

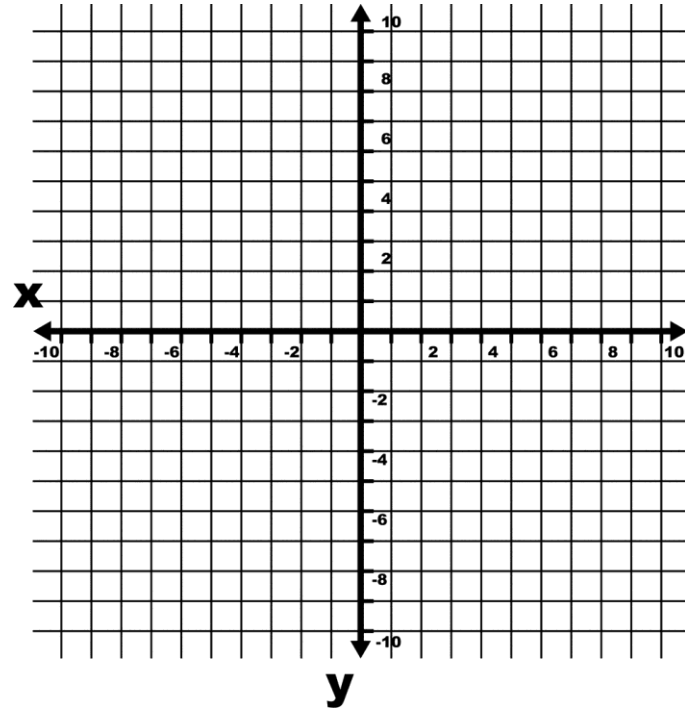
7.1/7.2 /7.3 Creating Systems of Linear Equations and Solving Systems Graphically

Concept #38 Solve a system graphically, with/without technology, and verify the solutions

Example 1) Solve the following systems by graphing.

a) $x + y = 8$

$3x - 2y = 14$



b) What are the coordinates of the point where both lines meet?(This is the solution to a linear system)

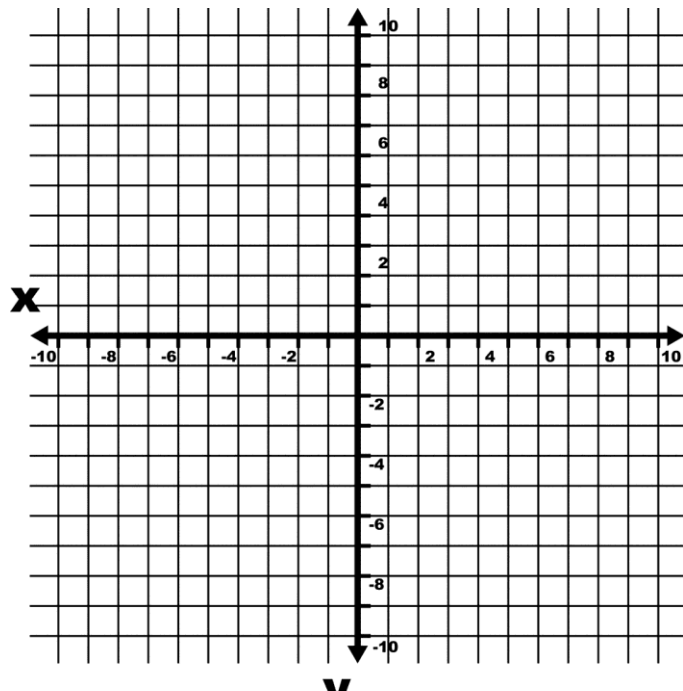
c) Verify your solution algebraically

YOUR TURN

Solve the following system by graphing

$x - y = 3$

$4x + 5y = 30$



Concept #40 – Create a linear system to model a situation & solve

Example 2) Tickets are sold for the Campbell Musical. Stasia buys 3 adult tickets and 2 student tickets. She pays \$31. Vincent buys 1 adult ticket and 1 student ticket. He pays \$12. What is the cost of each type of ticket?

a) Choose variables to represent the problem and write “let “ statements

b) Write equations to represent the problem

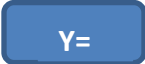
c) What solutions will work in both your equations?


d) What is the cost of each type of ticket?



e) Can you solve this graphically?


Use your Graphing Calculator to find Solutions to Systems

Step 1: Re-write equations using y and x variables. Rearrange equations so they are in slope intercept form.

Step 2 : Hit  button. Type both slope- intercept form equations in each line Y₁ and Y₂. (Hint: Put brackets around fractions)

Step 3: Hit  button. Each line will appear.

Step 4: To solve the system (The point of intersection) Hit   . Which is the calculate button. Choose #5 INTERSECT.

