Name ____ **Date** ______________ **Hr** ___

Lesson 3.1: Solving Systems by Graphing

Systems of Equations: consists of two equations

$$\begin{cases} ax + by = C \\ dx + ey = F \end{cases}$$

Solution: the point where the two graphs intersect

Ex 1: Check whether the coordinates below are solutions to the following systems.

$$\begin{cases} -2x + 3y = 10 \\ x - 3y = -5 \end{cases}$$

a. (1, 4)

b. (-5, 0)

Recall:

Slope-intercept form: for graphing $y = mx + b$

Standard form: find x- and y-intercepts $Ax + By = C$

Types of Systems

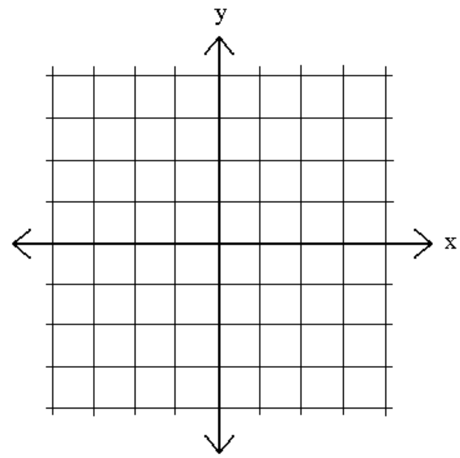
One solution: ________________________________

Infinite solutions: ________________________________

No solutions: ________________________________

<u>Ex 2</u>:
Solve by graphing.

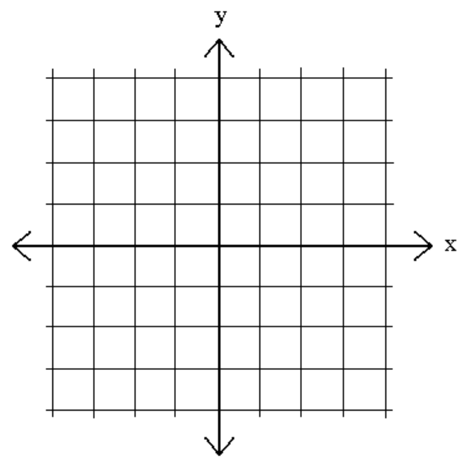
$$\begin{cases} 2x - 2y = -8 \\ 2x + 2y = 4 \end{cases}$$



Solution: ______________________

<u>Ex 3</u>:
Solve by graphing.

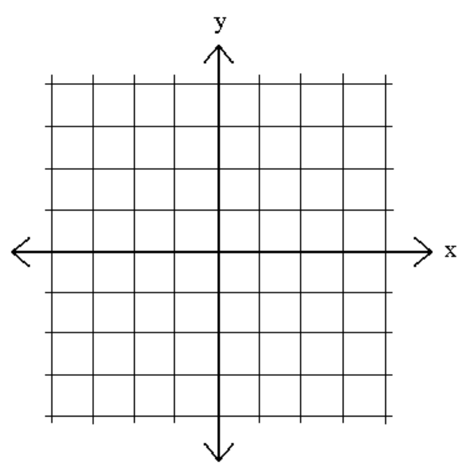
$$\begin{cases} 2x + 4y = 12 \\ 2y = -x + 6 \end{cases}$$



Solution: ______________________________

<u>Ex 4</u>: Solve by graphing.

$$\begin{cases} y = x + 5 \\ 2x - 2y = 8 \end{cases}$$



Solution: ______________________________

Lesson 3.2: Solving Systems Algebraically

Substitution:

1. Solve one equation for _______ or _______
2. Take result in step 1 and ________________ into _____________ equation
3. ______________ for the ______________
4. Use the answer for step _______ to find other variable by _________________ in equation

Ex 1: Solve by substitution.

$$\begin{cases} -3x + y = -13 \\ 2x + 2y = -10 \end{cases}$$

Solution: ____________________________

Ex 2: Solve by substitution.

$$\begin{cases} y = x + 5 \\ 2x - 2y = 8 \end{cases}$$

Solution: ____________________________

Ex3: Solve by substitution.

$$\begin{cases} -3x + 2y - 3z = -13 \\ -x + 2y - 2z = 5 \\ 2x = 18 \end{cases}$$

Solution: ____________________________

Elimination/Linear Combination:

Ex 3: Solve by elimination.

$$\begin{cases} -x + 3y = 1 \\ 4x + 6y = 8 \end{cases}$$

Solution: ______________________________

Ex 4: Solve using any algebraic method.

$$\begin{cases} 4x = 3y \\ -10x + 7y = -2 \end{cases}$$

Solution: ____________________________

Ex 5: Solve using any algebraic method.

$$\begin{cases} y = 3x + 5 \\ -9x - 3y = 15 \end{cases}$$

Solution: ____________________________

Ex 6: The sum of two numbers is 14. Their difference is 24. Find the two numbers.

a. Write a system of equations for the situation.

b. Solve the system and answer the question.

____

<u>Ex 7</u>: Without solving, which method would you use? How many solutions will you have?

a. $\begin{cases} 4x - 2y = 16 \\ -8x + 4y = -32 \end{cases}$

b. $\begin{cases} 2x + 3y = 6 \\ -8x - 12y = 24 \end{cases}$

Method: ______________________

Solutions: ____________________

Method: ______________________

Solutions: ____________________

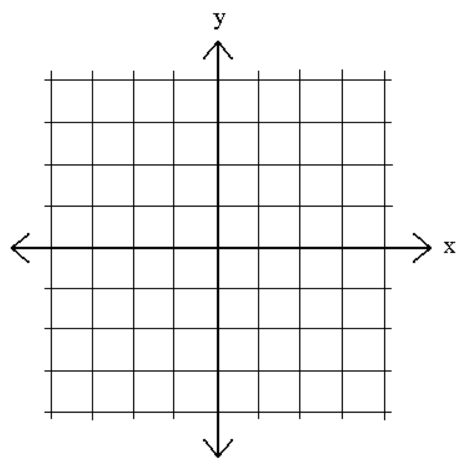
Lesson 3.3: Graphing and Solving Systems of Linear Inequalities

Recall:

Graph $y \leq 2x - 5$

<u>Ex 1</u>:
Graph the following system of inequalities.

$$\begin{cases} y \leq \frac{1}{2}x + 2 \\ 2x + y < 4 \end{cases}$$



Determine whether the following ordered pairs are solutions to the system.

a. (2, 3) ____________________ c. (-4, 0) ____________________

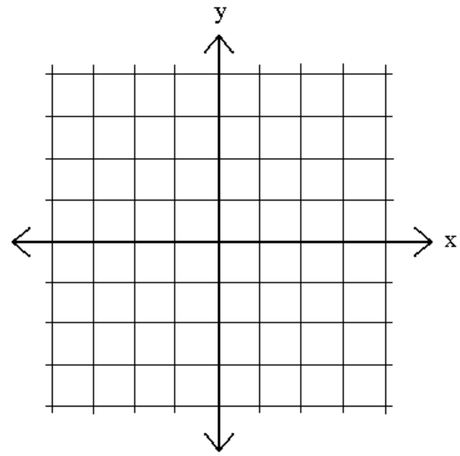
b. (1, -1) ____________________ d. (2, 0) ____________________

A <u>solution</u> of a system of linear inequalities is an ________________ that is a solution to ____________ inequalities in the system.

The <u>graph</u> of a system of linear inequalities is the graph of ____________________________ of the system. This will be represented by a ____.

Ex 2:
Graph the following system of inequalities.

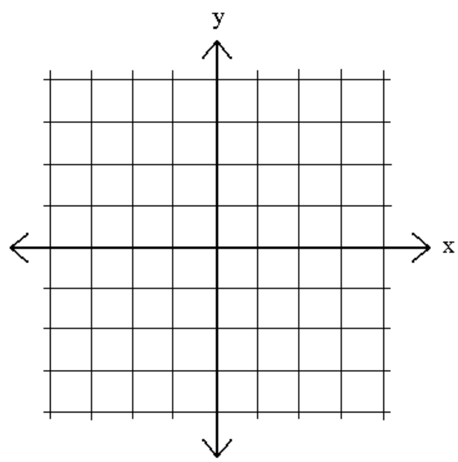
$$\begin{cases} x - y < 2 \\ x \geq -2 \end{cases}$$



Will there ever be a system of linear inequalities with no solutions? If so, give an example.

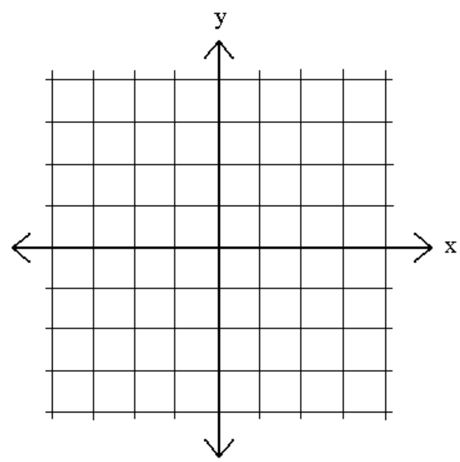
Ex 3: Graph the following system of inequalities.

$-2 \leq y < 4$

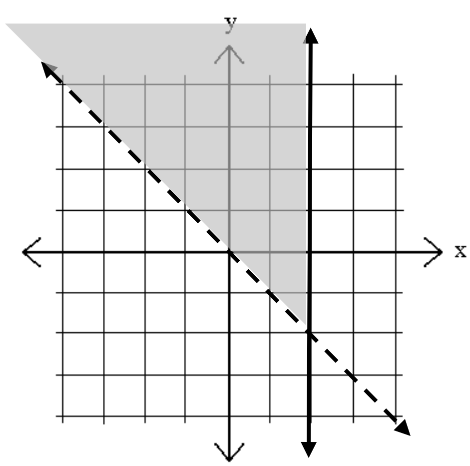


<u>Ex 4</u>: Graph the following system of inequalities.

b. $\begin{cases} 2x - 3y \leq 12 \\ x + 5y \leq 20 \\ x > 0 \end{cases}$



<u>Ex 5</u>: Write the system of inequalities graphed below.



Inequalities: ___________________________________

Lesson 3.4: Linear Programming

Optimization: finding the maximum and minimum value of some quality

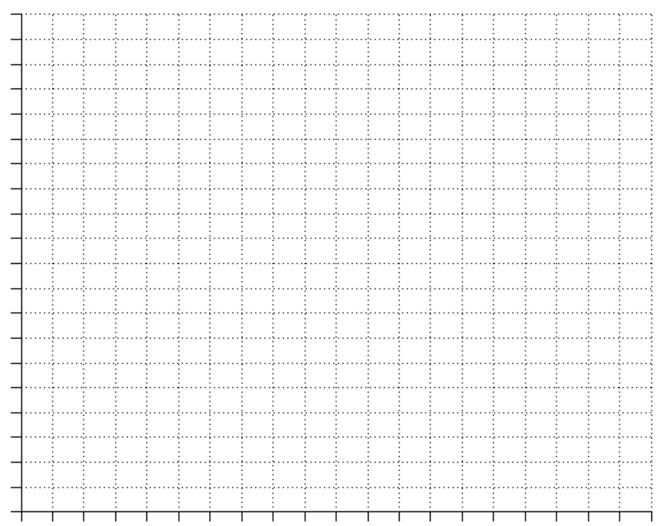
Linear program: one type of optimization. Process from which we examine the feasible region to a set of inequalities

Example:

A bakery is making whole-wheat bread and apple bran muffins. For each batch of bread they make $35 profit. For each batch of muffins they make $10 profit. The bread takes 4 hours to prepare and 1 hour to bake. The muffins take 0.5 hours to prepare and 0.5 hours to bake. The maximum preparation time available is 16 hours. The maximum baking time is 10 hours. How many batches of bread and muffins should be made to maximize profits?

	Whole-wheat bread	Apple bran muffins	Maximum Time
Preparation time	4	0.5	16
Baking time	1	0.5	10
Profit	$35	$10	

a. Write the system of inequalities that models this situation. Identify your variables.



b. Graph the system from part a. Label the axis.

c. Identify the vertices (corners) of the feasible region.

d. Write the equation to be maximized. (objective function) ______________________________

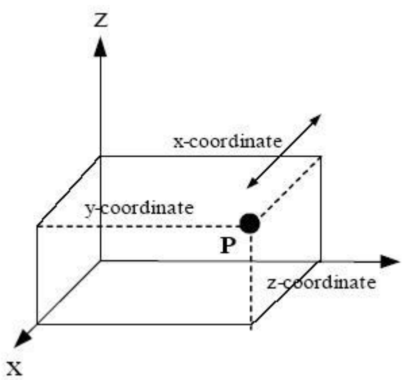
e. Apply the linear programming theorem (corner-point principle) and interpret the results so that the owner of the company knows what to do. (Explain your answer)

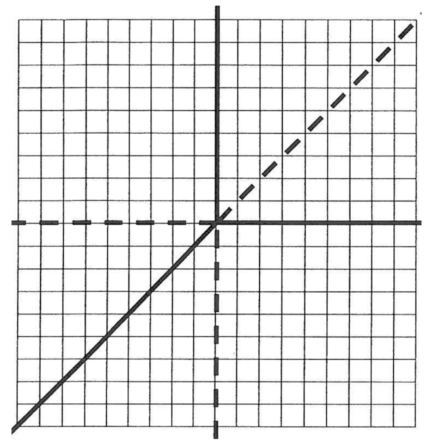
Lesson 3.5: Graphing Linear Equations in 3 Variables

<u>3-D Coordinate System</u>: a coordinate system determined by three mutually perpendicular axis; the three axis divide the coordinate system in to eight parts (octants)

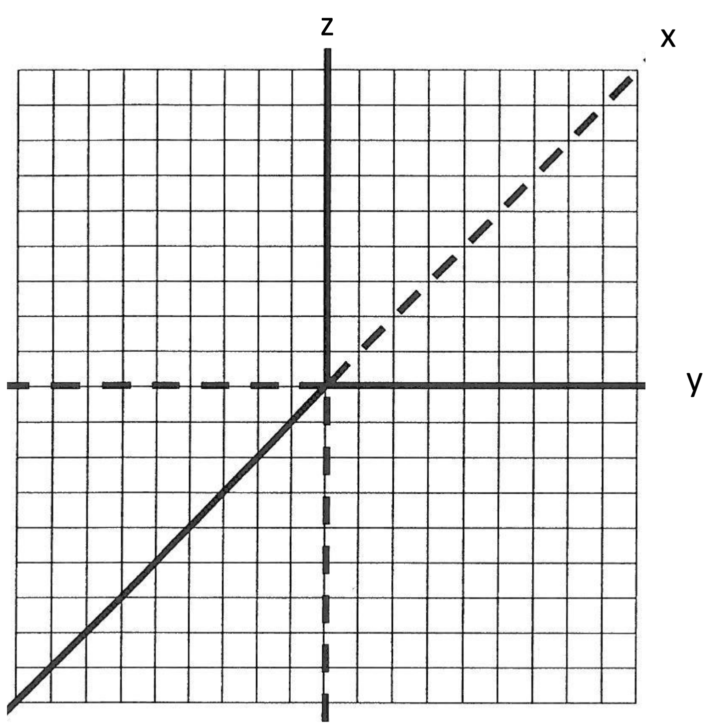
<u>Ordered Triple</u>: the coordinates required to graph on a 3 dimensional coordinate plane; (x, y, z)

<u>3-D coordinate equations</u>: $Ax + By + Cz = D$





<u>Ex 1</u>:
Graph the three-dimensional points below. Label your points.

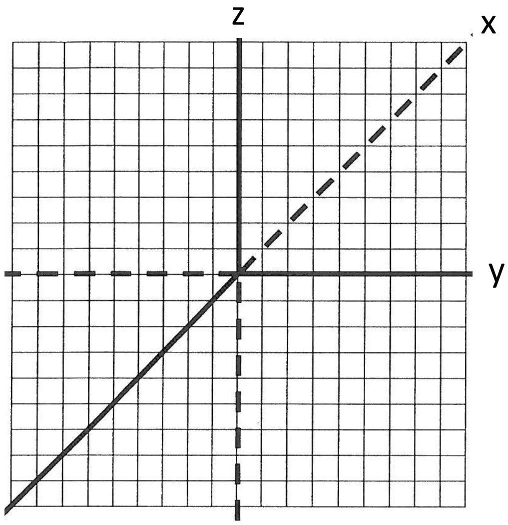


a. (1, 2, 5)

b. (-2, 3, -3)

c. (0, -2, 5)

Ex 2:
Sketch the graph $3x + 2y - 4z = 12$



Solution: _________________ region of the plane that lies in the __________ octant

Ex 2: Write the linear equation as a function of x and y.

$$-2x - y + z = 7$$

____

Evaluate the function when x = -3 and y = 2

____

Ex 3:
You are buying daisies, roses, and a glass vase to make a flower arrangement. The flower shop sells daisies for $0.82 each and roses for $0.49. The glass vase costs $12. Write a model for the total cost of the flower arrangement as a function of the number of daisies and roses you use.

____

Evaluate the model for 6 daisies and 3 roses.

____

Lesson 3.6: Solving Systems of Linear Equations in 3 Variables

Recall: Methods for solving systems of equations

1. ______________________________
2. ______________________________
3. ______________________________

Solutions in 3 variables: (pg. 177)

One solution: _____________ intersect at single point

Infinite Solutions: a __________ connecting all 3 planes; planes intersect in a _________

No Solutions: _________ points of intersection; intersect ______________ or _______________

Solve each system

Ex 1:

$$\begin{cases} 3x + 2y + 4z = 11 \\ 2x - y + 3z = 4 \\ 5x - 3y + 5z = -1 \end{cases}$$

<u>Ex 2</u>:

$$\begin{cases} x + y + z = 2 \\ 3x + 3y + 3z = 14 \\ x - 2y + z = 4 \end{cases}$$

<u>Ex 3</u>:

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