Unit 2A: Systems of Equations and Inequalities

In this unit, you will learn how to do the following:

Learning Target #1: Creating and Solving Systems of Equations

- Identify the solution to a system from a graph or table
- Graph systems of equations
- Determine solutions to a system of equations
- Use a graphing calculator to solve a system of equations
- Use substitution to solve a system of equations
- Use elimination to solve a system of equations
- Determine the best method for solving a systems of equations
- Apply systems to real world contexts

Learning Target #2: Creating and Solving Systems of Inequalities

- Graph linear inequalities
- Graph systems of inequalities
- Create a linear inequality or system of inequalities from a graph
- Determine the solution to a linear inequality or system of inequalities
- Determine if a given solution is a solution to an inequality or system of inequalities
- Apply inequalities to real world contexts
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Mon, 12/3 Health Surveys	**Tue, 12/4** **Day 1:** Graphing Systems of Equations	**Wed, 12/5** **Day 2:** Solving Systems by Substitution	**Thurs, 12/6** **Day 3:** Solving Systems by Substitution/ Applications	**Fri, 12/7** **Day 4:** Quiz on Graphing & Substitution Methods/ Solving Systems by Elimination
Mon, 12/10 **Day 5:** Solving Systems by Elimination/ Applications	**Tues, 12/11** **Day 6:** Quick Check on Elimination/ Graphing Linear Inequalities	**Wed, 12/12** SMI/SRI Testing **Day 7:** Graphing Systems of Inequalities/ Real World Applications	**Thurs, 12/13** Quick Check on Graphing Systems of Inequalities/ Real World Applications of Systems	**Fri, 12/14** Unit 2A Review
Mon, 12/17 **Unit 2A Test**	**Tues, 12/18** Review Day for Finals	**Wed, 12/19** Review Day for Finals	**Thurs, 12/20** Final Exams – 3rd and 4th block No Book bags!	**Fri, 12/21** Final Exams – 1st and 2nd Block No Book bags!

Day 1 – Graphing Systems of Equations

Standard(s): ____

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Graphing a Line in Slope-Intercept Form

When we write an equation of a line, we use **slope intercept form** which is ***y = mx + b***, where **m** represents the **slope** and **b** represents the **y-intercept**.

Slope Intercept Form

$y = mx + b$

m: slope   b: y=intercept

Slope can be described in several ways:

- Steepness of a line
- Rate of change – rate of increase or decrease
- $\frac{\text{Rise}}{\text{Run}}$
- Change (difference) in y over change (difference) in x

A **y-intercept** is the point where the graph crosses the y-axis. Its coordinate will always be the point (0, b), where b stands for the number on the y-axis where the graph crosses and the value of the x-coordinate will always be 0.

Slope and Y-intercepts from an Equation

The equation for a line includes and represents the slope and y-intercept. The equation for a line is **y = *mx* + *b***, where *m* is the slope and *b* is the y-intercept. It is called **slope intercept form.**

Slope Intercept Form
y = mx + b
m: slope
b: y-intercept

a. y = -4x + 1

b. 3x – 2y = -16

Slope: _______ y-intercept: _______

Slope: _______ y-intercept: _______

Graphing Linear Functions

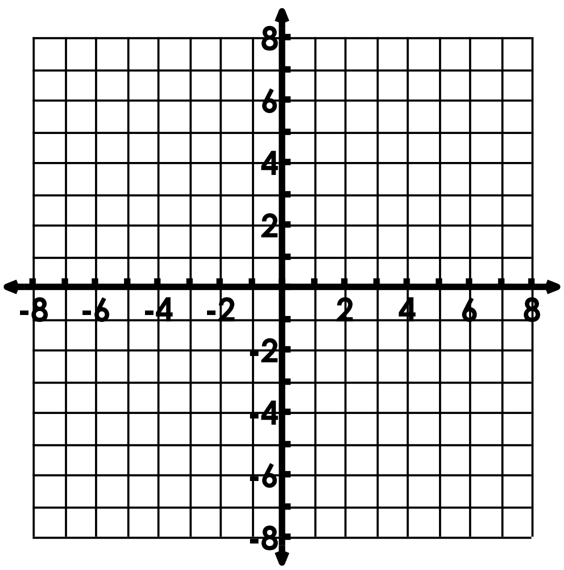
When you graph equations, you have to be able to identify the slope and y-intercept from the equation.

Step 1: Solve for y (if necessary)
Step 2. Plot the y-intercept.
Step 3: From the y-intercept, use the slope to calculate another point on the graph.
Step 4: Connect the points with a ruler or straightedge.

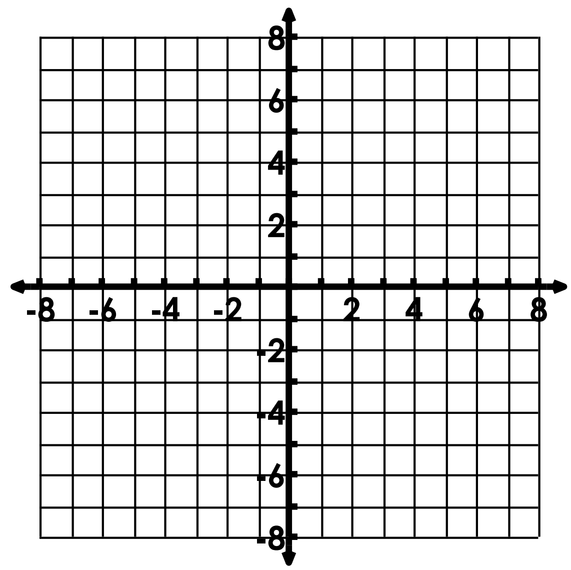
$$\textbf{Slope} = \frac{change\ in\ y}{change\ in\ x} = \frac{+\uparrow \quad -\downarrow}{+\rightarrow \quad -\leftarrow}$$

Ex. Graph the following lines:

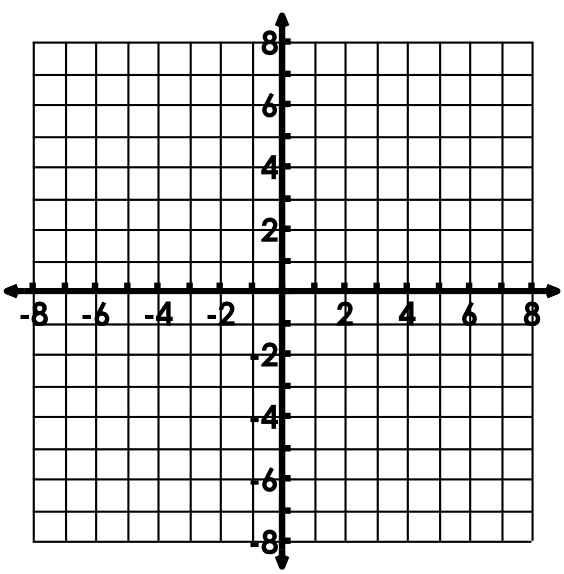
A. y = $-\frac{2}{3}x + 4$ m = _______ b = _______



