of equations by substitution.

Solving Systems by Substitution

Solve this system of equations using substitution. Check.

$$3y - 2x = 11$$
$$y = 9 - 2x$$

The substitution method is used to eliminate one of the variables by replacement when solving a system of equations.



Think of it as "grabbing" what one variable equals from one equation and "plugging" it into the other equation.

Systems of Equations may also be referred to as "simultaneous equations".

Let's look at an example using the substitution method:

Solve this system of equations (and check):	$3y - 2x = 11$ $y = 9 - 2x$
1. Replace the "*y*" value in the first equation by what "*y*" now equals. Grab the "*y*" value and plug it into the other equation.	$3(9 - 2x) - 2x = 11$
2. Solve this new equation for "*x*".	$27 - 6x - 2x = 11$ $27 - 8x = 11$ $-8x = -16$ $x = 2$
4. Place this new "*x*" value into either of the ORIGINAL equations in order to solve for "*y*". Pick the easier one to work with!	$y + 2x = 9$ or $y = 9 - 2x$ $y = 9 - 2(2)$ $y = 9 - 4$ $y = 5$

Solving Systems by Substitution NOTES

1) $y = 20$

$y = 5x - 10$

Solution: ______

Check solutions

$y = 20$ $y = 5x - 10$

2) $y = 5x$

$y = 2x + 9$

Solution: ______

Check solutions

$y = 5x$ $y = 2x + 9$

3) $y = x + 5$

$y = 2x - 12$

Solution: ______

Check solutions

$y = x + 5$ $y = 2x - 12$

Solving Systems by Substitution…

1) Substitute to make one equation with one variable.

2) Solve the equation by UNDOING the order of operations.

3) Substitute your solution back in for your known variable to calculate the second value.

4) Write your solution as a coordinate point.

5) Check your solution by substituting your solution back into both equations.

Solving Systems by Substitution and Review by Graphing

Solve the following systems of equations using substitution. Check your solutions.

1) $y = 3x - 4$
$y = -3x + 2$

2) $y = 4x - 1$
$y = -x + 4$

3) $y = -x - 4$
$y = 3x + 4$

Solution: _______

Solution: _______

Solution: _______

Check Equation 1: $y = 3x - 4$

Check Equation 1: $y = 4x - 1$

Check Equation 1: $y = -x - 4$

Check Equation 2: $y = -3x + 2$

Check Equation 2: $y = -x + 4$

Check Equation 2: $y = 3x + 4$

Solve the following systems of equations using substitution. You do NOT <u>have</u> to check your solutions.

4) $y = 3$
$y = -\frac{2}{5}x + 13$

5) $y = -2x + 1$
$y = -x + 3$

6) $y = -3x + 6$
$y = 2x + 1$

Solution: _______

Solution: _______

Solution: _______

Homework is continued ⇨

7) $y = x + 2$

$y = -x - 4$

8) $y = 4x$

$y = -x + 15$

9) $y = 3x - 4$

$y = 28$

Solution: _______

Solution: _______

Solution: _______

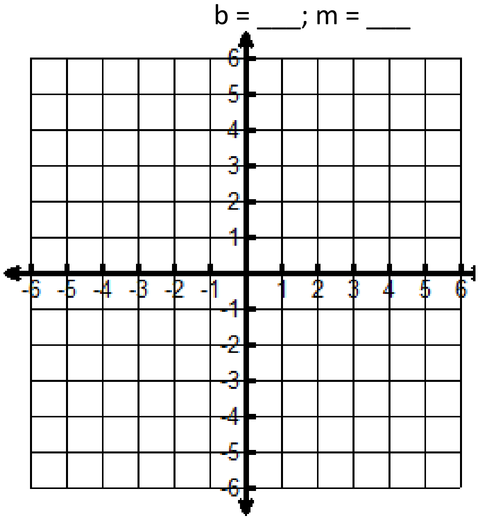
Solve the following systems of equations by graphing. Check your solutions

