Unit 3H: Algebraic Systems Study Guide Name: ______________________________ Per: ____

SHOW YOUR WORK FOR FULL CREDIT. NO WORK, NO CREDIT. NO WORK IN PEN.

		Due Date	
Assn	Topic	A Day	B Day
3.1	Number of Solutions and Graphing	Sept 17	Sept 18
3.2	Solve by Substitution	Sept 19	Sept 20
3.3	Solve by Elimination	Sept 21	Sept 24
3.4	More Practice	Sept 25	Sept 26
3R	Review of Unit 3	Sept 27	Sept 28
	Study Guide	Sept 27	Sept 28
	Linear Systems EMT	Oct 1	Oct 2

Targets	Sample Question	☹	:/	☺
Map the solution set for a given set of parameters.	$\begin{cases} y > \frac{3}{5}x + 3 \\ y < -x + 3 \end{cases}$ Graph and circle the region of solutions			
Approximate solutions by looking at a graph	By looking at the graph, approximate the solution.			
Find solution(s) from a system of equations by setting equal/substitution	Solve the system by setting them equal to each other. $y = x + 8$ AND $2x + y + 10 = 0$ or $x + y = 3$ AND $x = 2y$			
Find solution(s) from a system of equations by elimination	Use elimination to solve the following system of equations: $x + y = 13$ AND $x - y = 5$			
Be able to explain the number of solutions a system has	How many solutions does the following equation have and how do you know.			
Find solution(s) from a system of equations (or inequalities) from a story problem.	Hank sells 3 boxes of oranges and 4 boxes of apples for \$50.50. Charlie sold \$75 with 6 boxes of apples and 5 boxes of oranges. How much did a box and apples and oranges cost?			

Vocabulary:

System of Equations (or Inequalities):______________________________

Solution: ______________________________

Solution Set: ______________________________

Boundary Line:______________________________

Solve by Graphing: ______________________________

Solve by Substitution:______________________________

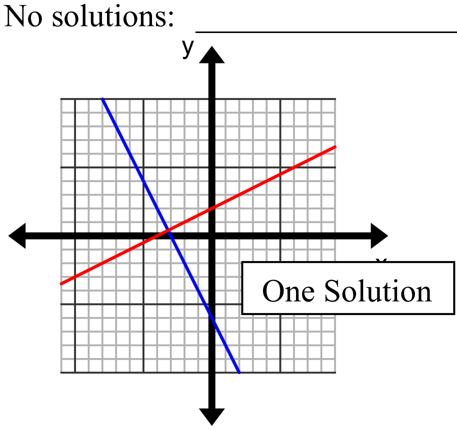
Solve by Elimination: ______________________________

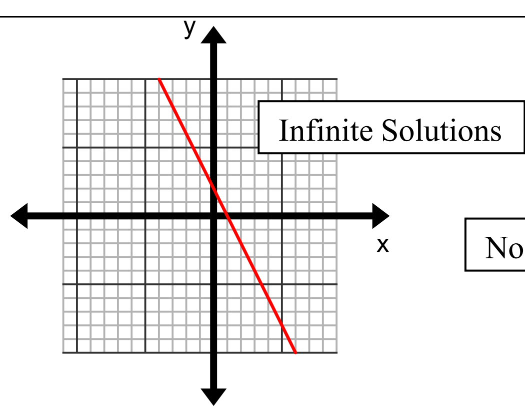
Number of Solutions for Systems of Linear Equations

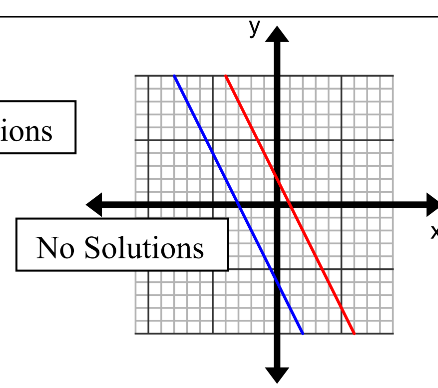
One solution:______________________________

An infinite number of solutions:______________________________

No solutions: ______________________________







System of Equations is a fancy phrase for finding where two (or more) different linear equations have the _________ answer (or cross on a graph.) Linear ______________ have two variables, often x and y. In a system, both equations have the same value for the x and the _______.