Step 5: The calculator will ask you which lines you want to find the intersection of , their equations will appear at the top. Hit  3 times

YOUR TURN Campbell sold 94 smoothies to raise money for charity. A banana smoothie costs \$3 and a peach mango smoothie cost \$5. The school raised \$394. How many of each type of smoothie did Campbell sell?

a) Choose variables to represent the problem and write “let” statements

b) Write equations to represent the problem

c) What solutions will work in both equations? Solve graphically using your graphing calculator.

d) How many of each type of smoothie did Campbell sell?

Example 3) Which pair of values is a solution for this linear system?

$$x = 2y + 2$$

Solution A: $x=4$ and $y = 1$ or **Solution B:** $x=-2$ and $y = -2$

$$x + 2y = -6$$

7.1/2/3 Assignment Pg 401 #5,6 Pg 409 #3,5 (use graph paper) #12,13 (Use graphing calculator or graph paper)

7.4 Using Substitution to Solve a System of Linear Equations

Concept #39 Solve a system algebraically using substitution and /or elimination and verify the solutions

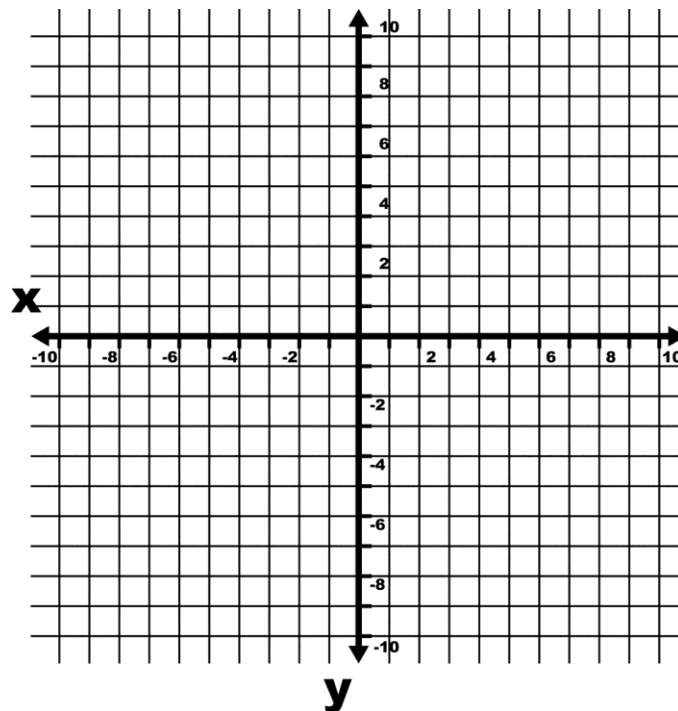
In lesson 7.1/2/3, you solved linear systems by graphing. This strategy can be time-consuming and sometimes you can only approximate the solution. We can use algebra to determine the exact solution.

Once algebraic strategy is called solving by substitution

Example 1 Solve the following linear system

$$4x + y = 5 \quad 2x - 4y = 7$$

a) Solve by Graphing



b) Solve by using substitution

STEPS FOR SOLVING BY SUBSTITUTION

- Label the equations 1 and 2
- Using either of the equations, solve for either x or y (get x or y by itself on one side of the equal sign).
Hint: It is always easiest to pick an x or y that has no number or negative sign in front of it!!!
- Begin by using the equation from the above step. Use what is on the OTHER side of the equal sign opposite your single variable. Substitute this expression into the value of the appropriate variable into the equation you did NOT use in the previous step.
- Using this new equation, get the variable by itself. This is the answer to either the x or the y part of the ordered pair.
- Substitute this answer for x or y into either of the original equations. This will allow you to find the answer to the other variable.

Example 2 Solve the following system using substitution

$$3x - 4y = -15 \quad 5x + y = -2$$

Example 3 Solve the following system using substitution

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

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

Concept #40 – Create a linear system to model a situation and solve

Example 4 A math test has short answer questions and word problems. A short answer question is worth 2 marks and a word problem is worth 4 marks. There are 11 questions for a total of 30 marks.

a) Create a linear system to model this situation.

b) Solve this system using substitution. How many short answer questions and how many word problems are on the test?

Assignment Pg 425 #4,5,19

AT LEAST TWO OF : 10,11,12,13,14,15,16,17,18

7.5 Using Elimination to Solve a linear System

Concept # 39 - Solve a system algebraically using substitution and/or elimination verify the solutions

Example #1: Solve the following system using the method of elimination.

$$3x + 5y = 12$$

$$7x + 5y = 8$$

Steps to solve using The Method of Elimination

1. Write the two equations so that one is on top of the other and they are both in the same order.
2. You will add or subtract the two equations and you want one of the variables to add or subtract to zero. To make this possible you need to have the same number with different signs in front of either both x terms or both y terms, if you are adding the equations. To make this possible, you may multiply each term in an equation all by the same number, or divide each term in an equation all by the same number.
3. Add the like terms in the top equation to the like terms in the bottom equation. Take what you get and solve for the variable (get it by itself).
4. Substitute your final answer to step 3 into one of the original equations to find the answer to

Example #2: Solve the following system using the method of elimination.

$$4x + 3y = 9$$

$$2x - 7y = 13$$

Example #3: Solve the following system using the method of elimination.

$$3x + 7y = 3$$

$$4x - 5y = 42$$

Example #4: Solve the following system using the method of elimination or substitution.

$$\frac{x}{2} + \frac{y}{2} = 7$$

$$3x + 2y = 48$$

Concept #40 – Create a linear system to model a situation and solve.

Example #5: (Solve by method of choice: graphing, substitution or elimination)

You won \$8000 in a lottery. You must invest part in an account earning 5% interest and part in an account earning 8% interest (both compounded annually). In one year the amount invested in the 8% account earns \$90 more than the amount earned in the 5% account. How much did you originally invest in each account?

7.5 Page 437 #3, 6, 7, 12

AT LEAST TWO OF: 8, 9, 10, 11, 13, 14, 16,

AT LEAST ONE OF: 22, 24

7.6 – Properties of Linear Systems (Number of solutions)

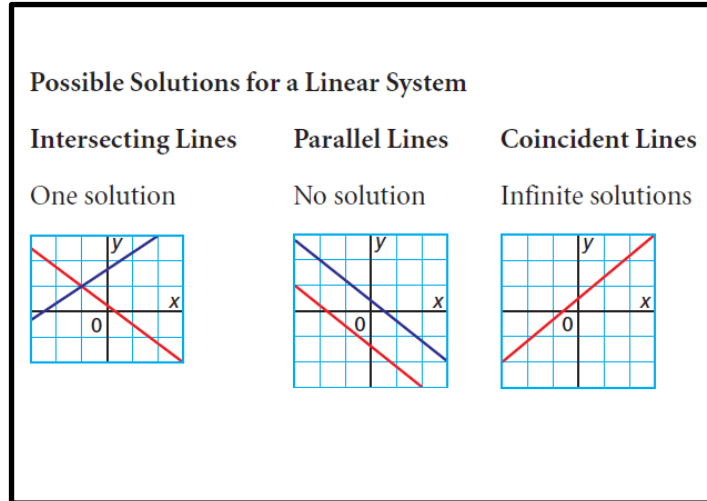
Concept # 41 – Determine the number of solutions for a linear system

Example 1: Determine the number of solutions of each linear system

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

b) $4x + 6y = -10$
 $-2x - y = -1$

c) $3x + y = -1$
 $-6x - 2y = 12$



How can you tell from the equations that the lines are parallel?

How can you tell from the equations that they represent the same line?

Why is it important to identify the y-intercepts when the equations in a linear system have the same slope?

Example 2: Given the equation $y = 2x + 4$ write another linear equation that will form a linear system with:

- a) exactly one solution

- b) no solution

- c) infinite solutions

Example 3:

What happens if you try to solve a system using substitution or elimination with no solution? Or with infinite solutions?

System 2

$$-2x + y = 2$$

$$-2x + y = 4$$

System 3

$$-2x + y = 2$$

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

7.6 ASSIGNMENT:

1. Determine the number of solutions for each linear system

a) $y = x + 2$

b) $y = 2x - 4$

c) $y = 3x + 2$

$y = x + 2$

$y = x + 1$

$y = 3x - 5$

d) $y = 56 - 2x$

e) $y = 60 + 3x$

f) $y = -4x - 3$

$y = 10 + x$

$y = 60 - 5x$

$y = 4x - 3$

2. Determine the number of solutions for each linear system (you may want to rearrange into slope-intercept form first)

a) $x + 2y = 6$

b) $3x + 5y = 9$

c) $2x - 5y = 30$

$x + y = -2$

$6x + 10y = 18$

$4x - 10y = 15$

d) $x + 3y = 6$

e) $3x - y = 12$

f) $x - 4y = 8$

$y = -\frac{1}{3}x + 6$

$4x - y = 12$

$x + 4y = 20$

3. Given the equation $-6x + y = 3$, write another linear equation that will form a linear system with:
- exactly one solution
 - no solution
 - infinite solutions
4. Suppose you are given only the following pieces of information about a system of linear equations. Would you be able to predict the number of solutions to the system? Explain.
- The slopes of the lines are the same
 - The y-intercepts of the lines are the same
 - The x-intercepts are the same, and the y-intercepts are the same.
5. Mark wrote the two equations in a linear system in slope-intercept form. He noticed that the signs of the two slopes were different. How many solutions will this linear system have? Explain.
6. Use substitution to show that the linear system $y = 2x + 5$ and $2y - 4x = -15$ has no solution. How do you know there is no solution?

SOLUTIONS:

- | | | |
|---------------------|-------------|------------|
| 1a) infinite | b) one | c) zero |
| d) one | e) one | f) one |
| 2a) one | b) Infinite | c) zero |
| d) zero | e) one | f) one |
| 3a) Various | b) Various | c) Various |
| 4) Discussion | | |
| 5) One; discuss why | | |
| 6) Discussion | | |