10) Equations: $\boldsymbol{y = -\frac{2}{3}x - 3}$

b = ___; m = ___

$\boldsymbol{y = \frac{4}{3}x + 3}$

b = ___; m = ___



Solution: _______

Check Eq. 1: $y = -\frac{2}{3}x - 3$

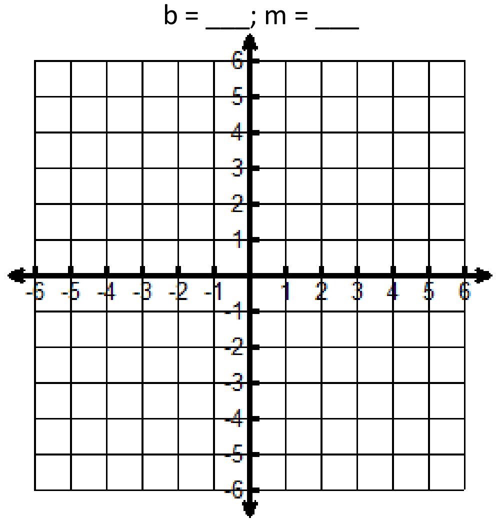
Check Eq. 2: $y = \frac{4}{3}x + 3$

11) Equations: $\boldsymbol{y = \frac{1}{3}x + 2}$

b = ___; m = ___

$\boldsymbol{y = -x - 2}$

b = ___; m = ___



Solution: _______

Check Eq.1: $y = \frac{1}{3}x + 2$

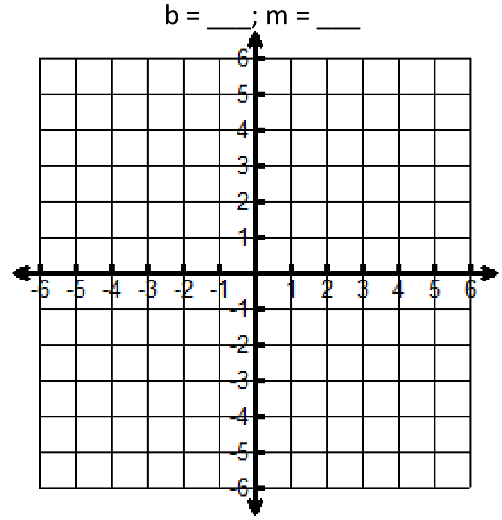
Check Eq.2: $y = -x - 2$

12) Equations: $\boldsymbol{y = x - 4}$

b = ___; m = ___

$\boldsymbol{y = -x + 2}$

b = ___; m = ___



Solution: _______

Check Eq. 1: $y = x - 4$

Check Eq. 2: $y = -x + 2$

I can solve a system of equations by substitution.

Solving Systems by Substitution II Examples and NOTES

1) $y = -4x$

$-2x + y = 24$

$-2x + (-4x) = 24$ ← Step1

$-6x = 24$ ← Step 2

$x = -4$

$y = -4x$ ← Step 3

$y = -4(-4)$

$y = 16$

$(-4, 16)$ ← Step 4

$y = -4x$ | $-2x + y = 24$ ← Step 5

$(16) = -4(-4)$ | $-2(-4) + (16) = 24$

$16 = 16$ ✓ | $8 + 16 = 24$ ✓

2) $y = x - 7$

$2x + y = 8$

$2x + (x - 7) = 8$ ← Step 1

$3x - 7 = 8$ ← Step 2

$3x = 15$

$x = 5$

$y = x - 7$ ← Step3

$y = 5 - 7$

$y = -2$

$(5, -2)$ ← Step 4

$y = x - 7$ | $2x + y = 8$ ← Step 5

$(-2) = (5) - 7$ | $2(5) + (-2) = 8$

$-2 = -2$ ✓ | $10 + -2 = 8$ ✓

3) $2x - 3y = 8$

$y = 5x + 6$

4) $y = -8x + 40$

$3x + y = 10$

Steps in Solving Systems by Substitution…

1) Substitute to make one equation with one variable.

2) Solve the equation by UNDOING the order of operations. (Isolate the variable.)

3) Substitute your solution back in for your known variable to calculate the second value.

4) Write your solution as a coordinate point.

5) Check your solution by substituting your solution back into both equations.

Solving Systems by Substitution II and Review of Graphing

Solve the following systems of equations using substitution. Don't forget to find the solution for both variables. Put a rectangle around your solution.

1) $y = 5x$

$2x + -2y = -64$

2) $y = -6$

$-5x + 3y = 32$

3) $-3x + 4y = -60$

$y = 2x$

4) $x = -7y$

$x - y = -32$

5) $x = y + 6$

$x + y = 30$

6) $x + 2y = 200$

$x = y + 50$

Homework is continued ⇨

7) $x = -3y + 3$

$-2x + 3y = -33$

8) $y = 3x - 10$

$y = 2x - 5$

9) $x = 3y + 7$

$2x + 4y = -6$

Solve the following systems of equations by graphing.

