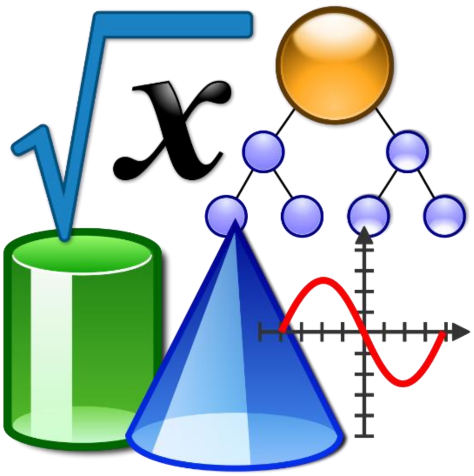
NPS Learning in Place

Algebra I



Name: ___________________________ School: ____________________ Teacher: ________________________

May 18 – June 5

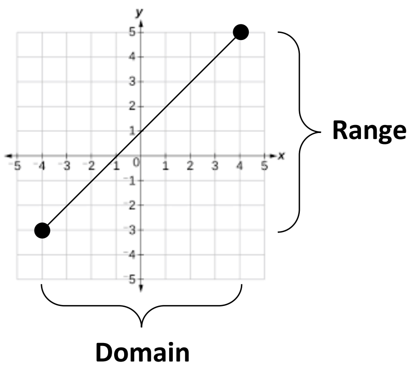
Week 1	• Linear Function
Week 2	• Slope and Equation of a Line
Week 3	• Systems of Equations • Systems of Inequalities

Week 1

Day 1: Domain and Range (linear)

Notes:
Domain – the set of input values of a relation (independent)
Range – the set of output values of a relation (dependent)

Example:

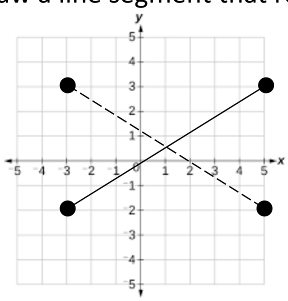


Notice that the **domain** includes all the real numbers greater than or equal to -4 and less than or equal to 4. This can be written {x: -4 ≤ x ≤ 4}

Notice that the **range** includes all the real numbers greater than or equal to -3 and less than or equal to 5. This can be written {y: -3 ≤ y ≤ 5}

When given restricted intervals for domain and range, remember they are not actual points. For example, when given a domain of values greater than or equal to -4 and less than or equal to 2, don't plot the point (-4,2)

Example:
Draw a line segment that represents a relation where the domain is {x: -3 ≤ x ≤ 5} and the range is {y: -2 ≤ y ≤ 3}

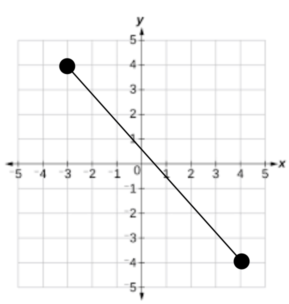


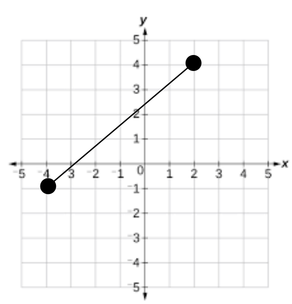
There are TWO possibilities shown on the graph.

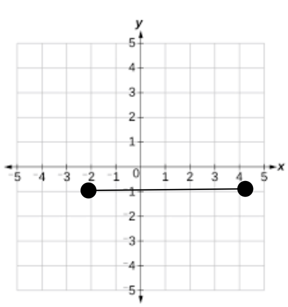
The solid line was created by pairing the lowest x value with the lowest y value and the highest x value with the highest y value.

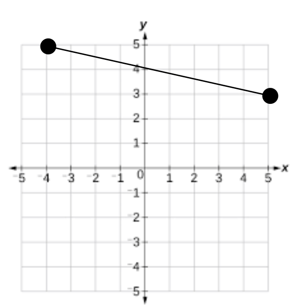
The dotted line was created by pairing the lowest x value with the highest y value and the highest x value with the lowest y value.

Identify the domain and range of the following relations:

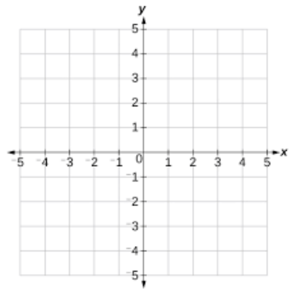
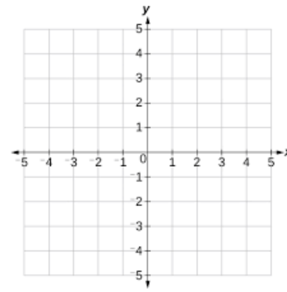
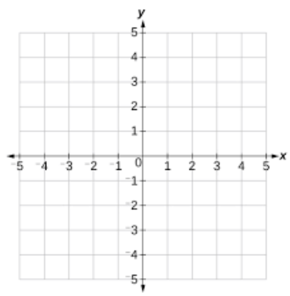
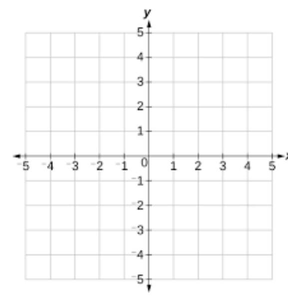








Draw a line segment with the given domain and range

Domain: {x: -4 ≤ x ≤ 3} Range: {y: 1 ≤ y ≤ 4} 	Domain: {x: -1 ≤ x ≤ 1} Range: {y: -4 ≤ y ≤ 5} 
Domain: {x: -3 ≤ x ≤ -1} Range: {y: 1 ≤ y ≤ 3} 	Domain: {x: -4 ≤ x ≤ 5} Range: {y: 0 ≤ y ≤ 1} 

Notes:
In real life the domain and range of a relation tend to be resticted based on the variables involed in a given situation.

For instance look at the following scenerio:

You are filling a nine gallon sink with water to wash dishes. The amount of water in the sink, y, is a function of how long the water has been running.

The independent variable in this situation is time. Time can not be negative, so x cannot be lower than 0. On the other hand, you might forget to turn the water off after the sink is full so the time can go on indefinitely. Therefore, the domain would be {x: x ≥ 0}.

The dependent variable is the amount of water in the sink. Just like time, the amount of water in the sink cannot be negative, so y cannot be lower than 0. On the other hand, the sink cannot hold more than nine gallons because then the water will spill out. Therefore the range would be {y: 0 ≤ y ≤ 9}.

Identify the domain and range of the following scenerios, Describe how the scenerio restricts the domain and range.

A student lives 3 miles from the library. He is riding his bike to the library. The distance he has remaining, y, is a function of how long he has been riding his bike.

A satellite is being launched to orbit 15000 miles above the earth. The distance the rocket is from the earth, y, is a function of how long it's been since takeoff.

Day 2: Function Notation

Notes:
Function Notation – a method of writing a function using that gives a visual difference between the independent and dependent variables; $f(x)$ is used instead of y

- $f(x)$ is read, "the value of f at x" or "f of x"

- Notice the independent variable is inside the parenthesis

Algebraically, when a value of the domain is given it replaces the x in parenthesis

Example:
If $f(x) = 2|x - 3| + 4$, find the value of $f(2)$

$f(x) = 2|x - 3| + 4$
$f(2) = 2|(2) - 3| + 4$
$f(2) = 2|-1| + 4$
$f(2) = 2(1) + 4$
$f(2) = 2 + 4$
$\boldsymbol{f(2) = 6}$

This means that 6 is the number in the range that corresponds to 2 from the domain.

Find the value of the function given the element in its domain:

$f(x) = 4x + 2$; Find $f(8)$	$f(x) = 4x + 1$; Find $f(3)$
$f(x) = 3x - 5$; Find $f(2)$	$w(n) = n - 1$; Find $w(-4)$
$h(n) = 3n - 4$; Find $h(-6)$	$h(x) = 4x - 2$; Find $h(-9)$

$h(x) = 3\|2x\|$; Find $h(6)$	$k(a) = \|a\| + 1$; Find $k(-7)$

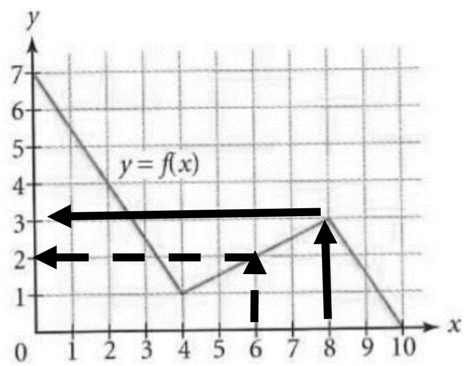
Notes:

Graphically, find the value from the domain on the x-axis and find the corresponding y value on the y-axis.

Example:

$f(8) = 3$

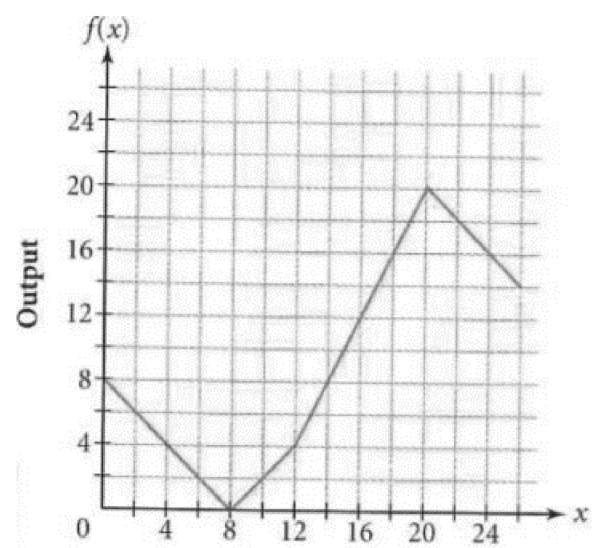
$f(6) = 2$



Use the graph to find the value of the function at the given domain values:

Find $f(14)$

Find $f(20)$



Day 3: Determining the range of a Function

Notes:
When given multiple values of the domain, plug each number in separately to find their corresponding value in the range.