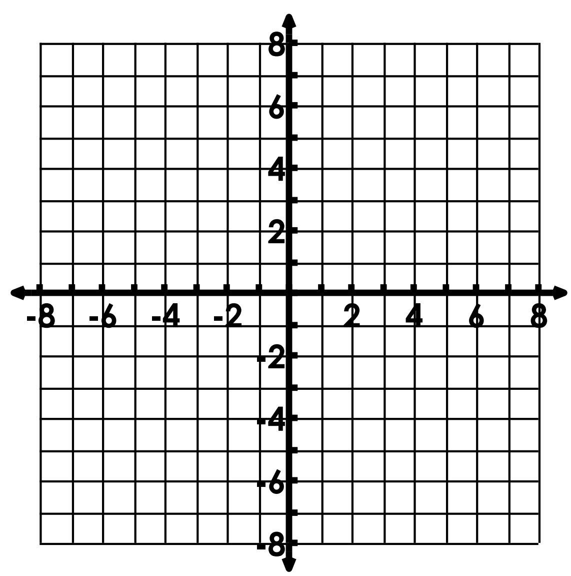
y = 3x + 2 m = _______ b = _______



C. y = -4x – 1 m = _______ b = _______



D. y = $\frac{5}{3}x - 3$ m = _______ b = _______



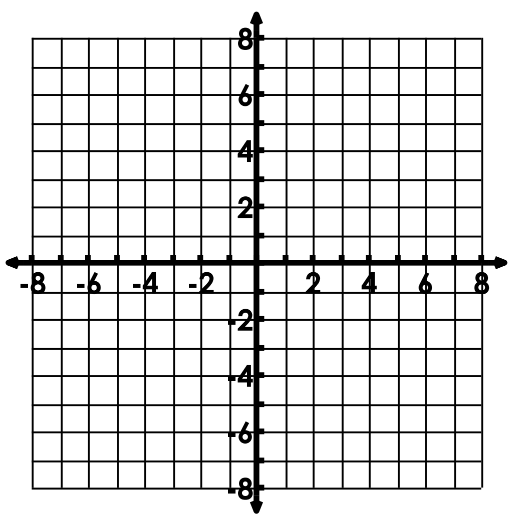
Graphing Horizontal and Vertical Lines

H
O
Y

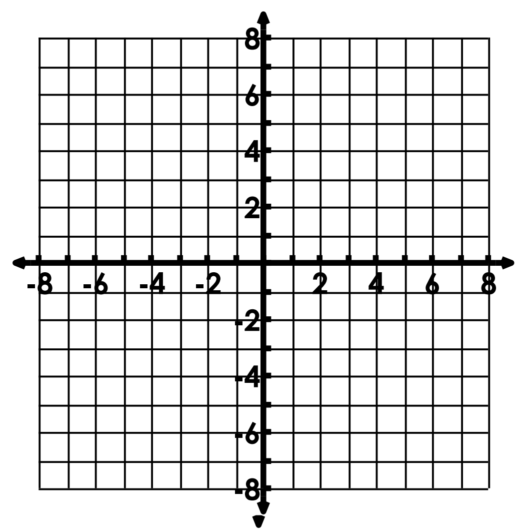
V
U
X

When graphing horizontal and vertical lines, you will have one variable set equal to a constant. Whatever constant the variable is set equal to represents that value in a coordinate point. For example, if you have y = 2, all coordinate points must have a value of 2 and x can be whatever you want. Pick 3 points to graph the lines below.

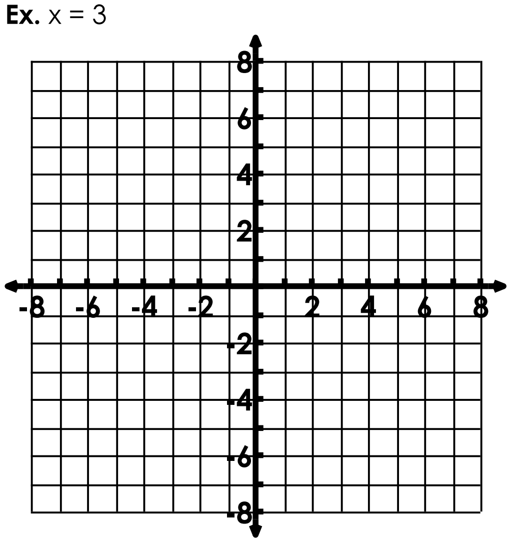
Ex. y = 4



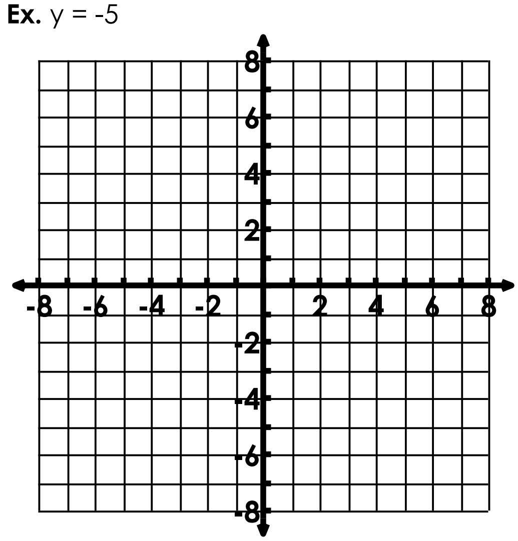
Ex. x = -2



Ex. x = 3



Ex. y = -5

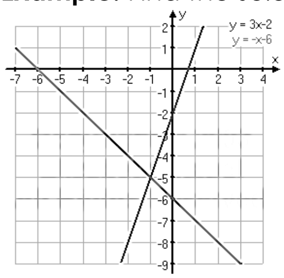


Solving Systems of Equations by Graphing

Two or more linear equations in the same variable form a **system of equations**.
Example:

A **solution** to a system is an ordered pair (x, y) that makes each equation in the system a true statement. A solution is also the point where the two equations intersect each other on a graph.

Example: Find the solution of the linear equation and check your answer.



Examples: Check whether the ordered pair is a solution of the system of linear equations.

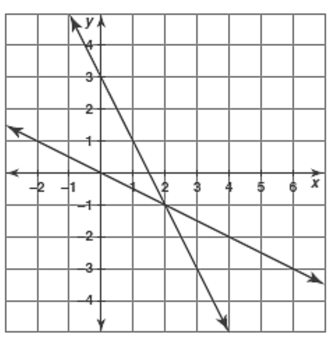
Ex. (1, 1)

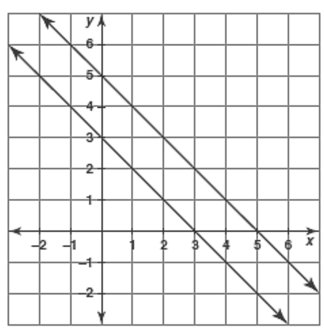
$2x + y = 3$
$x - 2y = -1$

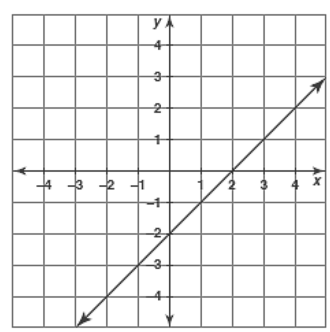
Ex. (-2, 4)

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

Practice: Tell how many solutions the systems of equations has. If it has one solution, name the solution.







Identify Solutions to a System from a Table

Remember, that the solution to a system of equations is where the two lines intersect each other. The point of the intersection is the **solution. The solution is where the x-value (input) produces the same y-value (output) for both equations.** Using the tables below, identify the solution.

a.

x	$y = -x$	$y = x - 6$
0	0	−6
3	−3	−3
6	−6	0
9	−9	3

b.

x	$y = 2x + 4$	$y = 4x + 2$
−2	0	−6
−1	2	−2
0	4	2
1	6	6

Solving a Linear System by Graphing

Step 1: Write each equation in slope intercept form (y = mx + b).
Step 2: Graph both equations in the same coordinate plane.
Step 3: Estimate the coordinates of the point of intersection.
Step 4: Check whether the coordinates give a true solution by substituting them into each equation of the original linear system.

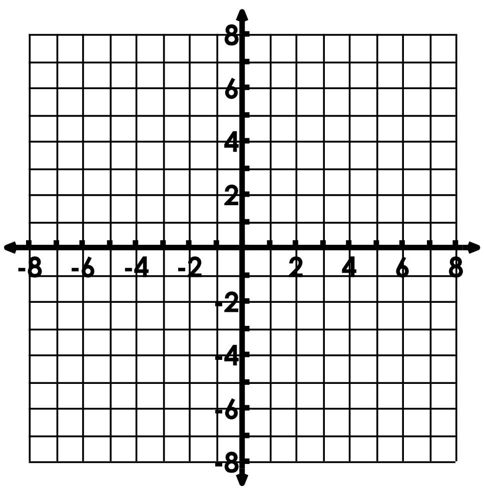
Example: Use the graph and check method to solve the linear equations.