10) $\boldsymbol{y = -x + 6}$

b = ___; m = ___

$\boldsymbol{y = x - 2}$

b = ___; m = ___

11) $\boldsymbol{y = -\frac{1}{2}x + 4}$

b = ___; m = ___

$\boldsymbol{y = x + 1}$

b = ___; m = ___

12) $\boldsymbol{2x + y = 6}$

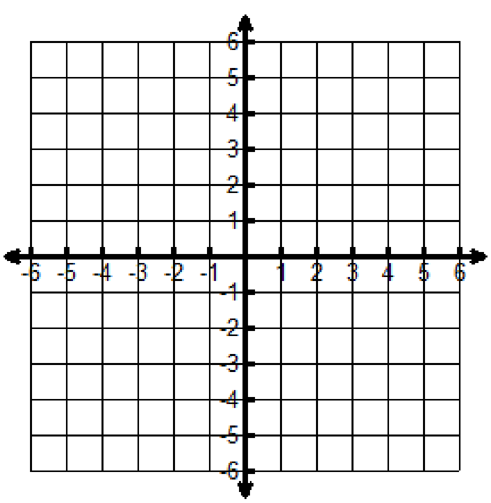
y-intercept: (0 , ___)

x-intercept: (___ , 0)

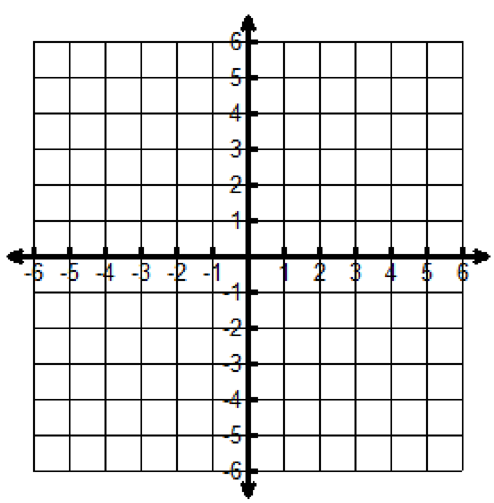
$\boldsymbol{3x - 3y = -9}$

y-intercept: (0 , ___)

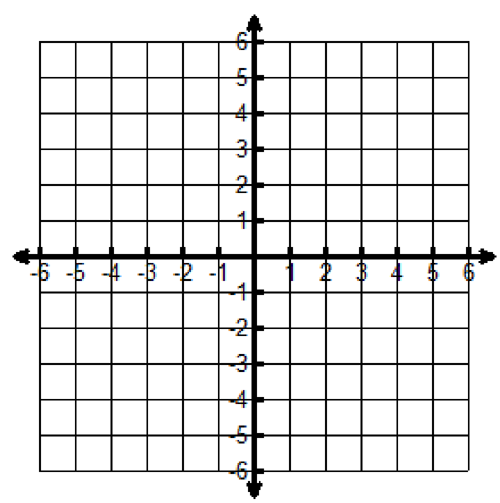
x-intercept: (___ , 0)



Solution: ________



Solution: ________



Solution: ________

I can solve a system of equations by elimination.

Solving Systems Using Elimination (also called Addition Method or Combination Method)

The addition method of solving systems of equations is also called the method of elimination. This method is similar to the method you probably learned for solving simple equations. If you had the equation "$x + 6 = 11$", you would write "–6" under either side of the equation, and then you'd "add down" to get "$x = 5$" as the solution.

$$\begin{array}{l} x + 6 = 11 \\ \underline{\quad -6 \quad -6} \\ \quad x = 5 \end{array}$$

You'll do something similar with the addition method.

- **Solve the following system using addition.**

$$\mathbf{2x + y = 9}$$
$$\mathbf{3x - y = 16}$$

Note that, if I add down, the y's will cancel out. So I'll draw an "equals" bar under the system, and add down:

$$\begin{array}{l} 2x + y = 9 \\ \underline{3x - y = 16} \\ 5x = 25 \end{array}$$

Now I can divide through to solve for $\boxed{x = 5}$, and then back-solve, using either of the original equations, to find the value of y. The first equation has smaller numbers, so I'll back-solve in that one:

$$\begin{array}{l} 2(5) + y = 9 \\ 10 + y = 9 \\ y = -1 \end{array}$$

Then the solution is $(x, y) = (5, -1)$.