Example:

$f(x) = -4x^2 + 8x + 3; D = \{-2, -1, 0, 1\}$

$f(-2) = -4(-2)^2 + 8(-2) + 3$
$f(-2) = -4(4) - 16 + 3$
$f(-2) = -16 - 16 + 3$
$f(-2) = -32 + 3$
$\boldsymbol{f(-2) = -29}$

$f(-1) = -4(-1)^2 + 8(-1) + 3$
$f(-1) = -4(1) - 8 + 3$
$f(-1) = -4 - 8 + 3$
$f(-1) = -12 + 3$
$\boldsymbol{f(-1) = -9}$

$f(0) = -4(0)^2 + 8(0) + 3$
$f(0) = -4(0) + 0 + 3$
$f(0) = 0 + 0 + 3$
$f(0) = 0 + 3$
$\boldsymbol{f(0) = 3}$

$f(1) = -4(1)^2 + 8(1) + 3$
$f(1) = -4(1) + 8 + 3$
$f(1) = -4 + 8 + 3$
$f(1) = 4 + 3$
$\boldsymbol{f(1) = 7}$

So, the range of the function given the domain is $R = \{-29, -9, 3, 7\}$

What Did They Call the Duck Who Became a Test Pilot?

Follow the directions given for each section. Cross out each box in the rectangle below that contains a correct answer. When you finish, print the letters from the remaining boxes in the spaces at the bottom of the page.

I For each function, find the indicated values.

1. $f(x) = 2x - 5$ A. $f(6)$ B. $f(1)$
2. $f(x) = x^2 - 4$ A. $f(12)$ B. $f(-2)$
3. $g(x) = x^2 - 7x + 1$ A. $g(3)$ B. $g(0)$
4. $h(x) = \dfrac{x+3}{x^2 + x - 6}$ A. $h(4)$ B. $h(-1)$

II Find the range of each function for the given domain.

5. $f(x) = 3x + 2$ $D = \{-2, 0, 2\}$
6. $g(x) = 9 - 5x$ $D = \{-3, -1, 1\}$
7. $F(x) = 2x^2 - 1$ $D = \{5, 1, -4\}$
8. $h(x) = x^2 - 8x + 3$ $D = \{1, 0, -1\}$
9. $f(t) = \dfrac{t^2 + 4t}{t - 6}$ $D = \{4, 0, -4\}$
10. $G(n) = -n^2 + 2n + 3$ $D = \{-2, 1, 4\}$

SK $\{49, 1, 31\}$	Y 0	S $\frac{1}{2}$	AF $\{49, -1, 9\}$	E $\{-16, 0\}$	IL 7	LY $\{-16, 8, -2\}$
BE $\{24, 14, 4\}$	ER $\{-5, 0\}$	ST $\{-5, 4\}$	QU $-\frac{3}{2}$	IT $-\frac{1}{3}$	I -3	A $\{24, 14, -7\}$
DU -11	CK $\{-4, 7, 12\}$	MB 140	IN $\{-4, 2, 8\}$	H $\{-4, 3, 12\}$	ER $\{-4, 2, -1\}$	UP 1

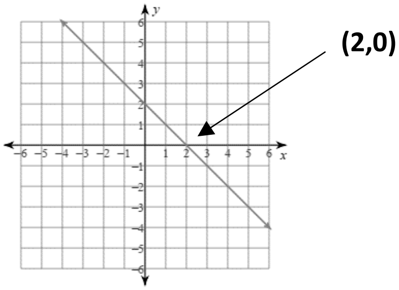
OBJECTIVE 1-b: To find values of a function; to find the range of a function for a given domain.

Day 4: Zeros (linear)

Notes:

Zero – The value of x where the function, y, is equal to 0

When given a graph, the zero is the x coordinate of the ordered pair where the line touches the x-axis.



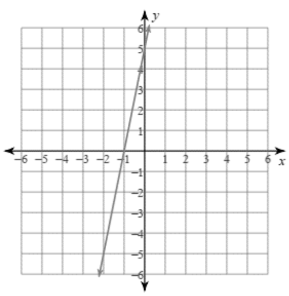
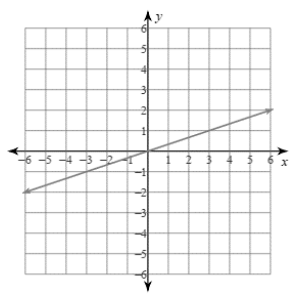
Notice that the graph touches the x-axis at the point (2,0). The zero of the function is $x = 2$.

When given an algebraic expression, substitute 0 in for y and solve for x.

$$\begin{aligned} y &= \tfrac{1}{2}x - 3 \\ (0) &= \tfrac{1}{2}x - 3 \\ 3 &= \tfrac{1}{2}x \\ \mathbf{6} &= \boldsymbol{x} \end{aligned}$$

$$\begin{aligned} 3x - 2y &= 8 \\ 3x - 2(0) &= 8 \\ 3x - 0 &= 8 \\ 3x &= 8 \\ \boldsymbol{x} &= \mathbf{\tfrac{8}{3}} \end{aligned}$$

Find the zeros of the following functions:

	
$y = -\dfrac{3}{4}x + 3$	$y = x + 5$
$2x + y = 2$	$x + 3y = -6$

$2 = -y + x$	$0 = 2y - x - 8$

Notes:
Now let's say $g(x) = 4x - 20$ and $h(x) = -\frac{1}{2}x + k$. We want to find a value for k so that the zero of $h(x)$ is equivalent to the zero of $g(x)$.

Remember that $g(x)$ and $h(x)$ are just another way of saying y, but it lets us distinguish between two separate equations that have the same independent variable.

Since k is not in $g(x)$, we can go ahead and find the zero of $g(x)$ by setting it equal to 0:

$$0 = 4x - 20$$
$$20 = 4x$$
$$5 = x$$

We know that the zero for $g(x)$ is 5 and since we want both functions to have the same 0, we can say $h(5) = 0$.

$$h(x) = -\frac{1}{2}x + k$$
$$0 = -\frac{1}{2}(5) + k$$
$$0 = -\frac{5}{2} + k$$
$$\boldsymbol{\frac{5}{2} = k}$$

So, if $k = \frac{5}{2}$, then both $g(x)$ and $h(x)$ will have the same zero, and that would be $x = 5$.

Find a value for k so that the following pairs of equations will have the same zero:

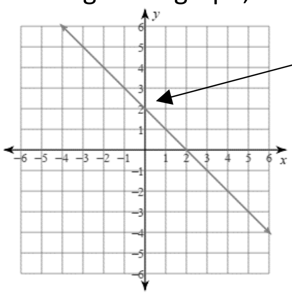
$f(x) = -3x + 18$ and $g(x) = 5x + k$	$t(x) = \frac{1}{2}x - 5$ and $v(x) = x + k$

Day 5: Intercepts (linear)

Notes:
x-intercept – the points where a graph crosses the x-axis, or $f(x) = 0$
y-intercept – the point where a graph touches the y-axis, or $f(0)$

Notice that the x-intercept is the same thing as the zero, which were covered yesterday. They are found the same way, and so for the sake of space we are going to just find the y-intercepts in these examples.

When given a graph, the y-intercept is the y coordinate of the ordered pair where the line touches the y-axis.



(0,2)

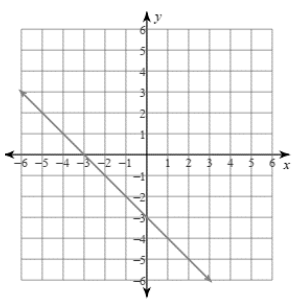
Notice that the graph touches the y-axis at the point (0,2). The y-intercept of the function is $(0,2)\ or\ y = 2$.

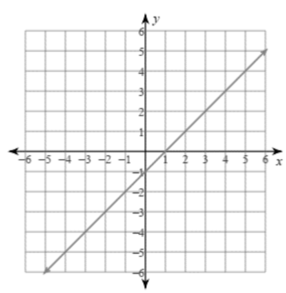
When given an algebraic expression, substitute 0 in for x and solve for y.

$$y = \frac{1}{2}x - 3$$
$$y = \frac{1}{2}(0) - 3$$
$$y = 0 - 3$$
$$\boldsymbol{y = -3}$$

$$3x - 2y = 8$$
$$3(0) - 2y = 8$$
$$0 - 2y = 8$$
$$-2y = 8$$
$$\boldsymbol{y = -4}$$

Find the x- AND y-intercepts of the following functions:





$y = -x - 1$

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

$x - 2y = 0$	$3x - y = 3$
$-y = -4x + 4$	$0 = -x - 5 + y$

Notes:

Now let's say $g(x) = 4x - 20$ and $h(x) = -\frac{1}{2}x + k$. We want to find a value for k so that the y-intercept of $h(x)$ is equivalent to the y-intercept of $g(x)$.

Since k is not in $g(x)$, we can go ahead and find the y-intercept of $g(x)$ by setting x equal to 0:

$$g(x) = 4(0) - 20$$
$$g(x) = 0 - 20$$
$$x = -20$$

We know that the y-intercept for $g(x)$ is -20 and since we want both functions to have the same y-intercept, we can say $h(0) = -20$.

$$h(x) = -\frac{1}{2}x + k$$
$$-20 = -\frac{1}{2}(0) + k$$
$$-200 = 0 + k$$
$$\mathbf{-20 = k}$$

So, if $k = -20$, then both $g(x)$ and $h(x)$ will have the same y-intercept, and that would be y$= -20 \; or \; (0, -20)$.