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

m= ______ m= ______

b = ______ b = ______

Solution: ________________

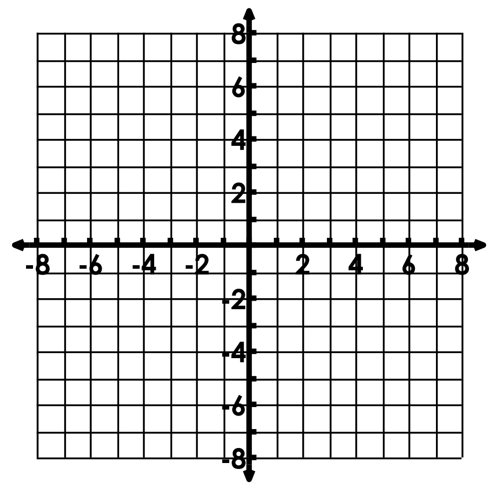


B. $y = -\frac{1}{2}x - 1$ $y = \frac{1}{4}x - 4$

m= ______ m= ______

b = ______ b = ______

Solution: ________________

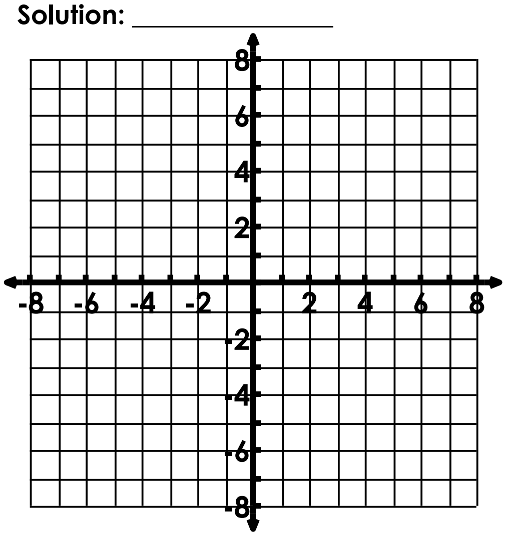


C. 3x + y = 6 -x + y = -2

m= ______ m= ______

b = ______ b = ______

Solution: ________________

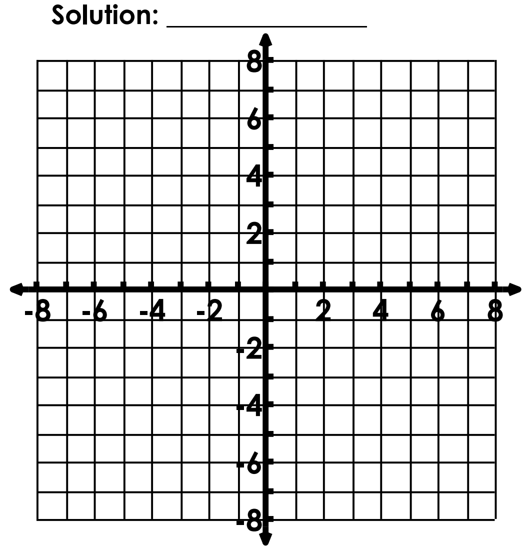


D. y = - 2 4x – 3y = 18

m= ______ m= ______

b = ______ b = ______

Solution: ________________



Day 2 – Solving Systems Using Substitution

Standard(s): ____

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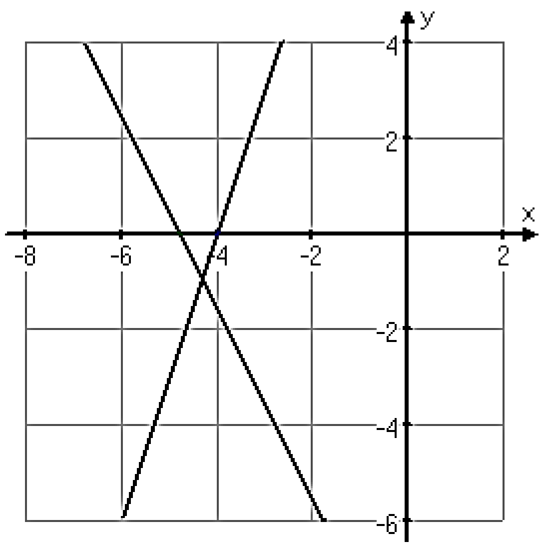
Name the solution of the systems of equations below:



Were you able to figure out an exact solution??? Unless a solution to a system of equations are integer coordinate points, it can be very hard to determine the solution. This is why we have the option to solve systems using algebra. Algebra allows us to find exact solutions, especially if the solution is a messy number that involves fractions or decimals. We will learn two methods: substitution and elimination (also called linear combinations)

Think About It

How would you find the x and y values for the following systems (i.e a point or solution to the systems)?

a. $-4x + 2y = 24$
$y = 8$

b. $x = 1$
$-2x + 8y = 14$

Steps for Solving a System by Substitution

Example:

$y = x + 1$

$2x + y = -2$

Step 1: Select the equation that already has a variable isolated.	**Step 2**: Substitute the expression from Step 1 into the other equation for the variable you isolated in step 1 and solve for the other variable.	**Step 3**: Substitute the value from Step 2 into the revised equation from Step 1 and solve for the other variable. Create a point from your solutions.	**Step 4**: Check the solution in each of the original equations.

Example 1: Solve the system below:

$2x + 2y = 3$

$x = 4y - 1$

Example 2: Solve the system below:

$y = x + 1$

$y = -2x + 4$

Example 3: Solve the system below:

$x = 3 - y$
$x + y = 7$

Example 4: Solve the system below:

$y = -2x + 4$

$4x + 2y = 8$

When the variables drop out and the resulting equation is **FALSE**, the answer is **NO SOLUTIONS.**
When the variables drop out and the resulting equation is **TRUE**, the answer is **INFINITE SOLUTIONS.**

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">Number of Solutions</td></tr>
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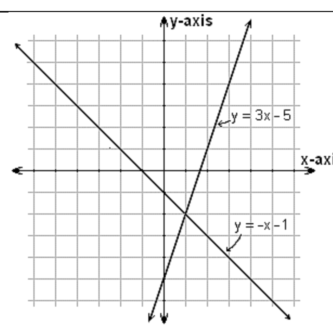
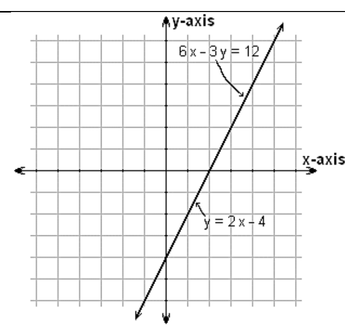
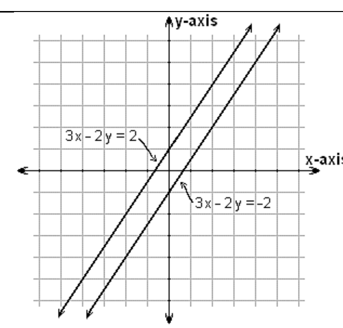
<tr><td rowspan="3">Solving Methods</td><td>Graphing</td><td>

When graphed, the 2 lines intersect once.</td><td>

When graphed, the 2 lines lie on top of one another.</td><td>

When graphed, the 2 lines are strictly parallel.</td></tr>
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For example: 2=2 or -5=-5</td><td rowspan="2">When using either substitution or elimination, you will get an equation that has no variable and is never true.

For example: 0=6 or -2=4</td></tr>
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Day 3 – Solving Systems Using Substitution

Standard(s): ____

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Review: Yesterday you learned how to solve systems of equations. Solve the following systems:

a. $3x + 3y = -3$
$y = -4x + 2$

Solution:

b. $y = 7x + 2$ (Be very careful on this one)
$7x - y = -4$

Solution:

c. $-2x - y = -7$ (Be very careful on this one)
$y = -3x + 7$

Solution:

d. $y = 2x - 5$
$-2x - 3y = 15$

Solution:

Problem Solving with Substitution

Example 1: Loren's marble jar contains plain marbles and colored marbles. If there are 32 more plain marbles than colored marbles, and there are 180 marbles total, how many of each kind of marble does she have?

a. Define your variables (what two things are you comparing?)

b. Create two equations to describe the scenario.

Equation 1: ______________________ (relationship between plain and colored marbles)

Equation 2: ______________________ (number of marbles total)

c. Solve the system:

Example 2: A bride to be had already finished assembling 16 wedding favors when the maid of honor came into the room for help. The bride assembles at a rate of 2 favors per minute. In contrast, the maid of honor works at a speed of 3 favors per minute. Eventually, they will both have assembled the same number of favors. How many favors will each have made? How long did it take?

a. Define your variables (what two things are you comparing?)

b. Create two equations to describe the scenario.

Equation 1: ______________________ (bride's rate)

Equation 2: ______________________ (maid of honor's rate)

c. Solve the system:

Example 3: Ben plans to attend the Mercer County Fair and is trying to decide what would be better deal. He can pay $30 for unlimited rides, including admission, or he can pay $12 for admission plus $1 per ride. If Ben goes on a certain number of rides, the two options wind up costing the same amount.

a. Define your variables (what two things are you comparing?)

b. Create two equations to describe the scenario.

Equation 1: _______________________ (Unlimited Rides)

Equation 2: _______________________ (Admission plus number of rides)

c. Create a table of values for each equation:

# of Rides	Unlimited Option	Admission Option
0		
2		
4		
6		
8		
10		
12		
14		
16		
18		
20		
22		
24		

d. Graph the two equations:

e. Solve the system algebraically:

- How many rides can Ben ride to where the two options are the same amount?
- When is the Unlimited rides a better option?
- When is the Admission plus number of rides a better option?

Day 4 – Solving Systems Using Elimination

Standard(s): ____

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Another method for solving systems of equations when one of the variables is not isolated by a variable is to use **elimination.** Elimination involves adding or multiplying one or both equations until one of the variables can be eliminated by adding the two equations together. Elimination is also called linear combinations.

Take a look at the following systems of equations. Add the equations together and try to solve the system– what do you notice?

a. $3x + 2y = 7$
$-3x + 4y = 5$

b. $2x - 3y = 4$
$-4x + 5y = -8$

Steps for Solving Systems by Elimination

Step 1: Arrange the equations with like terms in columns.
Step 2: Analyze the coefficients of x or y. Multiply one or both equations by an appropriate number to obtain new coefficients that are opposites
Step 3: Add the equations and solve for the remaining variable.
Step 4: Substitute the value into either equation and solve.
Step 5: Check the solution by substituting the point back into both equation.