It doesn't matter which equation you use for the backsolving; you'll get the same answer either way. If I'd used the second equation, I'd have gotten:

$$\begin{array}{l} 3(5) - y = 16 \\ 15 - y = 16 \\ -y = 1 \\ y = -1 \end{array}$$

...which is the same result as before.

Solving Systems by Elimination **NOTES**

1) $x + y = 9$

$x - y = 5$

Solution: ______

2) $2x - 3y = -7$

$-2x - 8y = -4$

Solution: ______

3) $-10x + 2y = -8$

$3x - 2y = -6$

Solution: ______

Solving Systems by Elimination…

1) Make sure that when you add your equations, one of the variables will be eliminated.

2) Add the two equations.

3) Solve for the variable. (Isolate)

4) Substitute your solution back in for your known variable to calculate the second value.

5) Write your solution as a coordinate point.

6) Check your solution by substituting your solution back into both equations.

Solving Systems by Elimination

Solve the following systems of equations using elimination. Make sure you find the value of both of the variables.

1) $2x + y = -5$

$2x - y = -3$

2) $3x + 6y = 48$

$5x - 6y = -32$

3) $2x + y = -9$

$-2x - 3y = 3$

4) $-x + 2y = 8$

$3x - 2y = 4$

5) $x - 2y = -6$

$-x - y = -3$

6) $5x + 6y = 13$

$-5x + 2y = 11$

Decide whether to use substitution or elimination method to solve. Solve each system.

7) $y = 6x - 5$

$y = -x + 30$

8) $-x - 7y = 18$

$4x + 7y = -30$

9) $x = 5y - 1$

$x + 2y = 27$

Review Solving Systems of Equations

Use the graphing method to solve each system.

1) $y = -4x$

$y = x + 5$

Solution: ______

2) $y = \frac{2}{3}x - 3$

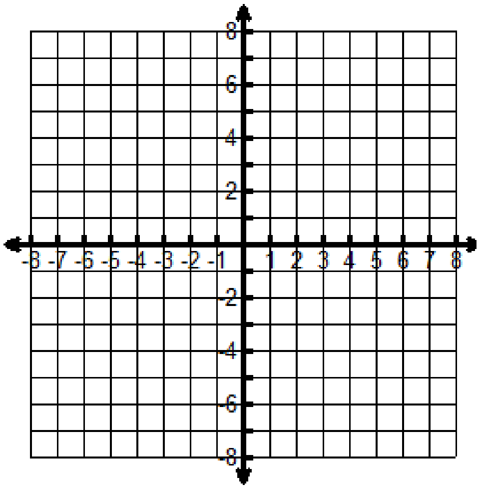
$y = -\frac{5}{3} - 10$

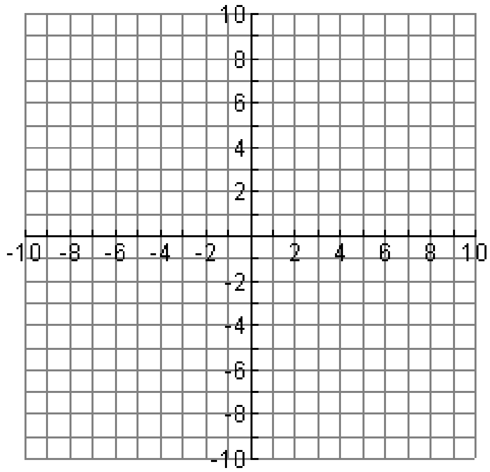
Solution: ______

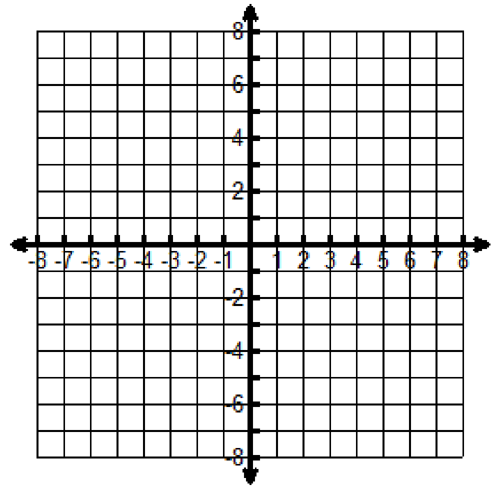
3) $2x - 6y = -6$

$2x + 3y = 12$

Solution: ______







Use the substitution method to solve each system.