Now, for anyone who remembers slope-intercept form, $\boldsymbol{y = mx + b}$, they could remember that b represents the y-intercept and therefore could have gotten the answer just by looking at the question. (This only works when comparing y-intercepts)

Let $g(x) = -2x - 5$ and $h(x) = 6x + k$. For what value of k will the x-intercept of $h(x)$ be equivalent to the x-intercept of $g(x)$?	Let $e(x) = \frac{4}{5}x + 1$ and $c(x) = -\frac{2}{3}x + k$. For what value of k will the y-intercept of $c(x)$ be equivalent to the y-intercept of $e(x)$?

Day 1 Focus: Finding the slope (m) of a line
You will determine the slope of a line when given a graph or two Points.

Graphic Organizer Slope

ANSWER KEY

Slope

$\frac{\text{rise}}{\text{run}}$

Definition:
Slope is the steepness of a line

$\frac{\text{Change in } y}{\text{Change in } x}$

Slope Formula
Given 2 points
(x_1, y_1) and (x_2, y_2)

$$\frac{y_2 - y_1}{x_2 - x_1}$$

Using Slope to Write Linear Equations

Slope - Intercept form:

$y = mx + b$

m = slope
b = y-intercept

Point-Slope Form:

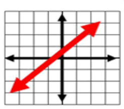
$y - y_1 = m(x - x_1)$

m = slope of the line

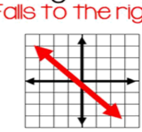
(x_1, y_1) = a point on the line

Types of Slopes

Positive:
Rises to the right

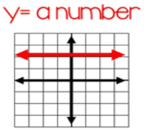


Negative:
Falls to the right



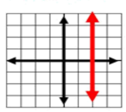
Zero:
Horizontal Line

y = a number



Undefined:
Vertical Line

x = a number



Find the slope between the 2 points:
(x_1, y_1) (x_2, y_2)

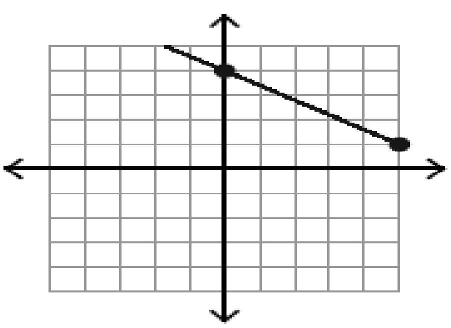
A) (2, 8) & (4, 7)

$$\frac{7-8}{4-2} = \frac{-1}{2}$$

B) (1, 3) & (-2, 9)

$$\frac{9-3}{-2-1} = \frac{6}{-3} = -2$$

Example 1: Given a graph of a line, determine the slope of a line



Find two points on the line

(0, 4) and (5. 1)

Step 1: Label the points (x_1, y_1) and (x_2, y_2)

(x_1, y_1) and (x_2, y_2)

(0, 4) and (5, 1)

Step 2: Use the slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$ and substitute the points

$m = \frac{(1)-(4)}{(5)-(0)} = \frac{-3}{5}$ **Answer: m =** $-\frac{3}{5}$

Example 2: Given two points (-2, -5) and (-3, 7), determine the slope of a line

Step 1: Label the points (x_1, y_1) and (x_2, y_2)

(x_1, y_1) and (x_2, y_2)

(-2, -5) and (-3, 7)

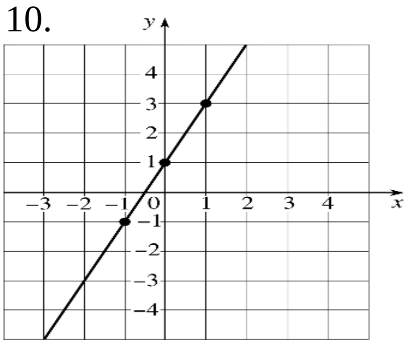
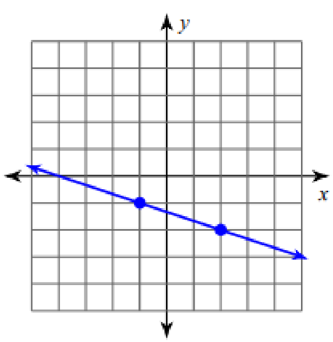
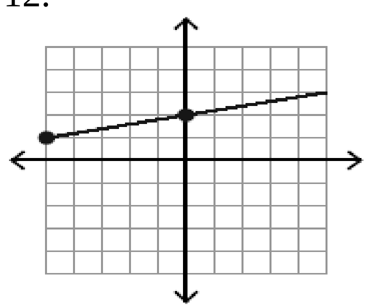
Step 2: Use the slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$ and substitute the points

$m = \frac{(7)-(-5)}{(-3)-(-2)} = \frac{12}{-1} = -12$ **Answer:** -12 ***(Be sure to reduce the fraction)***

Day 1

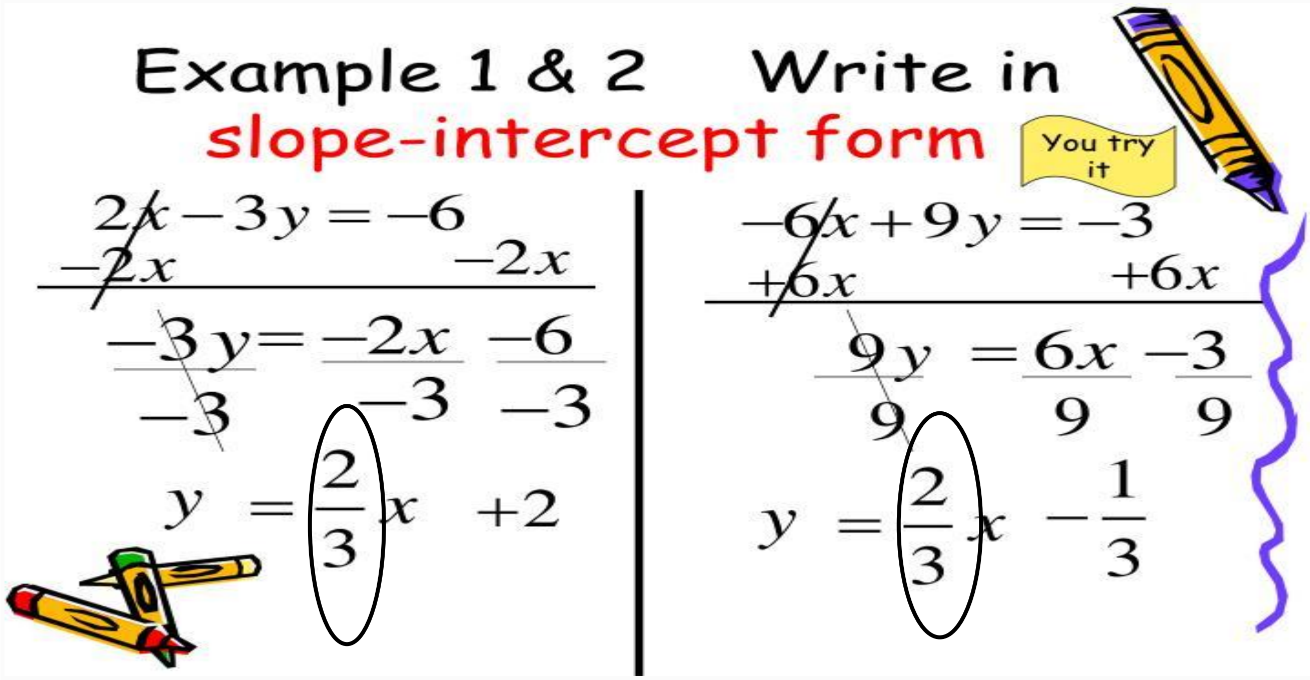
Directions: Determine the slope of the line given two points or a graph

1. (4. 3), (-1, 6)	2. (8, -2), (1, 1)	3. (2, 2), (-2, -2)
4. (6, -10), (6, 14)	5. (5, -4), (9, -4)	6. (11, 7), (-6, 2)
7. (-3, 5), (3, 6)	8. (-3, 2), (7, 2)	9. (8, 10), (-4, -6)

10. 	11. 	12. 

Day 2 Focus: Find the slope given an equation of a line

For these examples, the equations of a line are written in standard form. $Ax + By = C$



Answer: $m = \frac{2}{3}$ **Answer:** $m = \frac{2}{3}$

Example 3: The equation of a line is written in slope-intercept form.

$$y = \frac{3}{7}x + 5$$

The slope (m) is the coefficient (the number that is multiplied by a variable) in front of the variable, x. Therefore, (slope) **m =** $\frac{3}{7}$.

Day 2

Directions: Determine the slope of a line given the equation of a line

1. $3x + 5y = 25$	2. $x - 3y = -1$	3. $y = -\frac{2}{3}x - 1$
4. $y = -x + 2$	5. $3x - 4y = 12$	6. $-x + 5y = 6$
7. $y = \frac{1}{2}x$	8. $y = 5x + 6$	9. $-y = x + 5$
10. $y = -\frac{2}{3}x + 8$	11. $x - y = -6$	12. $y = -6x + 6$

Day 3: Focus: Write an equation of a line when given a two points or a graph

Example 1: Given the points (3, 0) and (4, 2), write the equation of a line in slope-intercept form.

Step 1: Use two points to find the slope. Use slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(2)-(0)}{(4)-(3)} = \frac{2}{1} = \mathbf{2}$

Step 2: Use the slope and the point to find the y-intercept (b) in the slope-intercept form:

$y = mx + b$

$$m = 2$$
$$x = 3$$
$$y = 0$$

$0 = (2)(3) + b$ Substitute the m = 2, and the ordered pair (3, 0) in x and y

$\underline{0 = 6 + b}$ Multiply the 2 and 3

$-6 \quad -6$ Subtract 6 from both sides of =

$-6 = b$

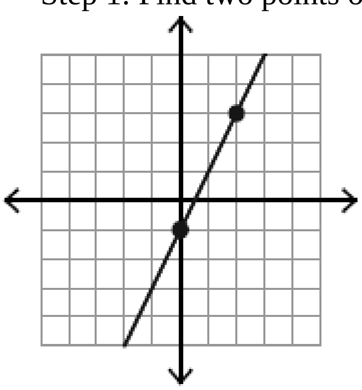
$b = -6$

Step 3: Substitute the m and the b in the slope-intercept form $y = mx + b$

Answer (slope-intercept form): $\boldsymbol{y = 2x - 6}$

Example 2: Give a graph, determine the equation of the line in slope-intercept form.

Step 1: Find two points on the line: ((0, -1), (2, 3)



Step 2: Use the slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$ and substitute the points

m = $\frac{(3)-(-1)}{(2)-(0)}$ = $\frac{4}{2}$ **Answer: m = 2**

Step 3: Find the y-intercept (where the line crosses the y-axis: $\boldsymbol{b = 0}$

Step 4: Substitute the slope intercept form $y = mx + b$

$$y = 2x + 0$$

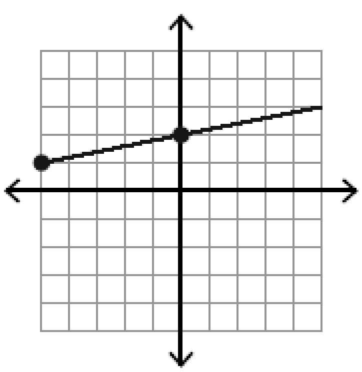
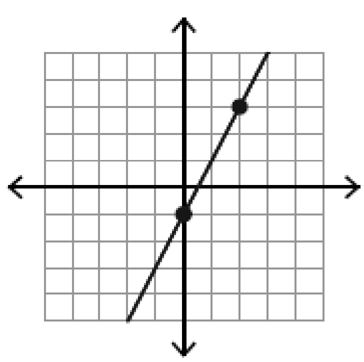
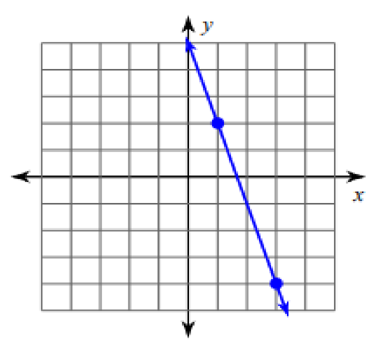
Answer (slope-intercept form): $\boldsymbol{y = 2x}$

Day 3: Part 1: Directions – Match the standard form (A – F) to the slope-intercept form (J – K)

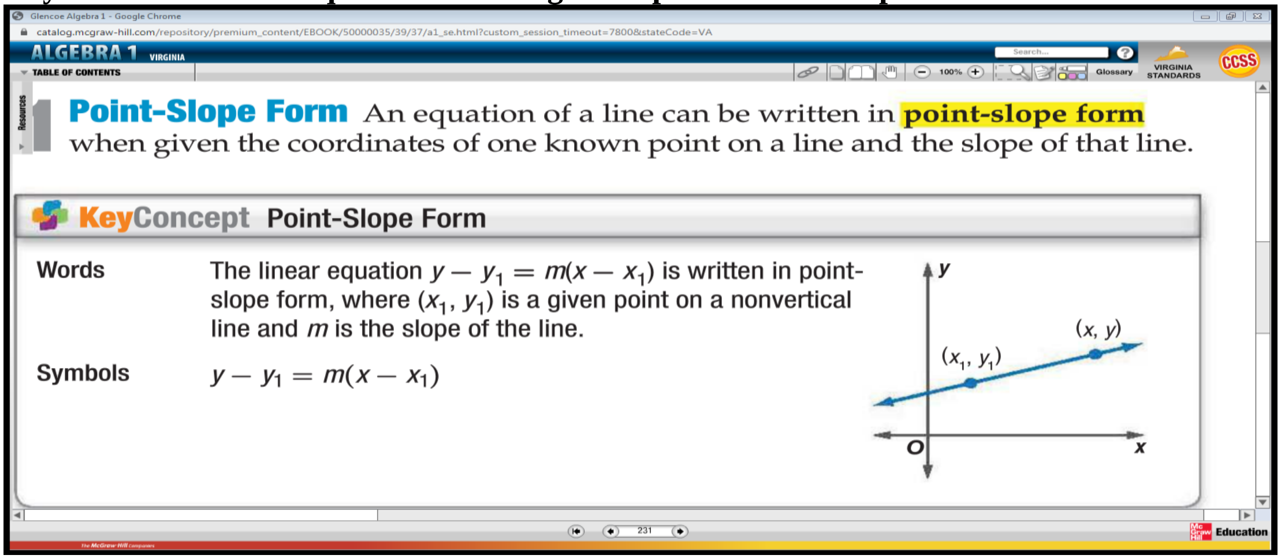
A $3x - 4y = 12$	B $5y + x = 6$	C $2y + 4x = 10$
D $7x - y = 11$	E $3x - 4y = 16$	F $2x - 3y = 15$

J $y = \frac{2}{3}x - 5$	I $y = -2x + 5$	H $y = -\frac{1}{5}x + \frac{6}{5}$
L $y = \frac{3}{4}x - 4$	G $y = 7x - 11$	K $y = \frac{3}{4}x - 3$

Part 2: Directions - Determine the slope-intercept form for the following graphs

1. 	2. 	3. 

Day 4: Determine the equation of a line given a point and the slope



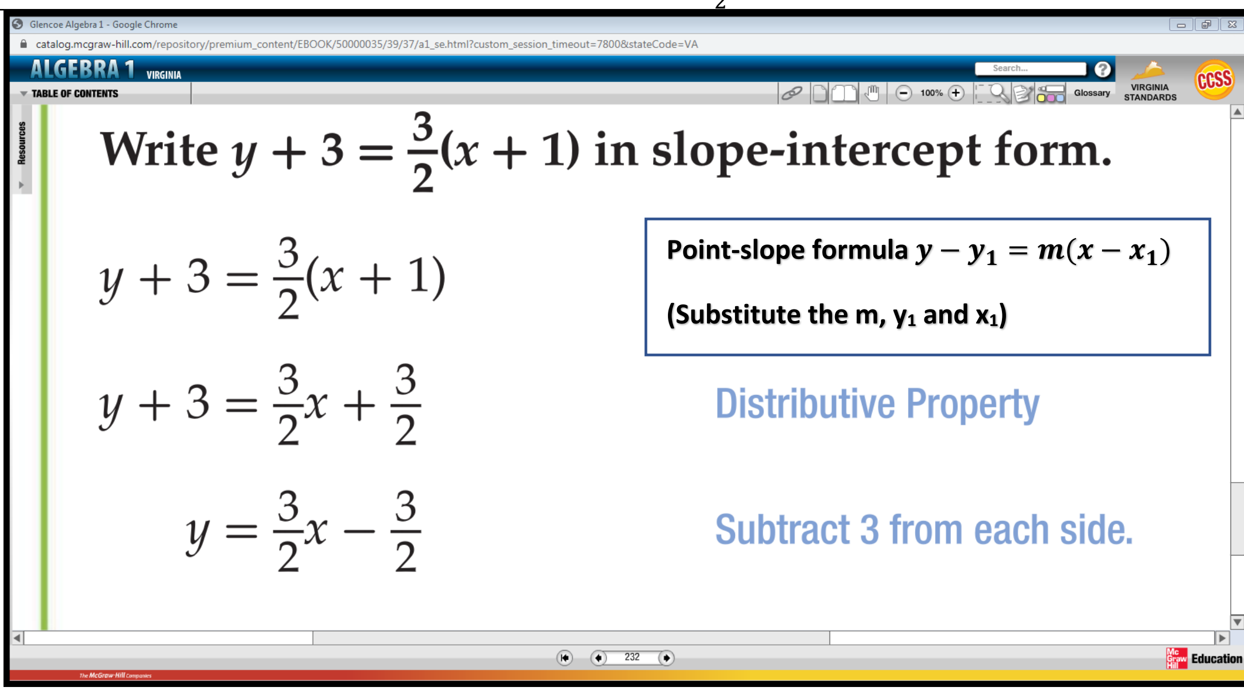
Point-Slope Form An equation of a line can be written in **point-slope form** when given the coordinates of one known point on a line and the slope of that line.

KeyConcept Point-Slope Form

Words The linear equation $y - y_1 = m(x - x_1)$ is written in point-slope form, where (x_1, y_1) is a given point on a nonvertical line and m is the slope of the line.

Symbols $y - y_1 = m(x - x_1)$

Example 1: Given the point (-3, -1) and the slope (m) = $\frac{3}{2}$, find slope-intercept form.



Write $y + 3 = \frac{3}{2}(x + 1)$ in slope-intercept form.

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

Point-slope formula $y - y_1 = m(x - x_1)$

(Substitute the m, y_1 and x_1)

$$y + 3 = \frac{3}{2}x + \frac{3}{2}$$ Distributive Property

$$y = \frac{3}{2}x - \frac{3}{2}$$ Subtract 3 from each side.

Example 2: Given a point (2, -2) and m = 3. Determine the slope-intercept form.

$y - y_1 = m(x - x_1)$ Point-Slope Form

$y - (-2) = 3(x - 2)$ Substitute the ordered pair (x_1, y_1) and m

$y + 2 = 3(x - 2)$ Substitution Property –(-2) = 2

$y + \cancel{2} = 3x - 6$ Distributive Property

$-\cancel{2} \qquad - 2$ Subtraction Property

$y = 3x - 8$ Slope-Intercept Form

Day 4: WHY WAS THE CAT KICKED OUT OF SCHOOL?

Either given a point and a slope, or two points, write each equation in slope-intercept form. Match the letter to a number in each set. Write the number in the matching numbered box at the bottom of the page.

Set 1	
E. (-3, 0); slope = $\frac{2}{3}$ ____________________	**8.** (2, -2); slope = 1 ____________________
H. (6, 2) and (-3, -7) ____________________	**3.** (4, 1); slope = $\frac{3}{2}$ ____________________
S. (-4, -6) and (3, 8) ____________________	**10.** (3, 4) and (-6, -2) ____________________
W. (-2, -8) and (6, 4) ____________________	**5.** (-3, -4); slope = 2 ____________________

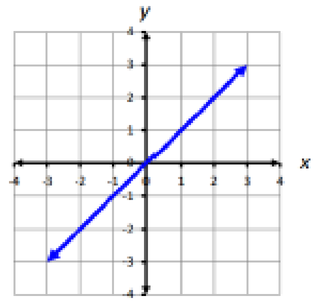
Set 2	
A. (-9, 17); slope = $-\frac{4}{3}$ ____________________	**12.** (-4, -5); slope = $\frac{1}{2}$ ____________________
C. (-3, 9) and (0, 1) ____________________	**6.** (3, 1) and (9, -7) ____________________
E. (1, -8); slope = -1 ____________________	**7.** (3, -7); slope = $-\frac{8}{3}$ ____________________
A. (2, -2) and (8, 1) ____________________	**2.** (5, -12) and (-3, -4) ____________________

Set 3	
H. (-12, 4) and (0, 2) ____________________	**9.** (-6, -4) and (12, 11) ____________________
E. (6, 6); slope = $\frac{5}{6}$ ____________________	**4.** (2, -8); slope = $-\frac{7}{2}$ ____________________
H. (-8, -4) and (4, -7) ____________________	**11.** (5, 1) and (10, 5) ____________________
T. (-5, -7); slope = $\frac{4}{5}$ ____________________	**13.** (6, 1); slope = $-\frac{1}{6}$ ____________________
A. (-4, 13) and (-2, 6) ____________________	**1.** (-4, -5); slope = $-\frac{1}{4}$ ____________________

1	2		3	4	5		6		7	8	9	10	11	12	13	!

Day 5: Focus: Using the parent function $y = x$ and describe transformations defined by changes in the slope or y-intercept.

LINEAR PARENT FUNCTION

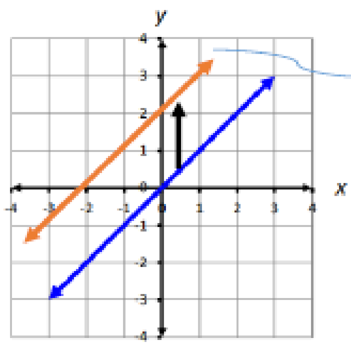


$f(x) = x$

$m = 1$

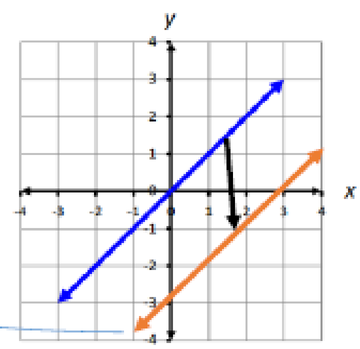
$b = 0$

Vertical Translations

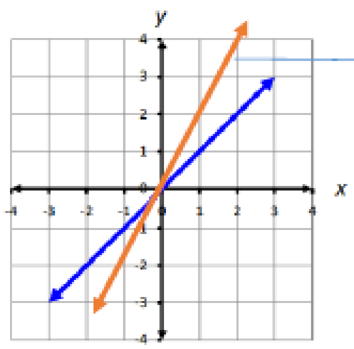


Shift up

Shift down

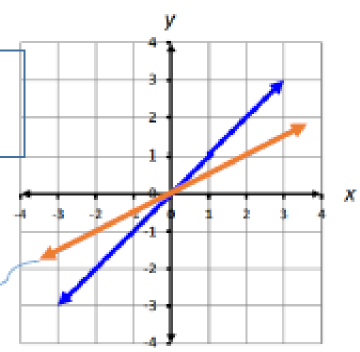


Vertical Dilations



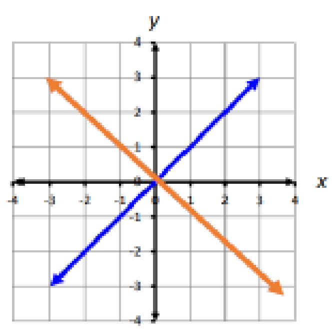
Stretch because the slope is greater than 1, so it is steeper

Compression because the the slope is between 0 & 1, so it is less steep.



Reflection

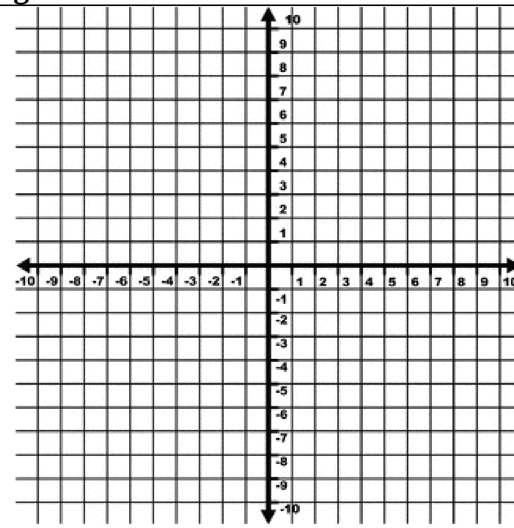
The slope is negative!



Day 5: Transformation Investigation

1. Sketch a graph for $y = x$. (consider using a regular black lead pencil)
2. Sketch a graph for each of the following equations. (consider using different colored pencils)

$$y_1 = x + 1 \qquad y_2 = x + 4 \qquad y_3 = x - 1 \qquad y_4 = x - 3$$



3. Complete the table below with the y-intercept and slopes for each equation.

	y	y_1	y_2	y_3	y_4
y-intercept					
Slope					

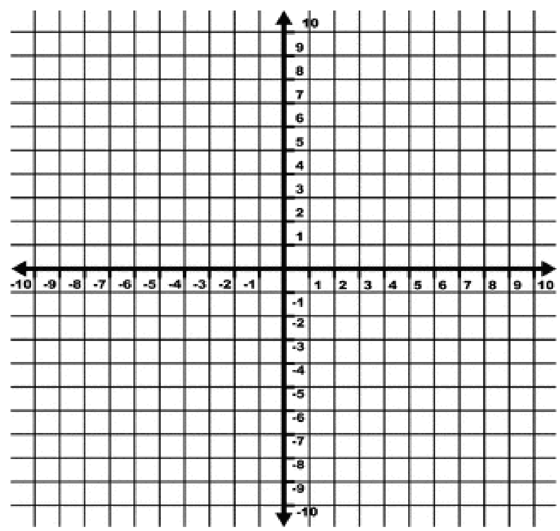
- What effect does changing b have on the parent function $y = x$?

- What generalizations can you make about the transformation seen when you change the y-intercept of a function?

4. Sketch a graph for $y = x$. (consider using a regular black lead pencil)
5. Sketch a graph for each of the following equations (consider using different colored pencils)

$$y_1 = 2x \qquad y_2 = \frac{1}{2}x \qquad y_3 = -5x \qquad y_4 = -\frac{2}{3}x$$

Record data in the table and then answer the following questions:



	y	y_1	y_2	y_3	y_4
y-intercept					
Slope					

- Compare the data for y_1, y_2, y_3, y_4 to the data for the parent function. What effect(s) does changing the slope have on the parent function?

- What generalizations can you make about the transformation seen in a graph when you change the slope of a function?

Week 3

A.4d Solve Systems Algebraically and Graphically….. Remember Desmos is a great tool for verifying your answer.

Exploratory: Day 1

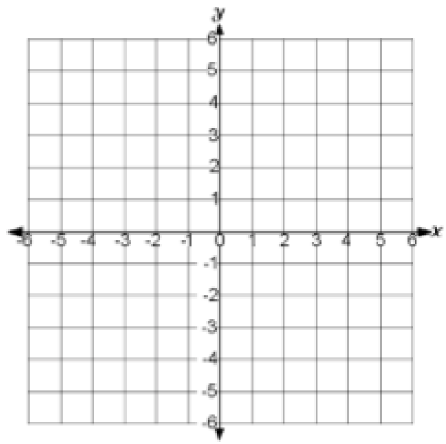
Solving a System by Graphing

I. System of Equations:

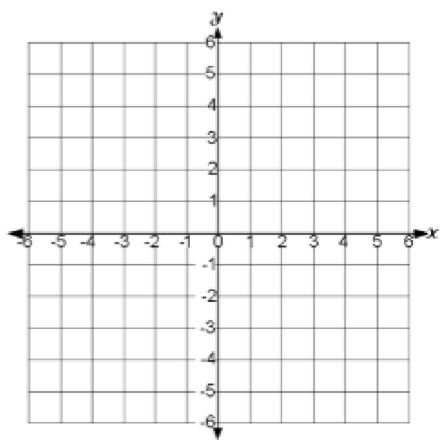
II. A system of equations can have 3 types of solutions.

System	Graph	Solution

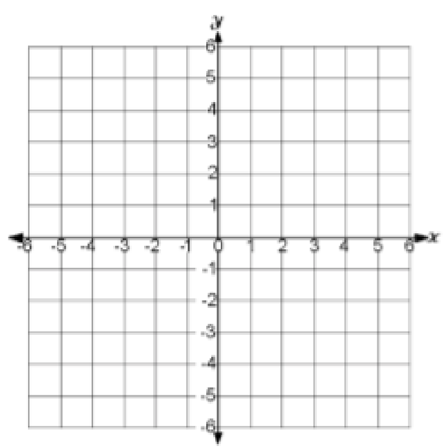
Ex 1. $\begin{cases} x + y = -4 \\ -2x + y = 2 \end{cases}$



Ex 2. $\begin{cases} -x + 2y = 2 \\ 3x - 6y = 12 \end{cases}$



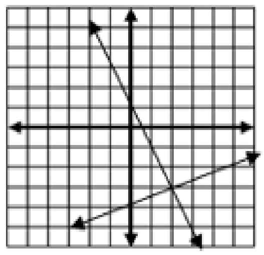
Ex 3. $\begin{cases} -8x + 2y = 8 \\ 4x - y = -4 \end{cases}$



Graphing Systems of Equations Cw

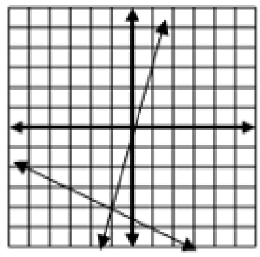
State the solution as a coordinate, infinite or none.

1.



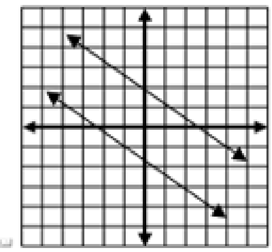
Solution:_______

2.



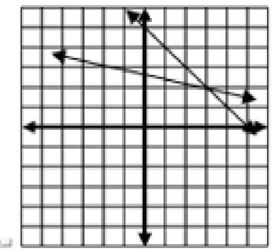
Solution:_______

3.



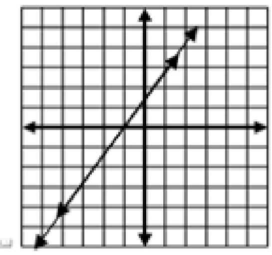
Solution:_______

4.



Solution:_______

5.



Solution:_______

SOLVE ALGEBRAICALLY: SOLVE **USING ELIMINATION:**

Steps to Solving Systems using ELIMINATION
Step 1: Line up LIKE terms for all equations **Step 2: ADD or SUBTRACT equations to eliminate the variable with matching coefficients** **Step 3: SOLVE the equations for the remaining variable** **Step 4: SUBSTITUTE your answer into either original equations and SOLVE for the other variable.** **Step 5: Write your answer as an ordered pair.**

Step 1 $\begin{cases} 3x + 4y = 18 \\ -2x + 4y = 8 \end{cases}$ **by elimination.**

Step 2

$$3x + 4y = 18$$
$$-(-2x + 4y = 8)$$

Step 3

$$3x + 4y = 18$$
$$+2x - 4y = -8$$

Add the opposite of each term in the second equation.

$$5x + 0 = 10$$

Eliminate the y-term.

$$5x = 10$$

Simplify and solve for x.

$$x = 2$$

Step 4

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

Write one of the original equations.

$$-2(2) + 4y = 8$$

Substitute 2 for x.

$$-4 + 4y = 8$$
$$+4 \qquad +4$$

Add 4 to both sides.

$$4y = 12$$

Simplify and solve for y.

$$y = 3$$

Step 5 $(2, 3)$ *Write the solution as an ordered pair.*

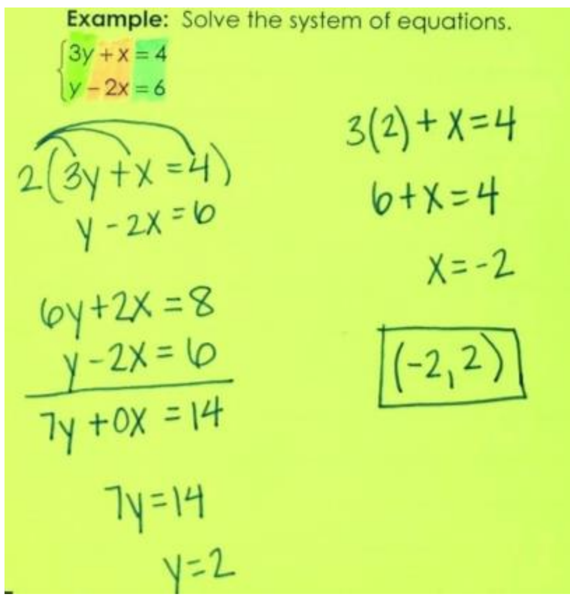
Solve each system using the elimination method: You may have to use notebook paper to solve the equations.

1. $-2x - 4y = 22$ $5x + 4y = -1$	2. $2x + 6y = -38$ $2x - 3y = 7$	3. $8x - 3y = 42$ $5x - 3y = 24$	4. $9x + 3y = -27$ $-9x - y = 27$

Day 2

What do you do if there are no matching coefficients?

- Multiply one or both equations by some number to create a matching coefficient.



SOLVE BY ELIMINATION….You HAVE To MAKE a zero pair by multiplying one equation by something!! You can multiply by anything, but what you do to one term you must do to every term!

1. $x + 3y = 6$ $2x - 7y = -1$	**2.** $9x + 3y = 12$ $2x + y = 5$	**3.** $3x - y = 14$ $5x + 4y = 12$	**4.** $x + y = -3$ $5x - 2y = -50$

Day 3: SOLVING BY THE SUBSTITUTION METHOD:

Steps to Solving Systems using ELIMINATION
Step 1: SOLVE one equation for X or Y. **Step 2: SUBSTITUTE the expression from step 1 into the other equation.** **Step 3: SOLVE the remaining variable.** **Step 4: Use the new value from step 3 to find the value of the other variable.** **Step 5: Write your answer as an ordered pair.**

Example:

1. $\begin{cases} y - 2x = -17 \\ x + y = 16 \end{cases}$ $\boxed{(11,\ )}$

Solve for a single variable	Substitute and Solve	Find other value and write solution
$y - 2x = -17$ $+2x \quad +2x$ $y = \boxed{2x - 17}$	$x + \boxed{y} = 16$ $x + (2x - 17) = 16$ $3x - 17 = 16$ $+17 \quad +17$ $\frac{3x}{3} = \frac{33}{3}$ $\boxed{x = 11}$	$y = 2\boxed{x} - 17$ Y = 2(11) – 17 Y = 22 – 17 Y = 5 Solution: (11, 5)

SOLVE EACH SYSTEM USING THE SUBSTITUTION METHOD:

1. y = x + 8 x + y = 2	**2.** y = 2x 5x – y = 9
3. y = x + 2 3x + 3y = 6	**4.** x = 3y 2x + 4y = 10
5. y = 2x + 1 2x – y = 3	**6.** 2x + y = -2 5x + 3y = -8

Use 2 different methods to solve the problems below:

SYSTEM A	Method of Choice: _______ Graphing ______ Substitution ______ Elimination
$x - y = -2$ $7x + 2y = -5$	Solution: ______________

SYSTEM B	Method of Choice: _______ Graphing ______ Substitution ______ Elimination
$8x + 5y = -13$ $3x + 4y = 10$	Solution: ______________

PRACTICAL PROBLEMS Match each word problem to the correct system of equations:

1. Nick Canon met his 9 cousins at a family reunion. The number of male cousins (x) was 2 less than the number of female cousins (y).	2. Kylie Jenner spent $25 to buy different size balloons for her daughter Stormi's birthday party. She bought pink balloons which cost $3 and purple balloons which cost $2.	3. Missy Elliot is buying Pies and cupcakes. She is spending a total of $25. Pies cost $9 and cupcakes $2. She bought a total of 9 pies and cupcakes.
4. A math quiz has 24 questions. Some questions are worth ¼ of a point and others are worth ½ of a point. There are a total of 9 points on the quiz.	5. Every time Lizzo gets change from a store she places it in a container. She has a mixture of nickels and quarters in the container. She has 25 coins and $5.	6. Billie Eilish is trying to save up for a new phone. In her savings jar she has quarters and nickels. She has a total of 25 coins and $9.

A. $.25x + .5y = 9 \; and \; x + y = 25$	B. $x + y = 25 \; and \; .25x + .05y = 9$
C. $x + y = 25 \; and \; .25x + .05y = 5$	D. $x + y = 9 \; and \; 9x + 2y = 25$
E. $x + y = 9 \; and \; x = y - 2$	F. $x + y = 9 \; and \; 3x + 2y = 2$

ANSWERS 1. ______ 2._______ 3. ________ 4. ________ 5. ________ 6._________

Day 3

Reminder:

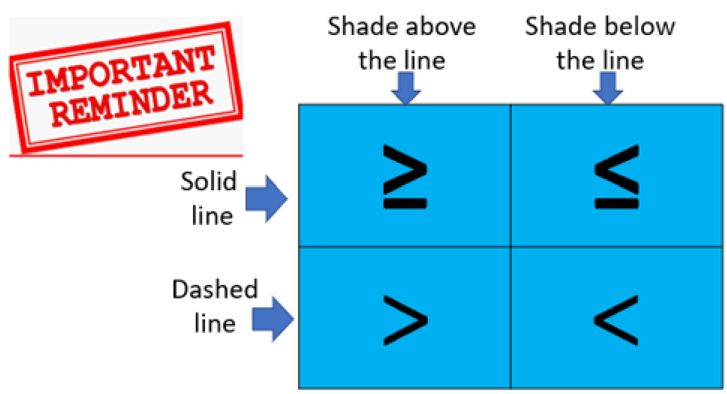
How to Graph a Linear Inequality in two variables

1. **Rearrange the equation so "y" is on the left and everything else on the right. (Slope-intercept form)**
2. **Plot the "y=" line (make it a solid line for y≤ or y≥, and a dashed line for y< or y>)**
3. **Use a test point to determine which side of the line to shade.**
   - ❖ **All the points within the shaded region represents a solution to the inequality**

*** Some of you skip the whole test point and just think logically… Greater than would be points above the line…LESS THAN would be points below the line. If you get confused by which way is up…than use a test point, plug the point into the inequality and see if it works. DESMOS is an awesome way to make sure your work is correct and it even shows the difference between a dashed and solid line!

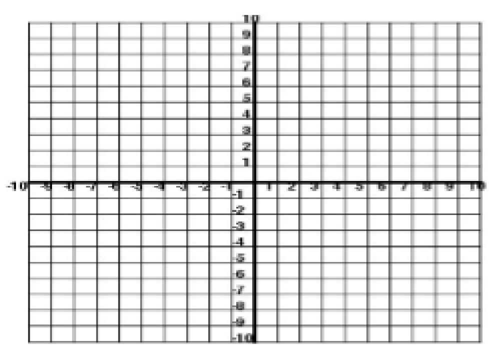
DO NOT FORGET TO SHADE!!! The shaded section represents the SOLUTION, all the points that will work in the inequality.

Recap

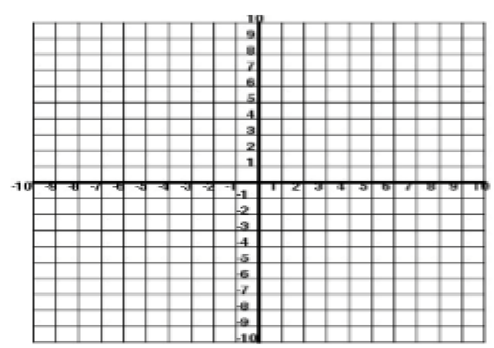


Practice Graphing Inequalities

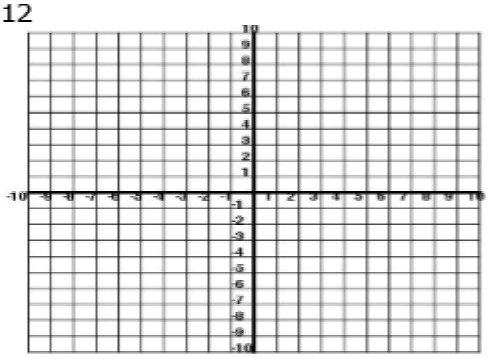
1. $y > \frac{1}{3}x - 5$



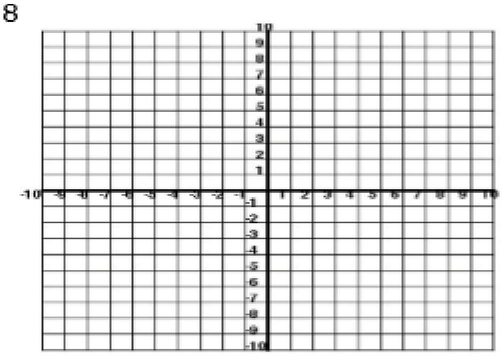
2. $y \leq -2x - 1$



3. $5x - 2y > 12$



4. $x - 4y < 8$



Day 4

SYSTEMS OF INEQUALITIES

Step 1: Graph both inequalities using the notes from day 3

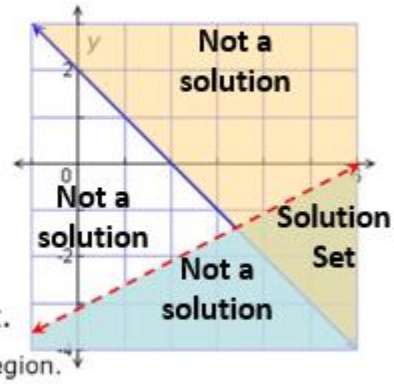
Step 2: The solution to a system of inequalities is any point that's located in the OVERLAPPING OR DOUBLE SHADED REGION. These points satisfy both inequalities.

1. Graph the system of inequalities.

$$\begin{cases} y < \frac{1}{2}x - 3 \\ y \geq -x + 2 \end{cases}$$

For $y < \frac{1}{2}x - 3$, graph the dashed boundary line $y = \frac{1}{2}x - 3$, and shade below it.

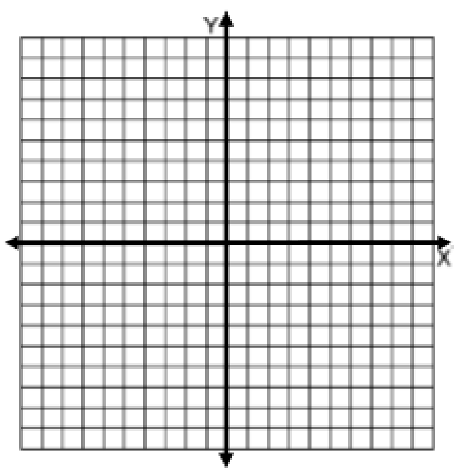
For $y \geq -x + 2$, graph the solid boundary line $y = -x + 2$, and shade above it.



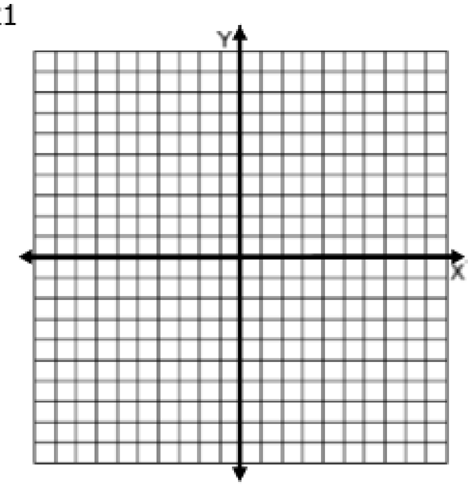
The overlapping region is the solution region.

SOLVE EACH SYSTEMS OF LINEAR INEQUALITIES: by graphing and shading

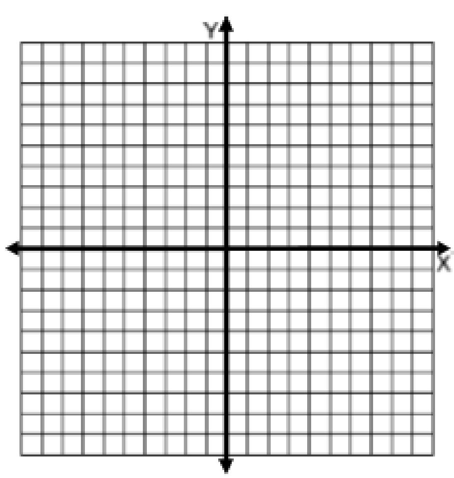
1. $x + y > -1$
$x - y > 5$



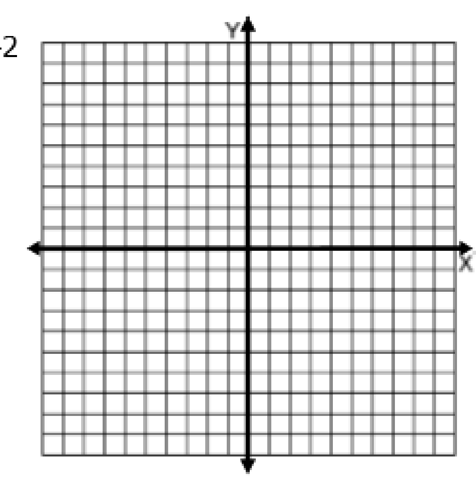
2. $-x + 3y < 21$
$y \geq -x + 4$



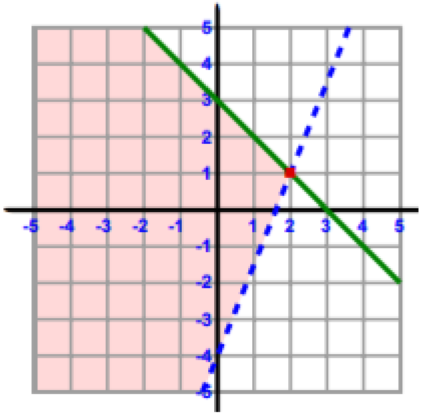
3. $x - 4y \leq 24$
$2x - y \geq -1$



4. $x < -4$
$3x + 2y \leq -2$



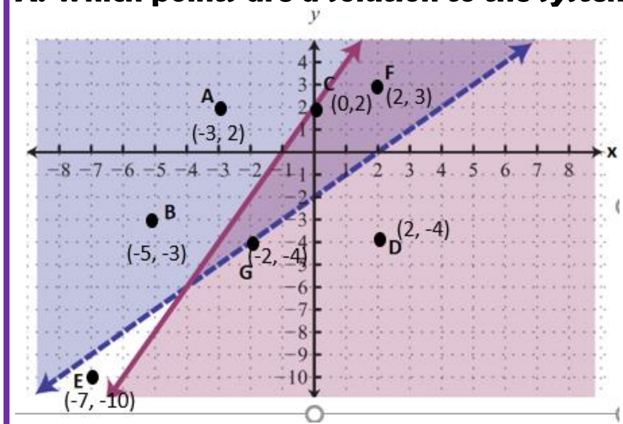
Task 1:
Can you write the system of inequalities?



Y ______________________________

Y______________________________

Task 2:
A. Which points are a solution to the systems?



Points:_________________ are solutions

B. Can you write the Systems?

Y ______________________________

Y______________________________

Day 5

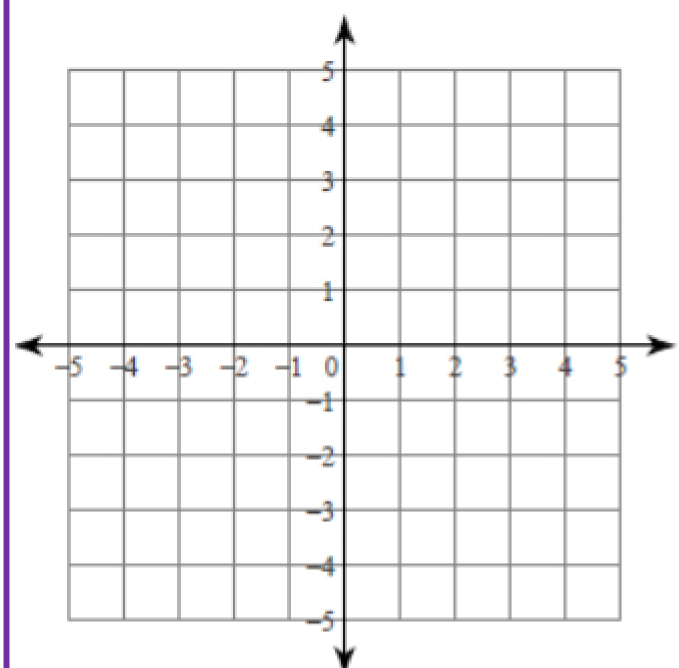
Task 3:
A. Graph the systems of inequalities

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

B. Which of the following points are solutions?

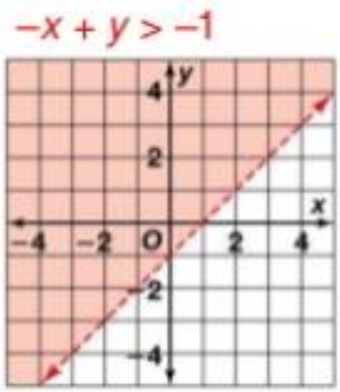
(0, 0)	(1, 4)	(0, -4)
(5, -4)	(-3, -2)	(-4, -5)

Task 3A



Task 4

A. Complete the systems of inequalities by graphing $y \geq -x + 3$



B. Which of the following points are solutions?

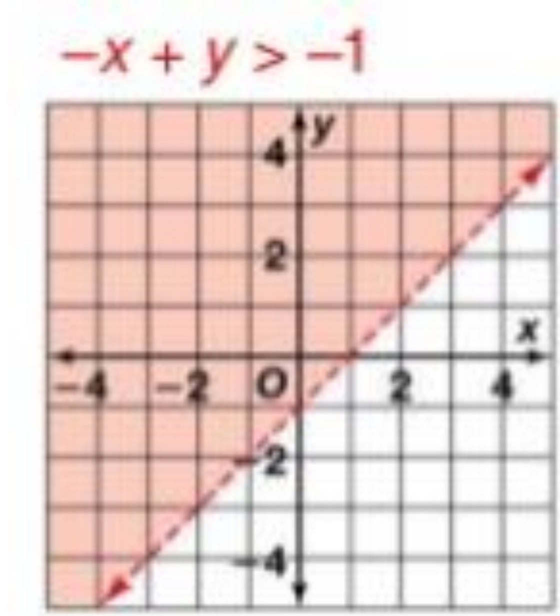
A. (0,2)

B. (4, 1)

C. (2, -1)

D. (3, 4)

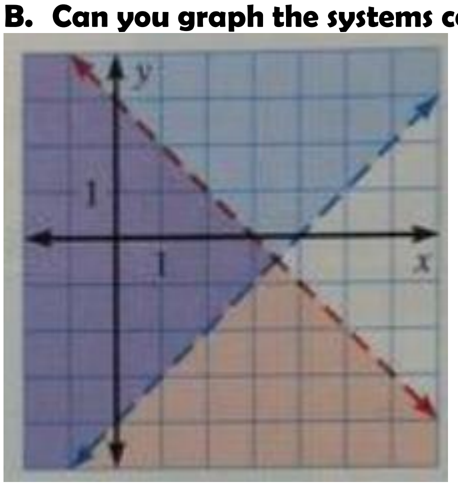
Task 4A



Task 5

A.What's wrong with the graph?

B. Can you graph the systems correctly?



Collen was asked to graph:

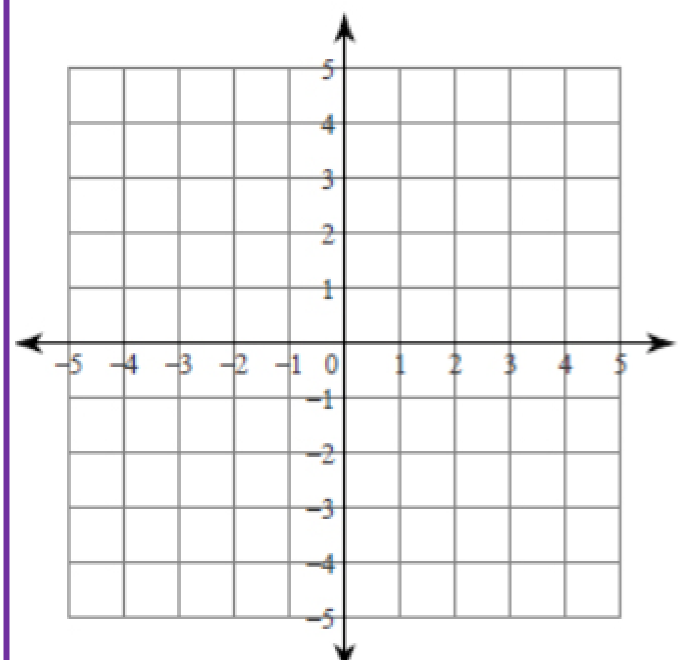
Y > x – 4

Y ≤ -x + 3

Task 5

A. What's wrong with the graph?

B. Graph the System of inequalities correctly

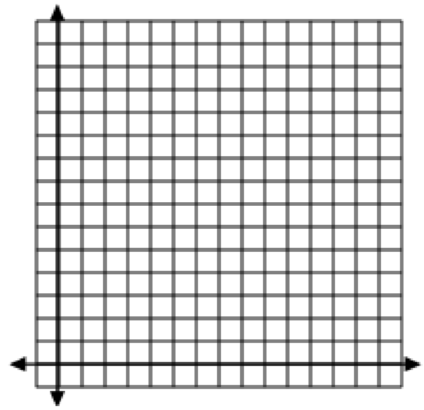


1. Suppose you buy flour and cornmeal in bulk to make flour tortillas and corn tortillas. Flour costs \$1.50 per pound and cornmeal costs \$2.50 per pound. You want to spend less than \$25 on flour and cornmeal, but you need at least 6 pounds altogether.

a. Write and graph a system of linear inequalities:

____

____



b. Write two possible solutions:

i. ______________________________

ii. ______________________________

SOL REVIEW QUESTIONS:

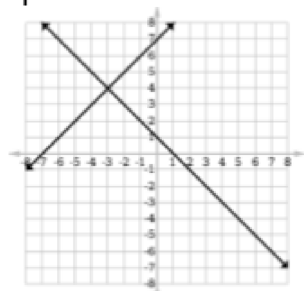
. What is the **y** value of the solution to this system of equations?

$$y = 2x - 11$$
$$-3x + 2y = -17$$

a) -1 b) 1
c) -6 d) 5

What appears to be the solution to the graph of the system of equations below?

a) (1, 0)
b) (4, -3)
c) (-3, 4)
d) (-7, 0)



.Directions: Select ALL correct answers. Which ordered pairs are solutions to the following system of inequalities?

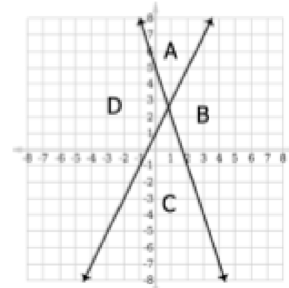
$$y \le 3x + 1$$
$$-2x - 2y < 6$$

(-1, -2)	**(4, 0)**
(3, -3)	**(-3, 0)**

Which area should be shaded to show the solution to the system of inequalities?

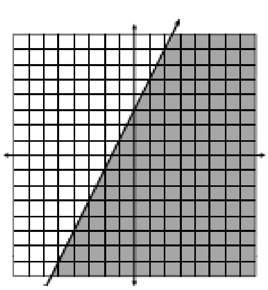
$$y \ge 2x + 1$$
$$3x + y \le 5$$

a) A
b) B
c) C
d) D

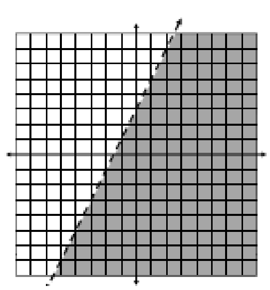


Which graph represents the solution to the inequality $2x - y \ge -3$?

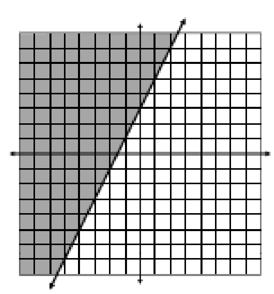
A.



B.



C.



D.