Solve by Graphing Graphing gives a **good estimate** of the solution set.

1. Graph the two ________________ and see where they intersect. $\begin{cases} 4x + 3y = -12 \\ 2x + 8y = 4 \end{cases}$
2. This is your solution. (Remember, this gives you an estimate, but it should be very close to the answer.)

To solve the following by graphing: $\begin{cases} 4x + 2y = -12 \\ 2x + -4y = -8 \end{cases}$

1

$4(0) + 2y = -12$
$2y = -12$
$y = -6$

2

$4x + 2(0) = -12$
$4x = -12$
$x = -3$

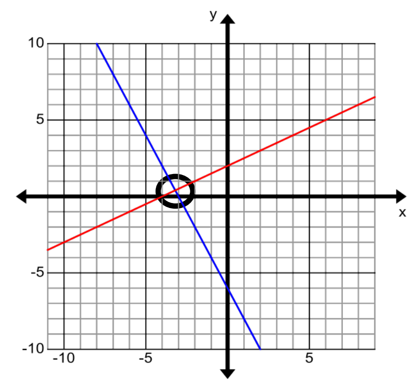
Step 1: Since the equations are NOT in Slope-Intercept Form, find the y-intercept for the equations, by plugging in ____ for x. In this case, the y-intercept is (0, – 6).

Step 2: Repeat by plugging in 0 for y to find the x-________________. In this case, the x-intercept is (–3, 0).

Step 3: Plot the intercepts and connect the points for the first equation.

Step 4: Plot the intercepts for the second equation. In this case, (0, 2) & (–4, 0).

Step 5: Find where the two lines cross on the grid. This is a close estimate (it may be right on!) for your answer. The solution is **ABOUT** (–3, 0).



In this case, checking with an algebraic methods, or using your graphing calculator, the answer is $\left(-\frac{16}{5}, \frac{2}{5}\right)$

Solve by Setting Equal

Find a solution for the equations $8x + 16y = -24$ and $x - y = 9$.

Step 1: Solve both equations for the same ______________. The variable must be ___________ with a co-efficient of positive one.

Step 2: Since the two equations are equal to the same variable, you can set them ____________ to each other. (Transitive Property)

Step 3: Solve the new ________________.

Step 4: Plug this value into either original equation to get the other half of the _________________ point.

1

$8x + 16y = -24$
$-16y = -16y$
$\frac{8x}{8} = \frac{-16y - 24}{8}$
$x = -2y - 3$

$x - y = 9$
$+y = +y$
$x = y + 9$

2

$-2y - 3 = y + 9$
$+2y \quad = +2y$
$0 \quad - 3 = 3y + 9$
$- 9 = \quad - 9$
$- 12 = 3y$
$-12/3 = 3/3y$
$-4 = y$

$x - y = 9$
$x - (-4) = 9$
$-4 = -4$
$x = 5$

(Since we know that y = -4, we can put that into either __________________.)

Your values make up your point on the graph or the "solution." (5, –4)

Step 5: Check your work with the other equation to make sure that it is true.

5

$8(5) + 16(-4) = -24$
$40 - 64 = -24$

So, (5, – 4) is correct !

Solve Using the Substitution

Find a solution for $\begin{cases} 8x + 16y = -24 \\ x - y = 9 \end{cases}$

Step 1: Solve one of the equations for either ________________.

Step 2: Plug that expression (that still has the other variable) into the other ________________ and solve for the answer.

Step 3: Plug that number into either equation and solve for the other ____________.

Step 4: List your answer as a coordinate _________.

Step 5: Check by plugging both numbers into both equations.

1

$x - y = 9$
$+y = +y$
$x = y + 9$

2

$8x + 16y = -24$
$8(y + 9) + 16y = -24$
$8y + 72 + 16y = -24$
$24y + 72 = -24$
$-72 = -72$
$24y = -96$
$24 = 24$
$y = -4$

3

$x - y = 9$
$x - (-4) = 9$
$x + 4 = 9$
$-4 = -4$
$x = 5$

4

(5, –4)

Use Setting Equal or Substitution to solve the following equations.

- $\begin{cases} -x + 4y = 5 \\ x + 6y = 15 \end{cases}$
- $\begin{cases} 2x - 3y = -5 \\ -x + y = 5 \end{cases}$
- $3x - y = 30$ and $x + y = 14$

Solve by Elimination

Solve the following system: $\begin{cases} -3y - 5x = 8 \\ 2x + 3y = 4 \end{cases}$

Step 1: Align the equations with the variables and ______________ in the same order.

Step 2: If one of the variables has **opposite co-efficients** (same number but one positive and one negative), add the two equations to ________________ that variable. (Add them to equal zero.)

Step 3: Substitute the answer into one of the equations.

Step 4: Check your answers by plugging the x and y into __________ equations.

1

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

2

$-5x - 3y = 8$
$2x + 3y = 4$
$-3x + 0 = 12$
$-3x = 12$
$-3 = -3$
$x = -4$

3

$2(-4) + 3y = 4$
$-8 + 3y = 4$
$+8 = +8$
$\frac{3y}{3} = \frac{12}{3}$
$y = 4$

4

(–4, 4)

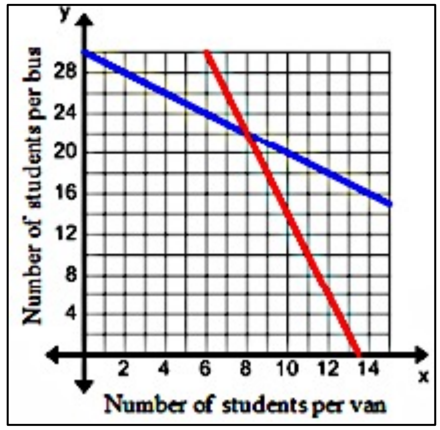
Remember: If a variable does not have opposite coefficients, multiply one or both of the equations by constant (number) so that they will have opposite coefficients

Use Elimination to solve the following equations.

- $\begin{cases} x + 2y = 9 \\ -x + 4y = 3 \end{cases}$
- $\begin{cases} 5x + 3y = -8 \\ -2x + 3y = -1 \end{cases}$
- $\begin{cases} 12x + 3y = 18 \\ 3x - 2y = 10 \end{cases}$

System of Equations Word Problems:

This year, the 9th grade class at Vista Heights and the 9th grade class at Frontier both planned trips to Lagoon. The 9th grade class at Vista Heights rented and filled 8 vans and 8 buses with 240 students. Frontier rented 4 vans and 1 bus with 54 students. Every van had the same number of students in it as did the buses.



Following the steps below, write a system of equations and solve to find the number of students in each van and in each bus.

Step 1: Define your variables. Let *v* represent the number of students per van and let *b* represent the number of students per bus.

Step 2: Write your equations. $\begin{cases} \text{Vista Heights:} & 8v + 8b = 240 \\ \text{Frontier:} & 4v + 1b = 54 \end{cases}$

Step 3: Chose a method to solve the system of equations. **Which method do you prefer to solve? ______________. Use that method to solve and find the intersection.**

Systems of Inequalities

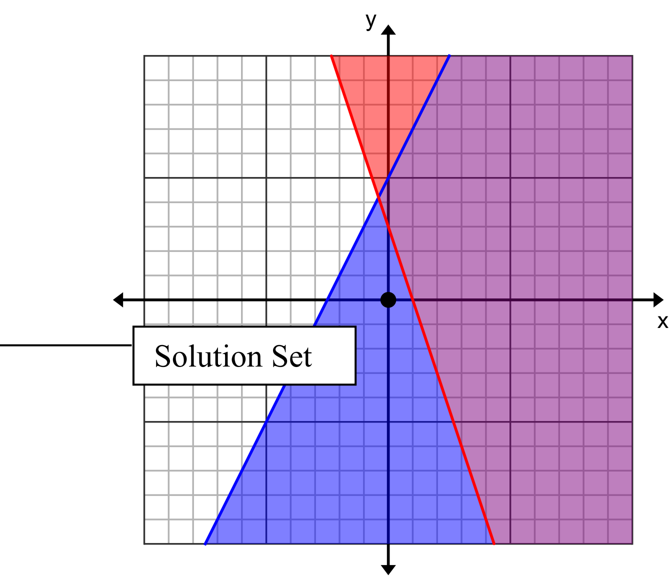
If an inequality states that the variable could be equal to the answer (≤ or ≥), then the line will be ___________. If an inequality states that the variable will be less or more than the answer and NOT equal to (< or >) then the line will be ___________.

Shading--DO NOT USE THE GREATER/LESS THAN SIGN TO TELL YOU WHICH SIDE TO SHADE.

The **(0, 0) Test** (or any point) will tell you where to shade. After you have drawn your ___________ (whether dotted or solid), plug a point like (0, 0) into the inequality. For example, given 2x + 5 > y, plug in (0, 0) to get 2(0) + 5 > 0. If the inequality is true, then the side of the line that contains (0, 0) is ______________. If the inequality is incorrect, (0 ≥ – 3(0) + 3 then the side of the line that does not contain (0, 0) is ______________.

If the point (0, 0) lies on the line, perform the test with a different point on either side of the _________..

When graphing a system, both of the inequalities are graphed and the solution set contains all the __________ that are "double-shaded".



Example: 2x + 5 > y
y ≥ – 3x + 3

In order to graph easily, you can simplify your equations to the y = mx + b format.

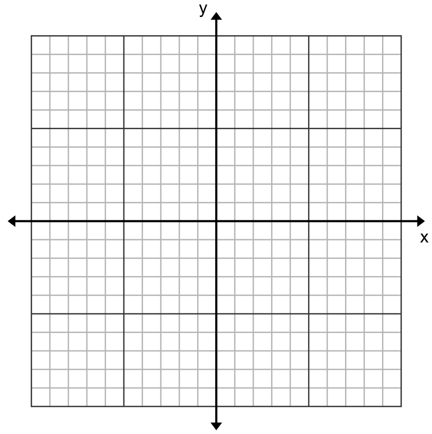
Graph the y-intercept first and then use the slope to graph your second point.

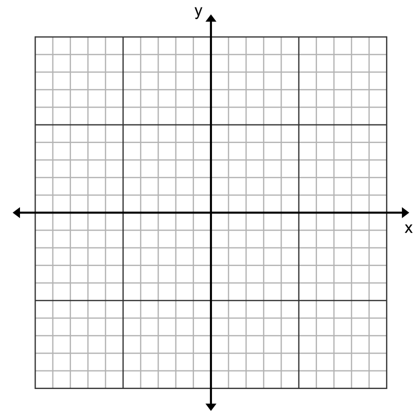
Note that (0, 0) is a solution to the first inequality so we shade on the side of (0,0).

It is NOT a solution to the second inequality, so we shade on the other side of the line.

GRAPH the following systems of inequalities and **CIRCLE** the solution set.

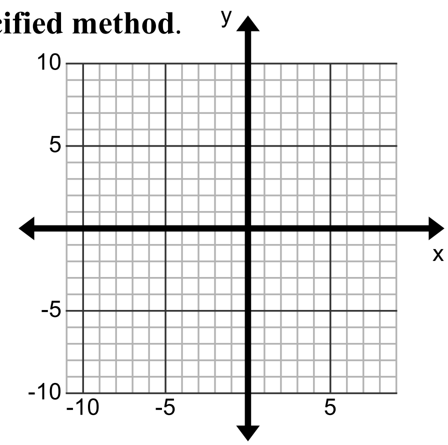
- $x - y > 2$ and $x \geq 3$
- $8 - 4(x - 2) < 2(3y)$ and $5y \leq x + 10$

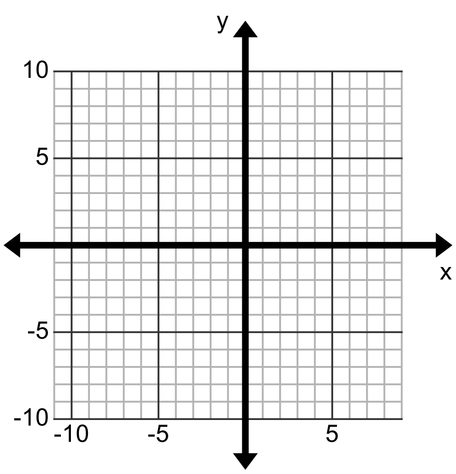




GRAPH each of the following and then **CHECK** your work **using the specified method**.

1. $2x + y = 5$ Elimination:
   $-4x - 2y = -10$





2. $x + 2y = 30$ Substitution:
   $3x + 6y = 15$

3. $2x + y = 5$ Elimination:
   $6x - 2y = 20$