4) $y = 4x$

$x + y = 5$

Solution: ______

5) $x = -4y$

$3x + 2y = 20$

Solution: ______

6) $y = x - 1$

$x + y = 3$

Solution: ______

7) $y = 3x - 4$

$2x - 3y = -9$

Solution: ______

8) $x = 8 - 4y$

$2x - 5y = 29$

Solution: ______

Homework is continued ⇨

Use the elimination method to solve each system.

9) $x - y = 1$
$x + y = 3$ ***Solution:*** ______

10) $-x + y = 1$
$x + y = 11$ ***Solution:*** ______

11) $x + 4y = 11$
$-x + 6y = -11$ ***Solution:*** ______

12) $3x + 4y = 19$
$-3x - 6y = -33$ ***Solution:*** ______

13) $x + 4y = -8$
$x - 4y = -8$ ***Solution:*** ______

14) $3x + 4y = 2$
$4x - 4y = 12$ ***Solution:*** ______

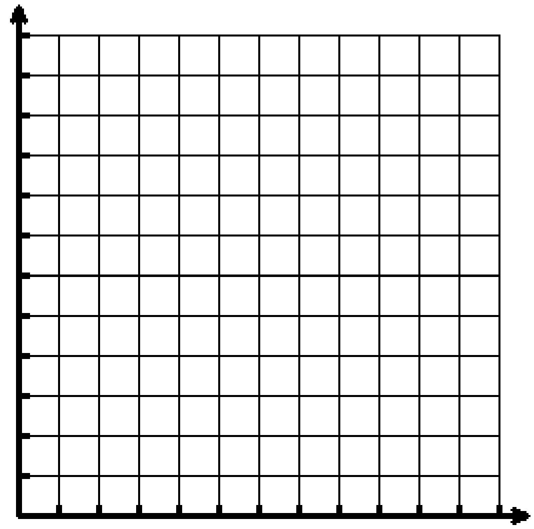
Homework is continued ⇨

15) You are buying $48 worth of lawn seed that consists of two types of seed. One type is a quick-growing rye grass that costs $4 per pound, and the other type is a higher-quality seed that costs $6 per pound. You need a total of 11 pounds of seed.

Define your variables: _____________ _______________

Write a system of equations: ___________________________

____



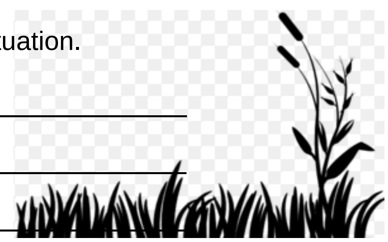
Find the x-intercept and y intercept for both equations.

Eq. 1: ___________ and ___________

Eq 2: ___________ and ___________

Graph your system on the same coordinate grid.
(Quick, Higher Quality) Use an interval of 1 on the x-axis and 1 on the y-axis)

State the coordinates of intersection. Explain what these coordinates tell you about the situation.



____

____

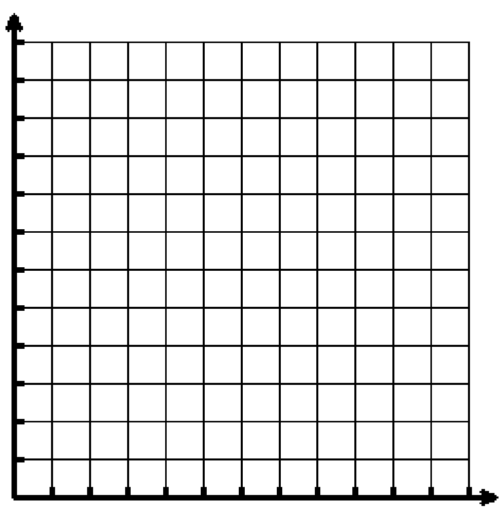
____

16) Your grandmother made 240 oz. of jelly. You have two types of jars. The smaller holds 10 oz. And the larger holds 12 oz. Your grandmother wants to fix 22 jars.