Elimination by Adding the Systems Together

Ex 1. $-2x + y = -7$
$2x - 2y = 8$

Solution:

Ex 2. $4x - 2y = 2$
$3x + 2y = 12$

Solution:

Elimination by Rearranging and Adding the Systems Together

Ex 3. $8x = -16 - y$

$3x - y = 5$

Solution:

Ex 4. $2x + y = 8$

$-y = 3 + 2x$

Solution:

Elimination by Multiplying the Equations and Then Adding the Equations Together

Ex 5. $x + 12y = -15$

$-2x - 6y = -6$

Solution:

Ex 6. $6x + 8y = 12$

$2x - 5y = -19$

Solution:

Ex 7. $5x + y = 9$

$10x - 7y = -18$

Solution:

Ex 8. $7x + 2y = 24$

$8x + 2y = 30$

Solution:

Ex 9. x – y = 2

2x – 2y = 4

Ex 10. x + y = 1

3x + 3y = 3

Solution:

Solution:

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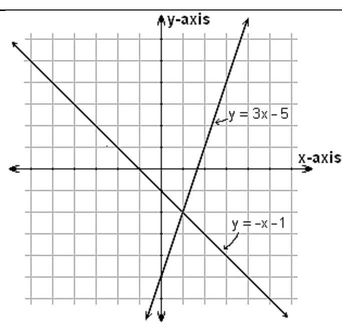
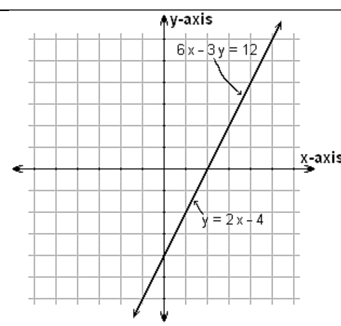
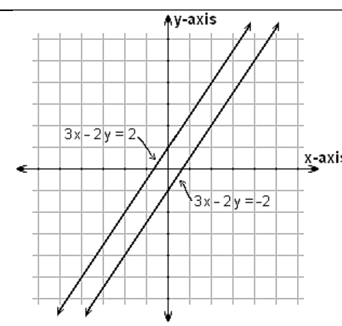
<tr><td rowspan="3">Solving Methods</td><td>Graphing</td><td>
When graphed, the 2 lines intersect once.</td><td>
When graphed, the 2 lines lie on top of one another.</td><td>
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Day 5 – Solving Systems Using Elimination

Standard(s): ____

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Yesterday, you learned how to solve systems by either having to add the equations together or multiply one of the equations by a constant and then add. Sometimes, you may have to multiply both equations by a constant in order to solve. Try the following equations below:

Steps for Solving Systems by Elimination

Step 1: Arrange the equations with like terms in columns.
Step 2: Analyze the coefficients of x or y. Multiply one or both equations by an appropriate number to obtain new coefficients that are opposites
Step 3: Add the equations and solve for the remaining variable.
Step 4: Substitute the value into either equation and solve.
Step 5: Check the solution by substituting the point back into both equation.

Elimination by Multiplying Both Equations by a Constant and then Adding

a. $5x - 4y = -1$
$8x + 7y = -15$

Solution:

b. $-6x + 12y = -6$
$-5x + 10y = -5$

Solution:

c. $-9x + 5y = 26$
$2x + 2y = 16$

Solution:

d. $2x + 2y = 10$
$3x + 5y = 13$

Solution:

Problem Solving with Elimination

1. Love Street is have a sale on jewelry and hair accessories. You can buy 5 pieces of jewelry and 6 hair accessories for 34.50 or 2 pieces of jewelry and 16 hair accessories for $33.00. This can be modeled by the equations: $\begin{cases} 5x + 8y = 34.50 \\ 2x + 16y = 33.00 \end{cases}$. How much is each piece of jewelry and hair accessories?

a. What does x and y represent?

d. Solve the system of equations:

b. Explain what the first equation represents:

c. Explain what the second equation represents:

2. A test has twenty questions worth 100 points. The test consists of True/False questions worth 3 points each and multiple choice questions worth 11 points each. This can be modeled by $\begin{cases} x + y = 20 \\ 3x + 11y = 100 \end{cases}$. How many multiple choice and True/False questions are on the test?

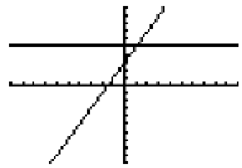
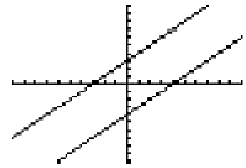
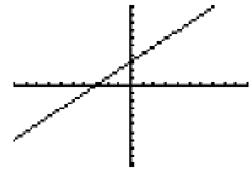
a. What does x and y represent?

d. Solve the system of equations:

b. Explain what the first equation represents:

c. Explain what the second equation represents:

How Many Solutions to the System?

Method		One Solution	No Solutions	Infinite Solutions
Graphing	**<u>Best to use when:</u>** Both equations are in slope intercept form. ($y = mx + b$) EX: $y = 3x – 1$ $y = -x + 4$ Solutions are integer coordinate points (no decimals or fractions)	 Solution is the point of intersection. Different Slope Different y-intercept	 Lines are parallel and do not intersect. (Slopes are equal) Same Slope Different y-intercept	 Lines are identical and intersect at every point. Same Slope Same y-intercept (Same Equations)
Substitution	**<u>Best to use when:</u>** One equation has been solved for a variable or both equations are solved for the same variable. EX: $y = 2x + 1$ or $y = 3x - 1$ $3x – 2y = 10$ $y = -x + 4$	After substituting and simplifying, you will be left with: x = # y = # Solution will take the form of (x, y)	After substituting, variables will form **zero pairs** and you will be left with a **FALSE** equation. $3 = 6$	After substituting, variables will form **zero pairs** and will leave you with a **TRUE** equation. $4 = 4$
Elimination	**<u>Best to use when:</u>** Both equations are in standard form. ($Ax + By = C$) Coefficients of variables are opposites. $3x + 6y = 5$ $-3x – 8y = 2$ Equations can be easily made into opposites using multiplication. $-2(4x + 2y = 5)$ $8x – 6y = -5$	After eliminating and simplifying, you will be left with: x = # y = # Solution will take the form of (x, y)	After eliminating, variables will form **zero pairs** and you will be left with a **FALSE** equation. $0 = 5$	After eliminating, variables will form **zero pairs** and will leave you with a **TRUE** equation. $0 = 0$

Day 6 – Real World Applications of Systems

Standard(s): ____________________

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Scenario 1: The admission fee for the county fair includes parking, amusement rides, and admission to all commercial, agricultural, and judging exhibits. The cost for general admission is $7 and the price for children is $4. There were 449 people who attended the fair on Thursday. The admission fees collected amounted to $2768. How many children and adults attended the fair?

Scenario 2: Ms. Ross told her class that tomorrow's math test will have 20 questions and be worth 100 points. The multiple choice questions will be 3 points each and the open ended response questions will be 8 points each. Determine how many multiple choice and open ended response questions are on the test.

Scenario 3: Serena is ordering lunch from Tony's Pizza Parlor. John told her that when he ordered from Tony's last week, he paid $34 for two 16 inch pizzas and two drinks. Jodi told Serena when she ordered one 16 inch pizza and three drinks, it cost $23. What is the cost of one 16 inch pizza and one drink?

Scenario 4: The Strauss family is deciding between two lawn care services. Green Lawn charges a $49 startup fee, plus $29 per month. Grass Team charges a $25 startup fee, plus $37 per month.

a. In how many months will both lawn care services costs the same? What will that cost be?

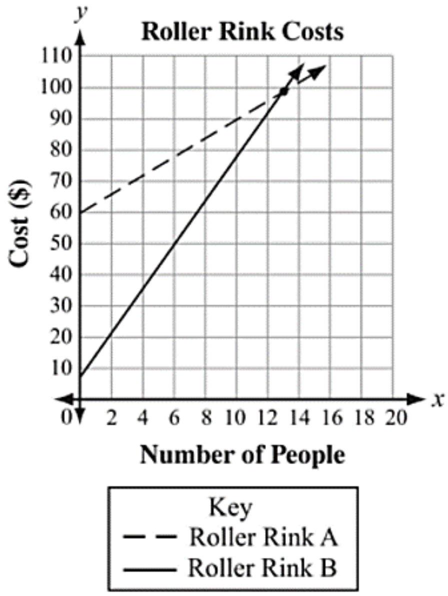
b. If the family will use the service for only 6 months, which is the better option? Explain.

Scenario 5: Jenna is deciding between two cell phone plans. The first plan has a $50 signup fee and costs $20 per month. The second plan has a $40 signup fee and costs $25 per month.

a. After how many months will the total costs be the same? What will the cost be?

b. If Jenna has to sign a one year contract, which plan will be cheaper?

Scenario 6: The following graph shows the cost for going to two different skating rinks.

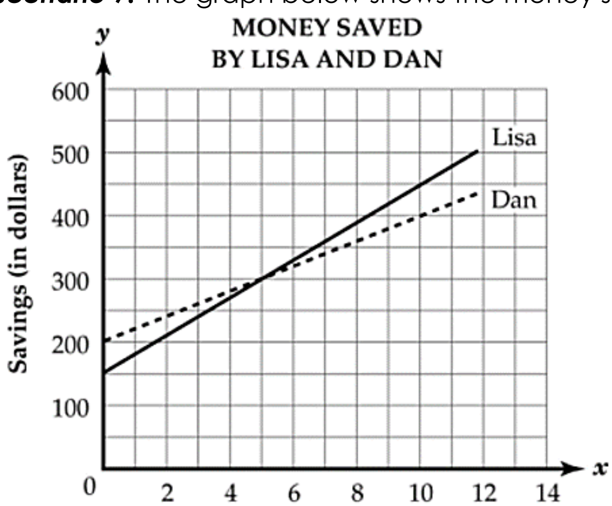


a. When is it cheaper to go to Roller Rink A?

b. When it is cheaper to go to Roller Rink B?

c. When does it cost the same to go to either roller rink?

Scenario 7: The graph below shows the money saved by Lisa and Dan over the summer.



a. How long did it take for them to save the same amount of money? How much money did they both save?

b. When did Lisa have more money saved?

c. When did Dan have more money saved?

Profits, Costs, and Break Even Points

Scenario: You have a part time job at a company that makes and sells color art markers. As part of your job, you are studying the company's production costs. The markers are made one color at a time. It costs $2 to manufacture each marker and there is a $100 set up cost for each color. You are also studying the income, or the amount of money the company earns, from the sales of the markers. The company sells the markers to office and art supply stores for $3 each.

a. Write an equation that gives the production costs in dollars to make one color of marker in terms of the number of markers produced. Define your variables.

b. Write an equation that gives the income, in dollars, in terms of the number of markers sold. Define your variables.

c. Find the production costs to make 80 markers of the same color.

d. Find the income from selling the 80 markers. Has the company made a profit from selling the 80 markers?

e. Find the production costs to make 100 markers of the same color.

f. Find the income from selling the 100 markers. Has the company made a profit from selling the 100 markers?

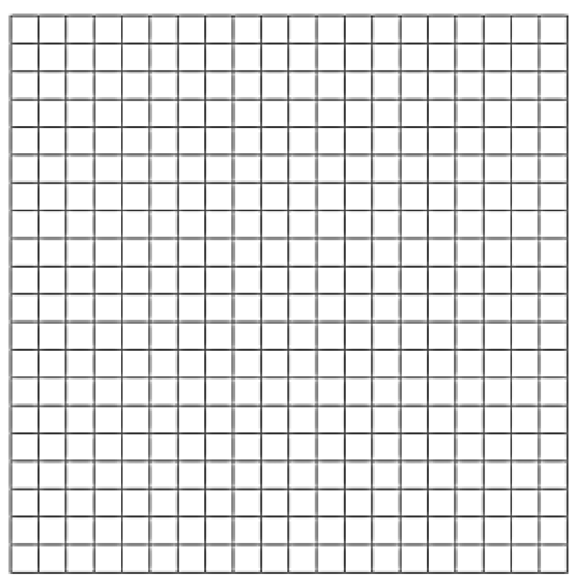
g. Find the production costs to make 200 markers of the same color.

h. Find the income from selling the 200 markers. Has the company made a profit from selling the 200 markers?

i. Complete the table below and use it to create a graph to describe the scenario.

Number of Markers	Production Costs	Income
x	2x + 100	3x
0		
80		
100		
	400	
200		
		1200

j.



k. At what point does the production costs equal the income costs? Use either substitution or elimination to confirm the point of intersection. Interpret the solution in terms of the problem scenario.

l. Using your graph, determine the number of markers for which the production cost is greater than the income.

m. Use your graph to determine the number of markers for which the income is greater than the production costs.

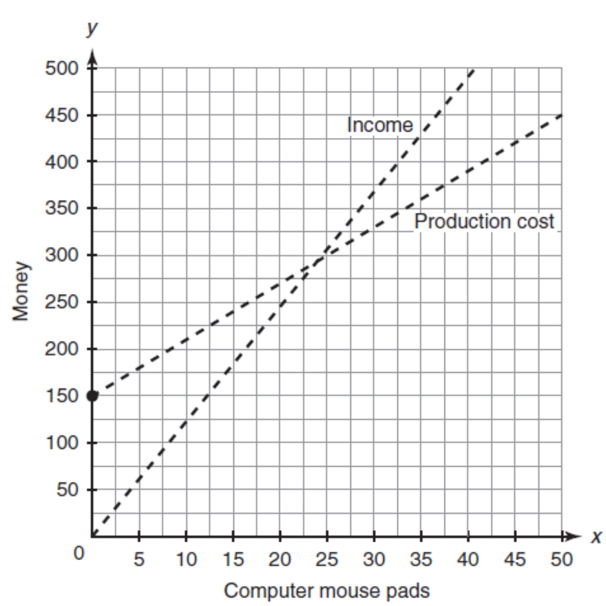
What you just discovered is called the **break-even point**. The break-even point is where production costs equal income. The break-even point can be found by finding the intersection of the two lines or by setting production/cost equation equal to the income equation. The x-coordinate of the break-even point represents how many of an item you need to make and sell to break-even and the y-coordinate of the break-even point represents how much the company spent making the item and then selling the item. The difference between the cost and income amounts will always equal 0.

Practice: Find the break-even point for the following graphs. How many of each item will the company need to sell to make a profit?

Point of Intersection: ___________________

Break Even Point:

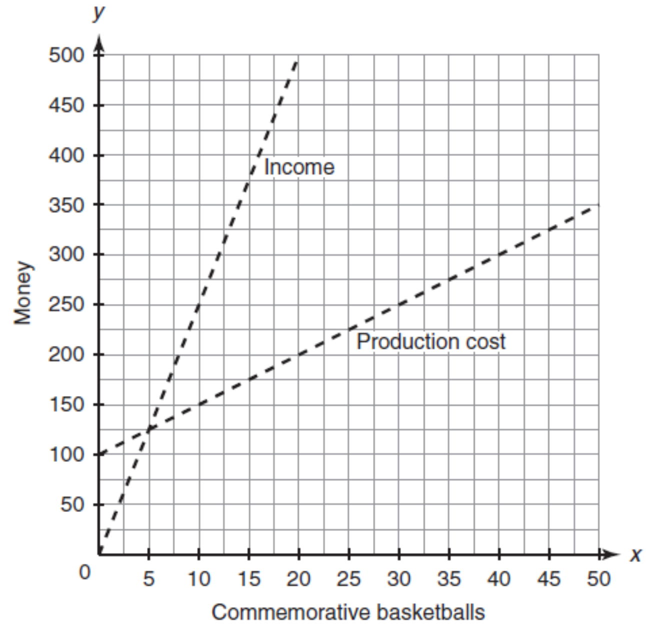
They need to sell at least _________ mousepads to make a profit.



Point of Intersection: ___________________

Break Even Point:

They need to sell at least _________ basketballs to make a profit.



Practice: Your work at the marker company has inspired you to start your own business. You decide to design and sell customized T-shirts. The company that supplies your T-shirts charges you $7.50 for each t-shirt and $22.50 for a new design. You decide to sell the T-shirts for $8.25 each. How many T-shirts do you need to make and sell to break even? How many t-shirts do you need to sell to make a profit?

Practice: The cost to take pictures at a school dance is $200 for the photographer and $3 per print. The dance committee decides to charge $5 per print. How many pictures need to be taken for the dance committee to break-even? How many pictures need to be taken to make a profit?

Day 8 – Graphing Linear Inequalities

Standard(s): ____

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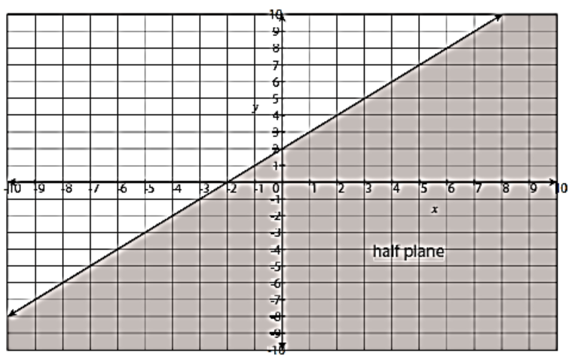
A **linear inequality** is similar to an equation as you learned before, but the equal sign is replaced with an inequality symbol. A **solution** to an inequality is any ordered pair that makes the inequality true.

Ex. Tell whether the ordered pair is a solution to the inequality.

(7, 3); $y < 2x - 3$ (4, 5); $y < x + 1$ (4, 5); $y \leq x + 1$

A linear inequality describes a region of a coordinate plane called a **half-plane**. All the points in the shaded region are solutions of the linear inequality. The **boundary line** is the line of the equation you graph.



Symbol	Type of Line	Shading
<	Dashed	Below boundary line
>	Dashed	Above boundary line
≤	Solid	Below boundary line
≥	Solid	Above boundary line

Graphing Linear Inequalities

Step 1: Solve the inequality for y (if necessary).

Step 2: Graph the boundary line using a solid line for ≤ or ≥ OR a dashed line for < or >.

Step 3:
If the inequality is > or ≥, shade **above** the boundary line
If the inequality is < or ≤, shade **below** the boundary line

OR

Select a test point and substitute it into linear inequality.

- If the test point gives you a **true** inequality, you shade the region where the test point is located.
- If the test point gives you a **false** inequality, you shade the region where the test point is NOT located.

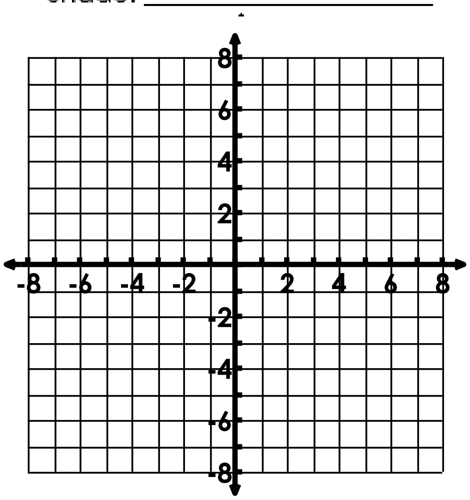
Practice Graphing Linear Inequalities

a. $y < 3x + 4$

Type of Line: ________________

Slope: _______ Y-int: ________

Shade: ______________________



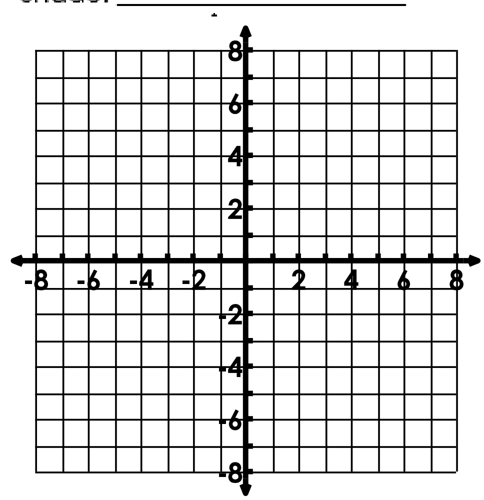
Test Point:

b. $y \geq -\frac{2}{3}x + 1$

Type of Line: ________________

Slope: _______ Y-int: ________

Shade: ______________________



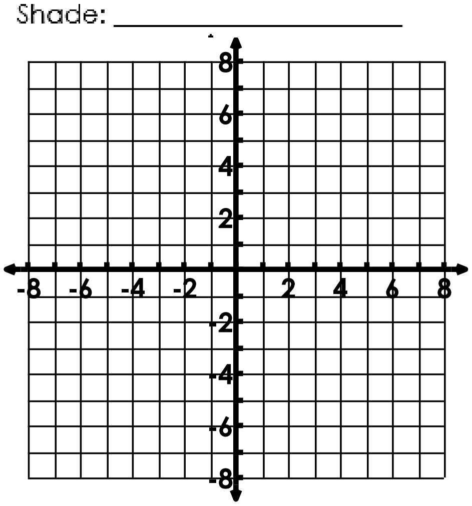
Test Point:

Ex. Graph the inequality:
a. $3x + 2y \geq 6$

Type of Line: ________________

Slope: _______ Y-int: ________

Shade: ______________________



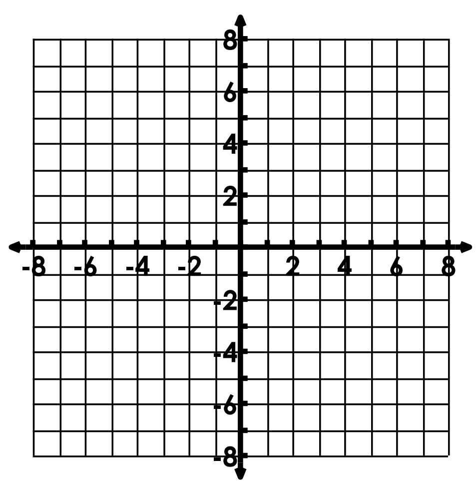
Test Point:

Ex. Graph the inequality:
b. $4x – 3y > 12$

Type of Line: ________________

Slope: _______ Y-int: ________

Shade: ______________________



Test Point:

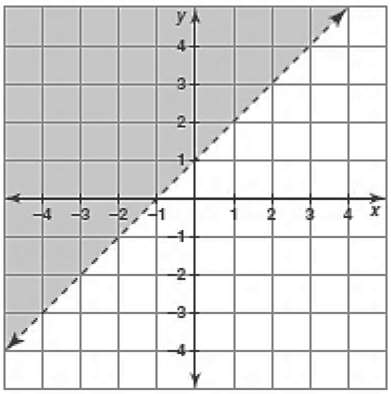
Naming Linear Inequalities

What information do you need to look at to name a linear inequality from a graph?

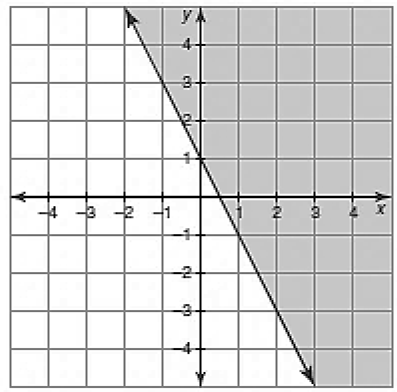
- ______________________________
- ______________________________
- ______________________________
- ______________________________

Practice: Name each linear inequality from the graph:

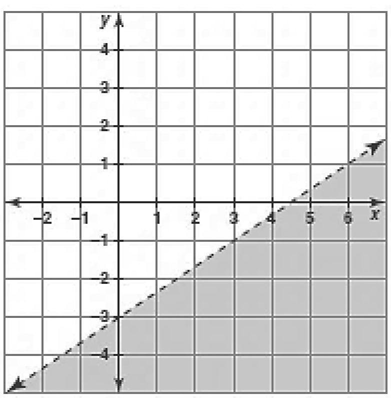
a.



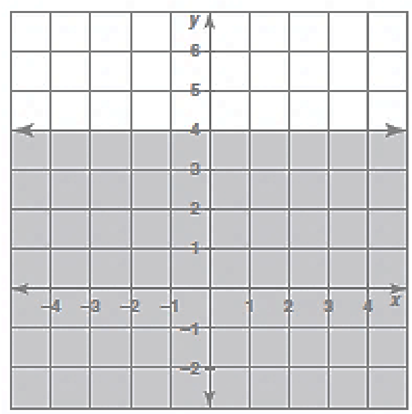
b.



c.



d.



Day 9 – Graphing Systems of Inequalities

Standard(s): ______________________________

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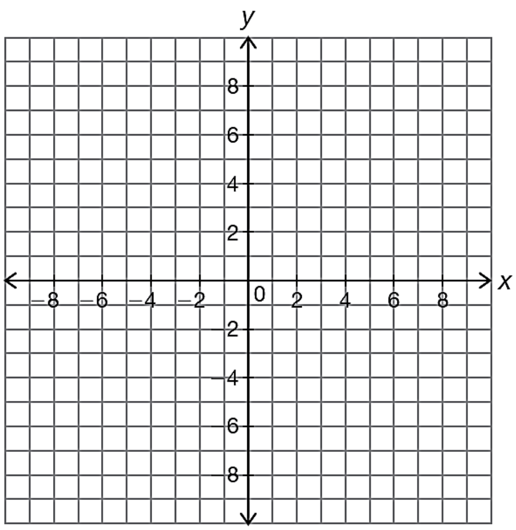
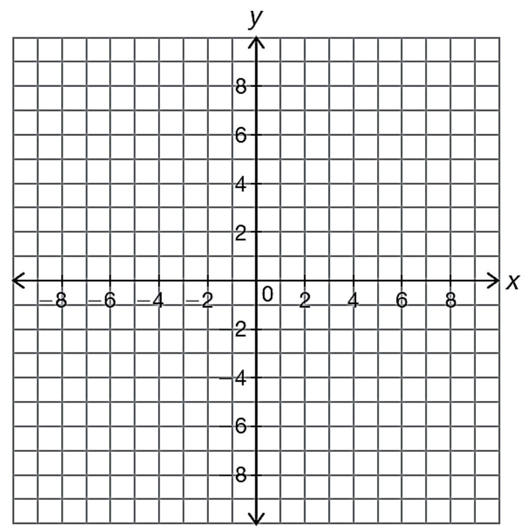
Review: Graph each inequality. Name a solution that would satisfy the inequality.

a. $y > x + 3$

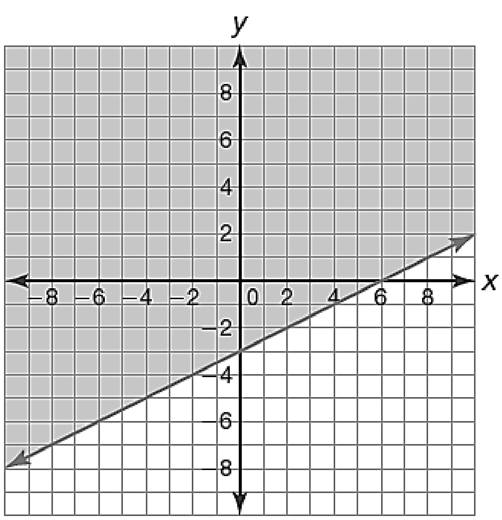


b. $y \leq -\frac{1}{2}x + 4$

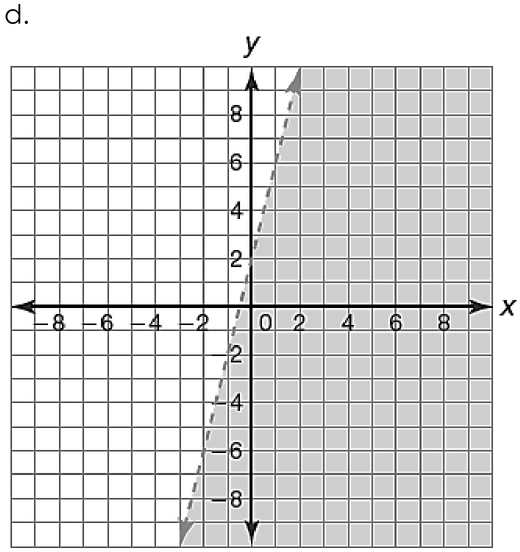


Review: Name the inequality that represents both graphs.

c.



d.



The **solution of a system of linear inequalities** is the intersection of the solution to each inequality. Every point in the intersection regions satisfies the solution. Determine if the following points are a solution to the inequality:

$$x + 5y < -1$$
$$2y \geq -3x - 2$$

(0, -1) (2, 3)

Graphing Systems of Inequalities in Slope Intercept Form

Steps for Graphing Systems of Inequalities

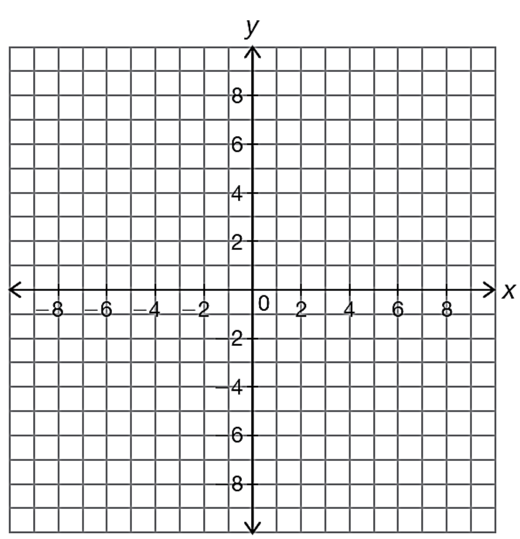
Step 1: Graph the boundary lines of each inequality. Use dashed lines if the inequality is < or >. Use a solid line if the inequality is ≤ or ≥.

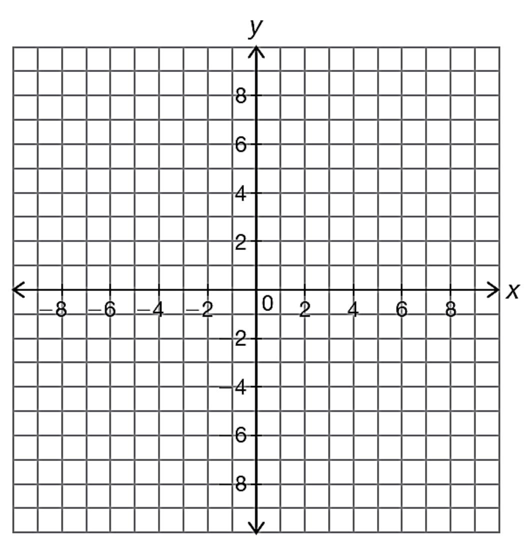
Step 2: Shade the appropriate half plane for each inequality.

Step 3: Identify the solution of the system of inequalities as the intersection of the half planes from Step 2.

A. $y < 3$
$x > 1$

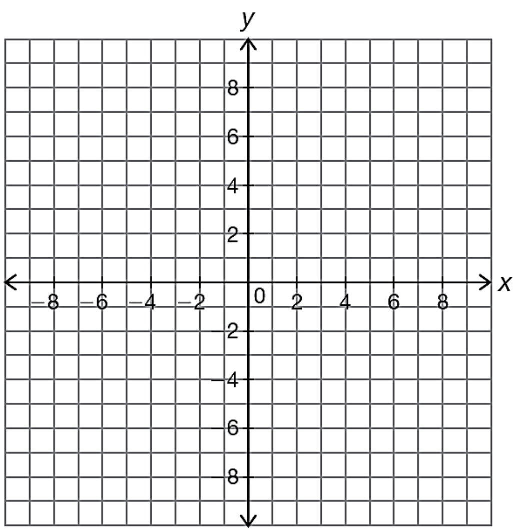
B. $y < -2x - 3$
$y \leq \frac{1}{2}x + 2$

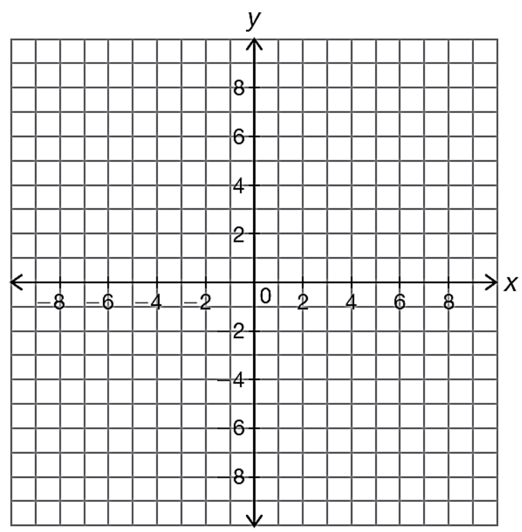




C. $y \geq 2/3x + 3$
$y > -4/3x - 3$

D. $2y > -8x + 16$ $4x + y < -2$



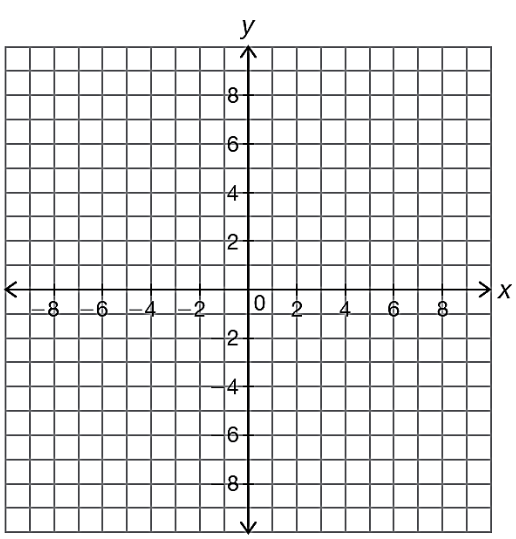


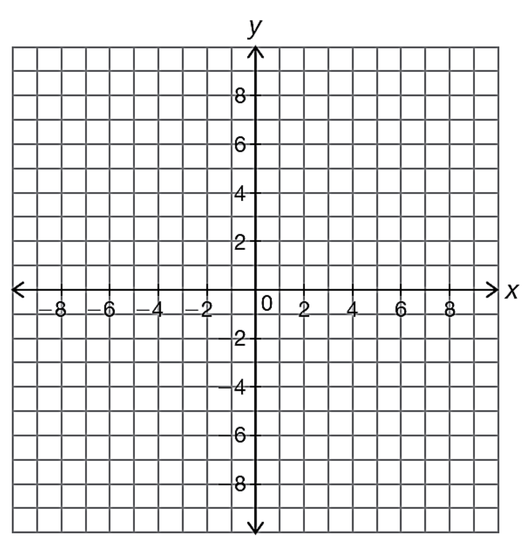
Graphing a System of Inequalities in Standard Form

Think Back…..What is the "Golden Rule" of inequalities?

E. $x + 3y \leq -9$ $5x - 3y \geq -9$

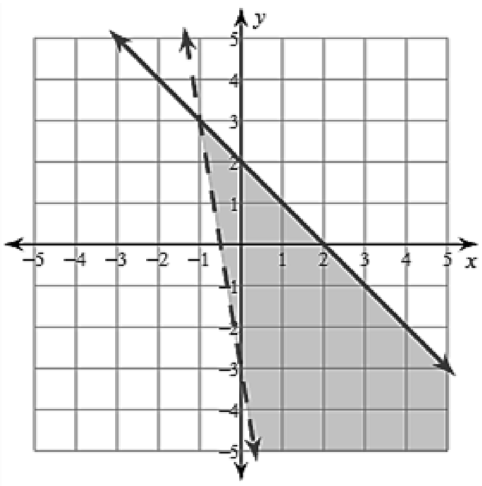
F. $x + y \geq -3$ $4x - y \leq -2$





Warning…Potential Misconception!!!

$x + y \le 2$
$6x + y > -3$



Do you think the point (-1, 3) is a solution to the inequality?

Determining Solutions Located on a Boundary Line

If a point lies on a **solid** line, it is ___________________________________.

If a point lies on a **dashed** line, it is ___________________________________.

It must be true or a solution for both inequalities/boundary lines to be a solution!

Create a System of Inequalities from a Graph

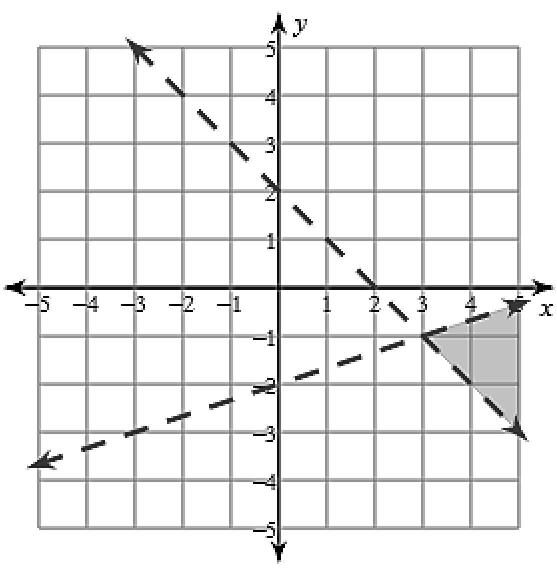
What information do you need to look at to name a system of inequalities from a graph?

- ______________________________
- ______________________________
- ______________________________
- ______________________________

Practice: Name each system of inequalities from the graph:

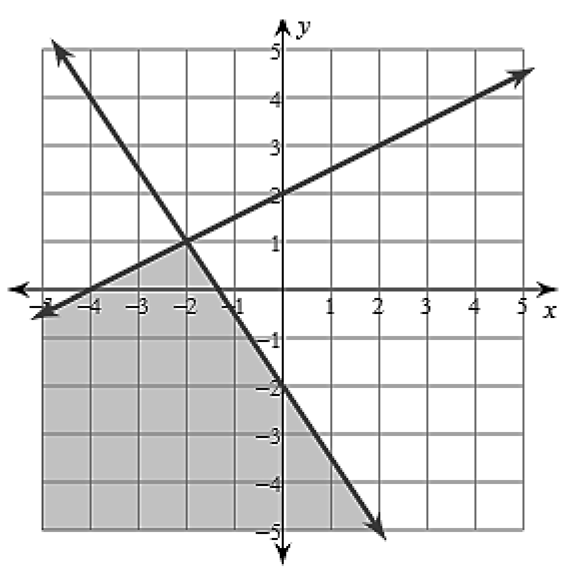
Line 1: ______________________________

Line 2: ______________________________



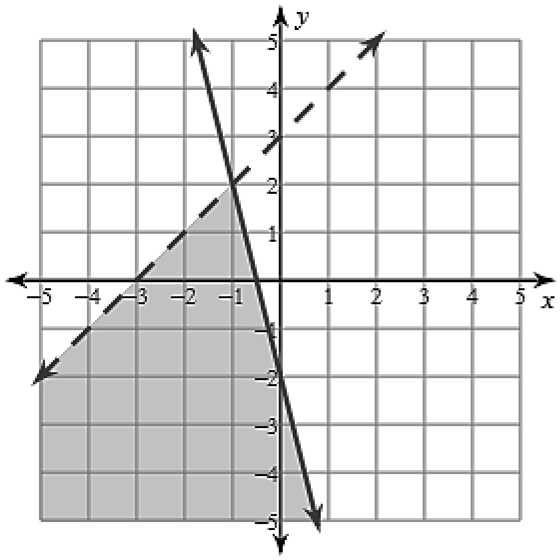
Line 1: ______________________________

Line 2: ______________________________



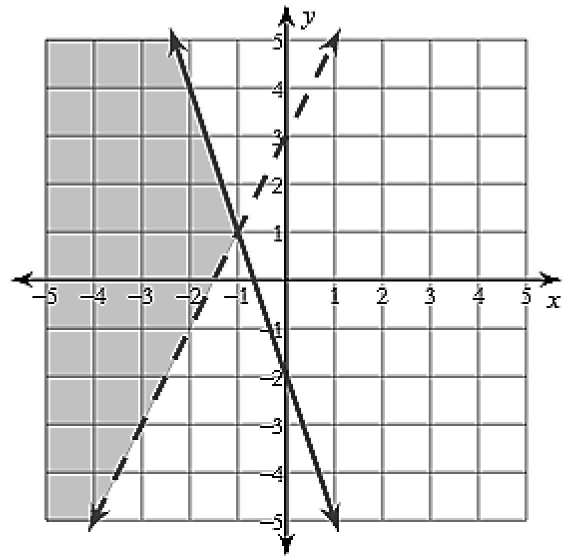
Line 1: ______________________________

Line 2: ______________________________



Line 1: ______________________________

Line 2: ______________________________



Day 10 – Systems of Inequalities Applications

Standard(s): ______________________________

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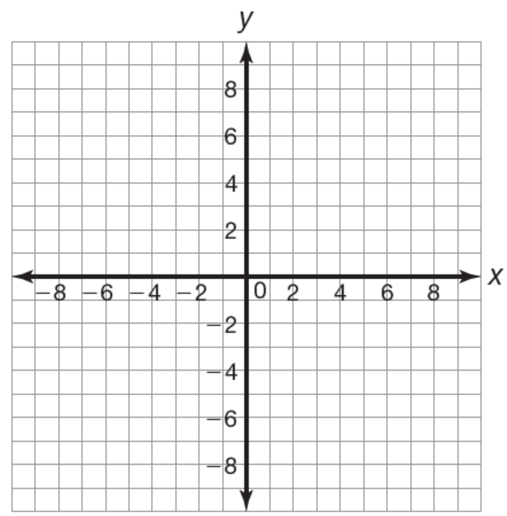
Review: Graph the systems of inequalities:

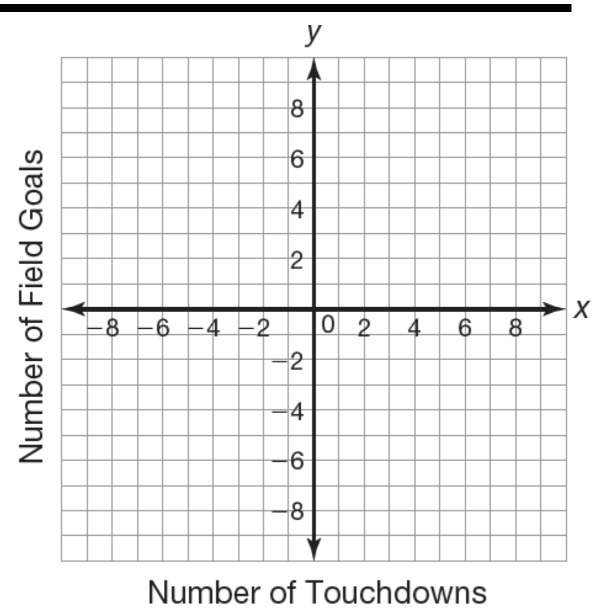
a.

$$\begin{cases} y \leq -\frac{2}{3}x + 3 \\ y \geq 3x - 4 \end{cases}$$



Problem Solving with Linear Inequalities

Example 1: Noah plays football. His team's goal is to score at least 24 points per game. A touchdown is worth 6 points and a field goal is worth 3 points. Noah's league does not allow the teams to try for the extra point after a touchdown. The inequality $6x + 3y \geq 24$ represents the possible ways Noah's team could score points to reach their goal.



a. Graph the inequality on the graph.

b. Are the following combinations solutions to the problem situation? Use your graph AND algebra to answer the following:

1. 2 touchdowns and 1 field goal

2. 1 touchdown and 5 field goals

3. 3 touchdowns and 3 field goals

Creating Systems of Inequalities

Write a system of inequalities to describe each scenario.

a. Jamal runs the bouncy house a festival. The bouncy house can hold a maximum of 1200 pounds at one time. He estimates that adults weight approximately 200 pounds and children under 16 weight approximately 100 pounds. For 1 four minute session of bounce time, Jamal charges adults $3 each and children $2 each. Jamal hopes to make at least $18 for each session.

- Define your variables:

- Write a system of inequalities
  Inequality 1: ____________________________ describes ______________________________________

  Inequality 2: ____________________________ describes ______________________________________

- If 4 adults and 5 children are in 1 session, will that be a solution to the inequalities?

- If 2 adults and 7 children are in 1 session, will that be a solution to the inequalities?

b. Charles works at a movie theater selling tickets. The theater has 300 seats and charges $7.50 for adults and $5.50 for children. The theater expects to make at least $1500 for each showing.

- Define your variables:

- Write a system of inequalities
  Inequality 1: ____________________________ describes ______________________________________

  Inequality 2: ____________________________ describes ______________________________________

- If 150 adults and 180 children attend, will that be a solution to the inequalities?

- If 175 adults and 105 children attend, will that be a solution to the inequalities?