Define your variables: _____________ _______________

Write a system of equations: ___________________________

____



Find the x-intercept and y intercept for both equations.

Eq. 1: ___________ and ___________

Eq 2: ___________ and ___________

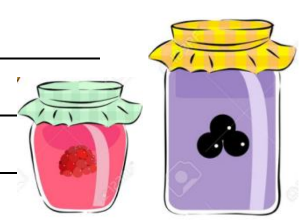
Graph your system on the same coordinate grid.
(Small, Large) Use an interval of 2 on the x-axis and 2 on the y-axis)

State the coordinates of intersection. Explain what these coordinates tell you about the situation.

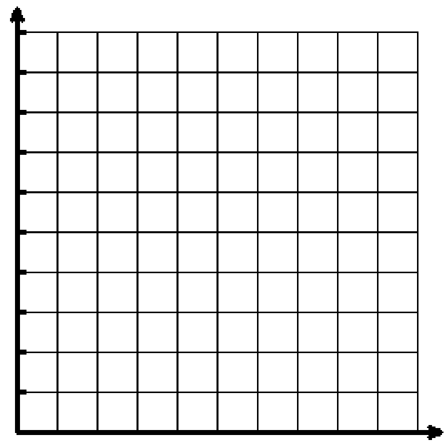
____

____

____



17) You are buying $30 worth of birdseed that consists of two types of seed. Thistle seed attracts finches and costs $2 per pound. Dark oil sunflower seed attracts many kinds of sunbirds and costs $1.50 per pound You are buying 18 pounds of birdseed.



Define your variables: ____________ ______________

Write a system of equations: _________________________

____

Find the x-intercept and y intercept for both equations.

Eq. 1: __________ and __________

Eq 2: __________ and __________

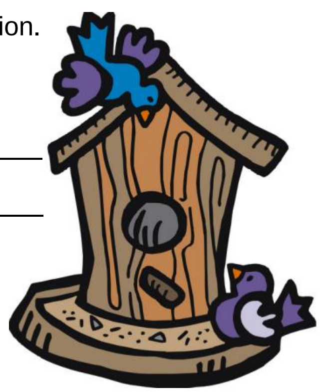
Graph your system on the same coordinate grid.
(Thistle, Dark) Use an interval of 3 on the x-axis and 3 on the y-axis)

State the coordinates of intersection. Explain what these coordinates tell you about the situation.

____

____

____



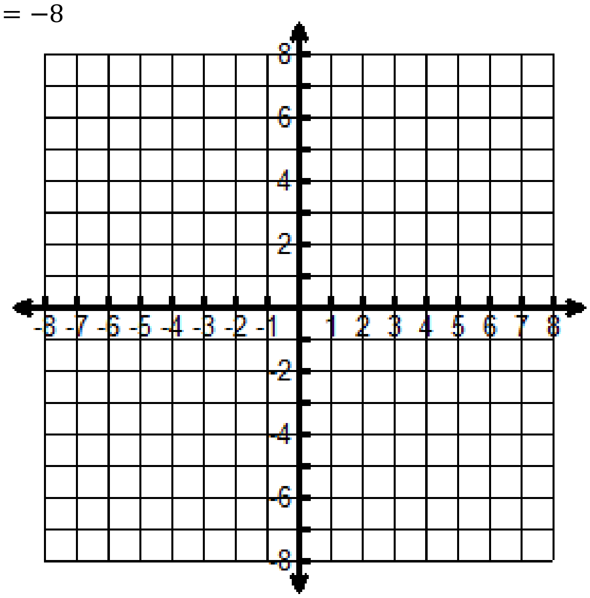
I can recognize special cases when solving a system of equations.

Solving Systems in Special Cases

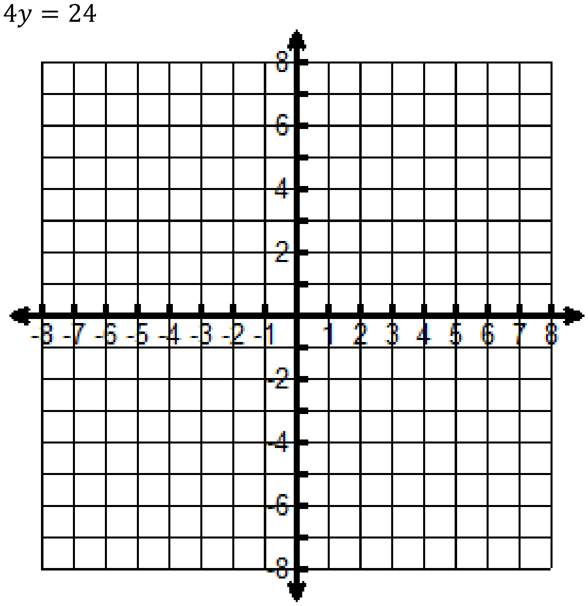
We learned 3 different ways to solve linear systems of equations: graphing, substitution, and elimination. You know the solution is the point where the two lines intersect. But sometimes, weird things can happen:

Solve each linear system by graphing:

1) $\begin{cases} y = \frac{1}{2}x - 4 \\ 2x - 4y = -8 \end{cases}$



2) $\begin{cases} y = -2x + 6 \\ 8x + 4y = 24 \end{cases}$



- If the lines are **parallel**, then you state that there is **No Solution**.
- If the lines are the **same line**, then you state that there are **Infinitely Many Solutions**.

So let's see what the solutions look like when we solve them by substitution or elimination:

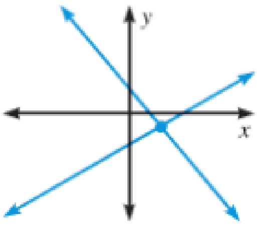
1) $\begin{cases} y = \frac{1}{2}x - 4 \\ 2x - 4y = -8 \end{cases}$

2) $\begin{cases} y = -2x + 6 \\ 8x + 4y = 24 \end{cases}$

- If the variables cancel out and the result is <u>NOT</u> EQUAL, then you state that there is **No Solution**.
- If the variables cancel out and the result is EQUAL, then you state that there are **Infinitely Many Solutions**.

Number of Solutions of a Linear System

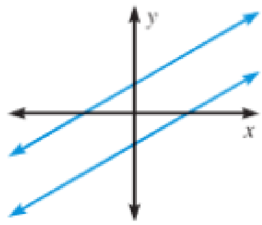
One solution



The lines intersect.

The lines have different slopes.

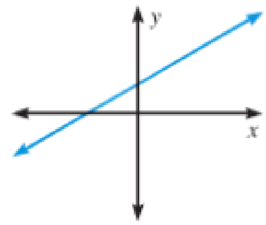
No solution



The lines are parallel.

The lines have the same slope and different *y*-intercepts.

Infinitely many solutions



The lines coincide.

The lines have the same slope and the same *y*-intercept.

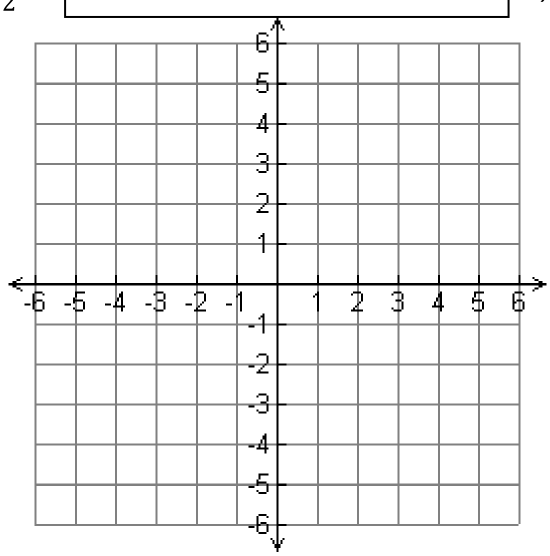
		POSSIBLE OUTCOMES		
		No Solution	1 Unique Solution	Infinitely Many Solutions
METHOD OF SOLVING	Graphing	Parallel Lines	Lines Intersect Once	Both Lines are the Same When Graphed
	Substitution or Elimination	Variables Cancel; Sides Not Equal	Each Variable Has One Solution	Variables Cancel; Sides are Equal

Practice on Your Own:

Solve each system by graphing. (You may have one solution, no solution or infinitely many solutions.)

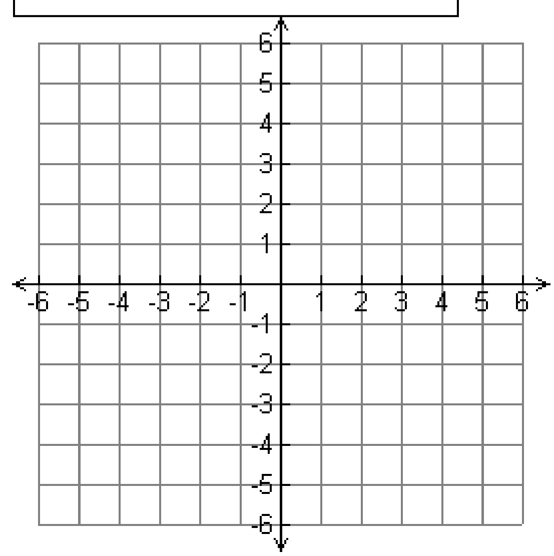
1) $\begin{cases} y = -x - 4 \\ y = x - 2 \end{cases}$

Solution:



2) $\begin{cases} y = \frac{1}{2}x + 2 \\ y = \frac{1}{2}x - 3 \end{cases}$

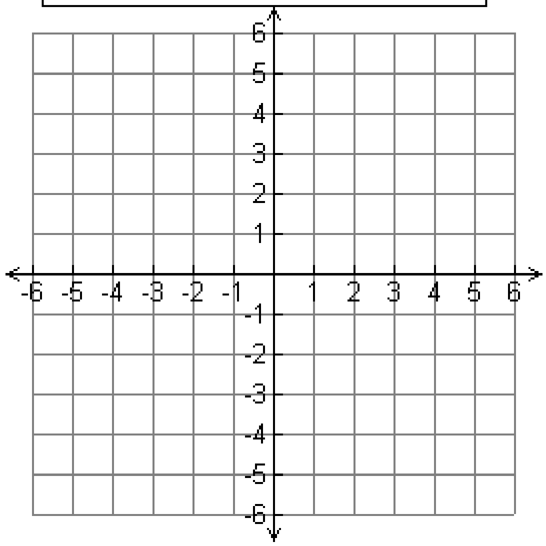
Solution:



Homework is continued

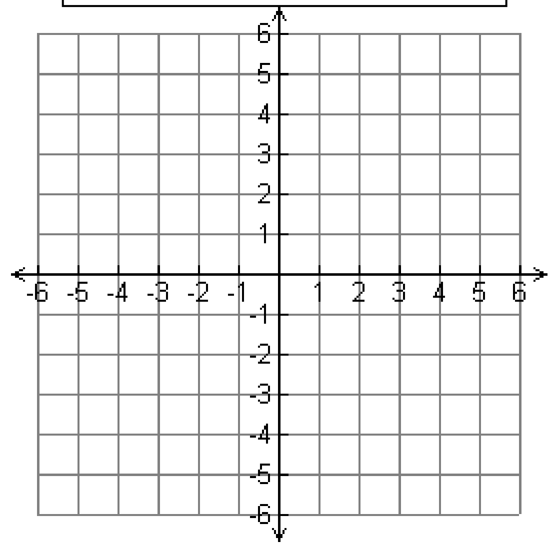
3) $\begin{cases} x + y = 3 \\ x + y = -1 \end{cases}$

Solution:



4) $\begin{cases} 2x - y = -4 \\ x - y = -2 \end{cases}$

Solution:



Solve each system by elimination. (You may have one solution, no solution or infinitely many solutions.)

5) $\begin{cases} -6x + 14y = -4 \\ 6x - 14y = 4 \end{cases}$

Solution:

6) $\begin{cases} 16x - 4y = -4 \\ -16x + 2y = -6 \end{cases}$

Solution:

7) $\begin{cases} 9x + 15y = -12 \\ -9x - 15y = 21 \end{cases}$

Solution:

8) $\begin{cases} -10x - 8y = -2 \\ 10x + 8y = 2 \end{cases}$

Solution:

Solve each system by substitution. (You may have one solution, no solution or infinitely many solutions.)

9) $\begin{cases} 12x - 2y = 3 \\ y = 6x - 2 \end{cases}$

Solution:

10) $\begin{cases} y = 3x + 21 \\ -9x + 3y = 63 \end{cases}$

Solution:

11) $\begin{cases} 3x - 6y = -6 \\ y = x - 2 \end{cases}$

Solution:

12) $\begin{cases} y = -8x - 1 \\ 24x + 3y = -3 \end{cases}$

Solution: