Ch 4 Calendar

Days	Dates	Assignment (due the next class meeting)
Monday Tuesday	10/31/22 11/01/22	4.1 Worksheet
Wednesday Thursday	11/02/22 11/03/22	4.2 Worksheet
Friday Monday	11/04/22 11/07/22	4.3 Worksheet
Wednesday Thursday	11/09/22 11/10/22	4.4 Worksheet
Monday Tuesday	11/14/22 11/15/22	4.5 Worksheet
Wednesday Thursday	11/16/22 11/17/22	Ch 4 Review Worksheet
Friday Monday	11/18/22 11/21/22	**Ch 4 Test** No HW 😊

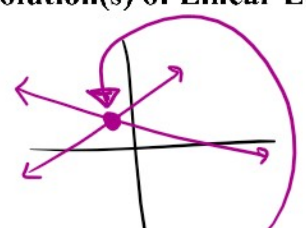
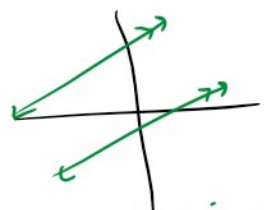
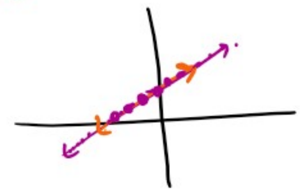
HW Hints:

- All handouts, include the Notes packet and HW Packet, are available at www.washoeschools.net/DRHSmath
- See the **Links** Channel in Teams to find our class YouTube page. Video lessons are available here for each section.
- Students who complete all assignments this semester by the date of the unit test for each chapter will receive a 2% bonus**.**
- Students with no late or missing assignments for this semester will receive a free pizza lunch.
- Assignments are due at the start of the next class meeting.
- Late assignments will be reduced by 50%.
- The last day to turn in assignments for this chapter is prior to the start of the test for this unit.

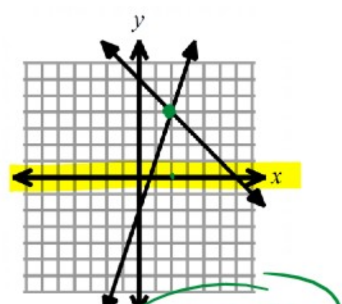
4.1 Notes: Solving Systems of Linear Equations by Graphing

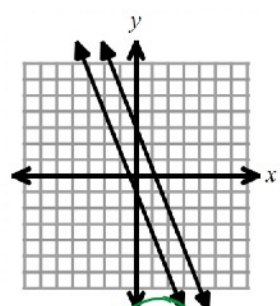
Objectives:
- **Students will interpret graphs of lines to find solutions of linear systems**
- **Students will graph lines to find solutions of linear systems**

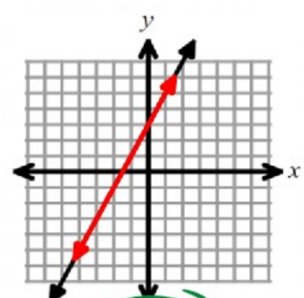
Key Vocabulary and Concepts

System of Linear Equations	* ≥ 2 or more equations with ≥ 2 or more variables
Solution(s) of Linear Equations → the point of intersection  one solution (x, y)  no solution ∅ NS  infinitely many solutions (IMS)	

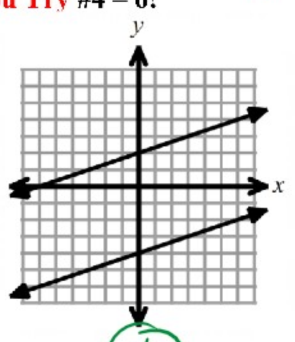
Examples #1 – 6: Find the solution(s) for each system of linear equations.

1) 
(2, 4)
x y

2) 
∅

3) 
IMS

You Try #4 – 6!

4) 
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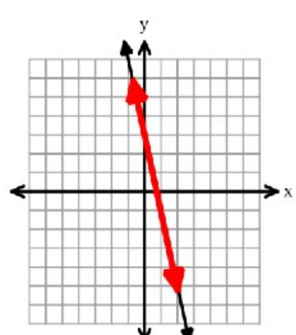
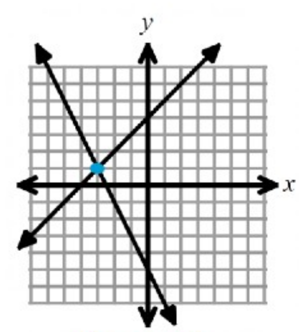
5) 
IMS

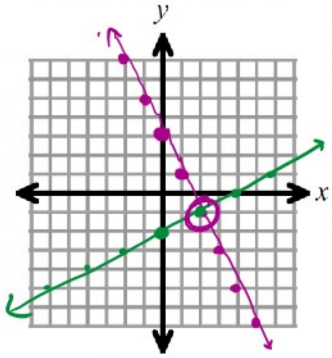
6) 
(-3, 1)
x y

$y = mx + b$
slope y-int

Examples #7 – 14, solve each system of linear equations by graphing.

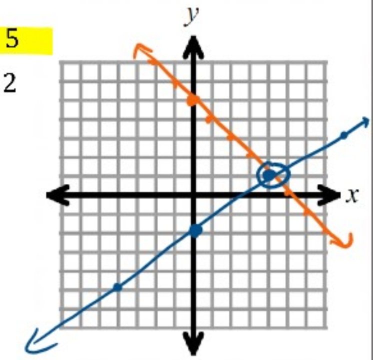
7) $\begin{cases} y = -2x + 3 \\ y = \frac{1}{2}x - 2 \end{cases}$

$\boxed{(2,-1)}$



8) **You try!** $\begin{cases} y = -x + 5 \\ y = \frac{3}{4}x - 2 \end{cases}$

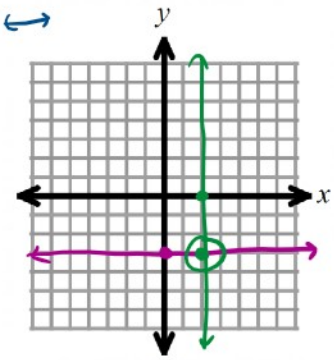
$\boxed{(4,1)}$
x y



2.5 Notes

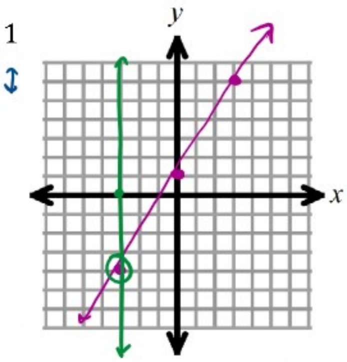
9) $\begin{cases} y = -3 \\ x = 2 \end{cases}$ horizontal ⟷ vertical ↕

$(2,-3)$
x y



10) **You try!** $\begin{cases} y = \frac{5}{3}x + 1 \\ x = -3 \end{cases}$

$\boxed{(-3,-4)}$
x y



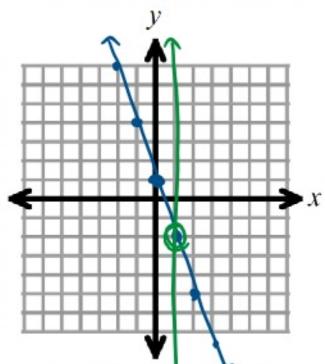
$y = mx + b$

11) $\begin{cases} 3x + y = 1 \\ x = 1 \end{cases}$

$3x + y = 1$
$-3x \quad -3x$

$y = -3x + 1$

$(1,-2)$
x y

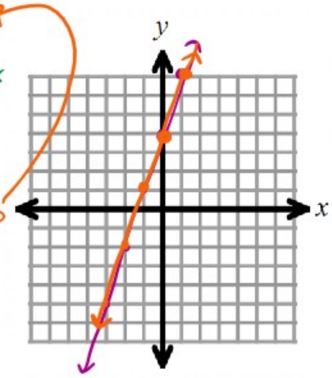


12) **You try!** $\begin{cases} y = 3x + 4 \\ -6x + 2y = 8 \end{cases}$
+6x +6x

$\frac{2y}{2} = \frac{6x}{2} + \frac{8}{2}$

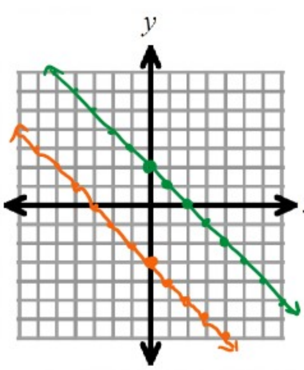
$y = 3x + 4$

$\boxed{\text{IMS}}$



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

$\boxed{\emptyset}$



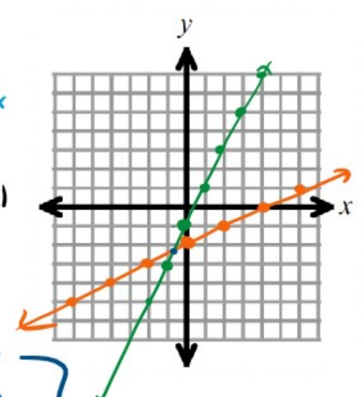
14) $\begin{cases} x - 2y = 4 \\ -2x + y = -1 \end{cases}$
-x +2x +2x

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

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

$y = 2x - 1$

$\boxed{(-0.8,-2.1)}$



(-0.8, -2.1)

4.2 Notes: Solving Systems of Linear Equations by Substitution

Objectives:
- **Students will solve systems by using substitution.**
- **Students will correctly interpret unusual solutions.**

Key Vocabulary and Concepts

The Substitution Property "plug in" Let $x = 3$ $5x + 2y = 8$ $5 \cdot 3 + 2y = 8$ $15 + 2y = 8$
Steps for Solving Systems with the Substitution Property ① one variable is isolated ② plug in the expression for isolated variable into the other equation. box ③ solve the other equation ④ solve for other variable (x, y)

Examples 1 – 4: Solve each system by using substitution.

1) $\begin{cases} x = \boxed{-2} \\ y = 4x + 19 \end{cases}$

$y = 4 \cdot -2 + 19$
$y = -8 + 19$
$y = 11$

$\boxed{\left(\underset{x}{-2}, \underset{y}{11}\right)}$

2) $\begin{cases} y = \boxed{5x + 6} \\ 2x + y = -1 \end{cases}$

$\underbrace{2x + 5x} + 6 = -1$
$7x + 6 = -1$
$-6 \quad -6$
$\frac{7x}{7} = \frac{-7}{7}$
$x = -1$

$\boxed{\left(\underset{x}{-1}, \underset{y}{1}\right)}$

3) $\begin{cases} 5x + 3y = -8 \\ x = \boxed{2y + 14} \end{cases}$

$5(2y + 14) + 3y = -8$
$10y + 70 + 3y = -8$
$13y + 70 = -8$
$-70 \quad -70$
$\frac{13y}{13} = \frac{-78}{13}$
$y = -6$

$x = 2(-6) + 14$
$x = -12 + 14$
$x = 2$

$\boxed{\left(\underset{x}{2}, \underset{y}{-6}\right)}$

4) $\begin{cases} 6x - y = 10 \\ y = \boxed{x + 5} \end{cases}$

$y = 5 \cdot -1 +$
$y = 1$

$6x - 1(x + 5) = 10$
$\underbrace{6x - 1x} - 5 = 10$
$5x - 5 = 10$
$+5 \quad +5$
$\frac{5x}{5} = \frac{15}{5}$
$x = 3$

$\left(\underset{x}{3}, \underset{y}{8}\right)$

$y = 3 + 5$
$y = 8$

$\left(\frac{1}{x}, \frac{1}{y} \right)$

You try #5 – 6! Use substitution to solve each system.

5) $\begin{cases} x = 9 \\ 2x + 5y = -2 \end{cases}$

$18 + 5y = -2$
$-18 \qquad -18$
$\frac{5y}{5} = \frac{-20}{5}$
$y = -4$

$\boxed{(9, -4)}$

6) $\begin{cases} -2x - 3y = -5 \\ y = 8x - 7 \end{cases}$

$-2x - 3(8x - 7) = -5$
$-2x - 24x + 21 = -5$
$-26x + 21 = -5$
$-21 \qquad -21$
$\frac{-26x}{-26} = \frac{-26}{-26}$
$x = 1$

$y = 8(1) - 7$
$y = 8 - 7$
$y = 1$

7) $\begin{cases} y = 6x + 10 \\ y = -3x + 37 \end{cases}$

$6x + 10 = -3x + 37$
$+3x \qquad +3x$
$9x + 10 = 37$
$-10 \qquad -10$
$\frac{9x}{9} = \frac{27}{9}$
$x = 3$

$y = 6 \cdot 3 + 10$
$y = 18 + 10$
$y = 28$

$\left(\frac{3}{x}, \frac{28}{y} \right)$

8) **You try!** $\begin{cases} y = -4x + 2 \\ y = x + 22 \end{cases}$

$-4x + 2 = x + 22$
$+4x \qquad +4x$
$2 = 5x + 22$
$-22 \qquad -22$
$\frac{-20}{5} = \frac{5x}{5}$
$-4 = x$

$y = -4 \cdot -4 + 2$
$y = 16 + 2$
$y = 18$

$\left(\frac{-4}{x}, \frac{18}{y} \right)$

Unusual Situations: Solve each system by using substitution. What do you think your answer means?

9) $\begin{cases} y = 5x + 2 \\ 10x - 2y = 30 \end{cases}$

$10x - 2(5x + 2) = 30$
$\cancel{10x} - \cancel{10x} - 4 = 30$
$-4 = 30$
False

$\boxed{\emptyset}$

10) $\begin{cases} 4x + 2y = 6 \\ y = -2x + 3 \end{cases}$

$4x + 2(-2x + 3) = 6$
$\cancel{4x} - \cancel{4x} + 6 = 6$
$6 = 6$
True

$\boxed{\text{IMS}}$

4.3 Notes: Solving Systems of Linear Equations by Elimination, Day 1

Objectives:
- **Students will solve systems by using elimination.**
- **Students will correctly interpret unusual solutions.**

Key Vocabulary and Concepts

Elimination
→ ADD vertically to eliminate a variable
Steps for using Elimination to Solve Systems
① Both equations must be in standard form: $Ax+By=C$ ② Add vertically → eliminate one variable ☆   ③ Solve for 1 variable   ④ solve for 2nd variable

Examples #1 – 4: Use elimination to solve each system of equations.

1) $\begin{cases} 3x + 2y = 10 \\ 1x - 2y = -4 \end{cases}$

+

$\frac{4x}{4} = \frac{6}{4}$

$x = 1.5$

$1.5 - 2y = -4$
$-1.5 \qquad -1.5$

$\frac{-2y}{-2} = \frac{-5.5}{-2}$

$y = 2.75$

(1.5, 2.75)

2) $\begin{cases} 6x + y = 13 \\ -6x + y = 1 \end{cases}$

+

$\frac{2y}{2} = \frac{14}{2}$

$y = 7$

$6x + 7 = 13$
$-7 \qquad -7$

$\frac{6x}{6} = \frac{6}{6}$

$x = 1$

$\left(\frac{1}{x}, \frac{7}{y}\right)$

You try #3 – 4!

3) $\begin{cases} 4x - 5y = -23 \\ 3x + 5y = 9 \end{cases}$

+

$\frac{7x}{7} = \frac{-14}{7}$

$x = -2$

$(\underset{x}{-2}, \underset{y}{3})$

$-6 + 5y = 9$
$+6 \qquad +6$

$\frac{5y}{5} = \frac{15}{5}$

$y = 3$

4) $\begin{cases} x + y = 8 \\ -x + y = 24 \end{cases}$

+

$\frac{2y}{2} = \frac{32}{2}$

$y = 16$

$(-8, 16)$

$x + 16 = 8$
$-16 \qquad -16$

$x = -8$

$y=3$

$Ax + By = C$

Elimination is easiest to use when both equations are in Standard **form.** If one equation is not in this form, but you want to use elimination to solve the system, then you will need to Convert the equation to Standard form before starting elimination.

Examples 5 – 6: Use Elimination to solve each system.

5) $\begin{cases} 3x + 4y = 4 \\ -4y = 16 + 2x \end{cases}$

$3x + 4y = 4$

$-2x - 4y = 16$

$x = 20$

$-4y = \underbrace{16 + 40}$

$\frac{-4y}{-4} = \frac{56}{-4}$

$y = -14$

$\boxed{(20, -14)}$

6) $\begin{cases} x - 3y = 7 \\ 3y = -23 - x \end{cases}$

$1x - 3y = 7$

$+\ 1x + 3y = -23$

$\frac{2x}{2} = \frac{-16}{2}$

$x = -8$

$-8 - 3y = 7$
$+8 \qquad +8$

$\frac{-3y}{-3} = \frac{15}{-3}$

$y = -5$

$\boxed{(-8, -5)}$

Sometimes the original system does not have opposite coefficient. You can change any equation by multiplying it by a negative one (or any other number) to make opposite signs.

Examples 7 – 8: Use Elimination to solve each system.

7) $-1\begin{cases} 3x + 2y = 13 \\ 5x + 2y = 15 \end{cases}$

$-3x - 2y = -13$

$5x + 2y = 15$

$\frac{2x}{2} = \frac{2}{2}$

$x = 1$

$5 + 2y = 15$
$-5 \qquad -5$

$\frac{2y}{2} = \frac{10}{2}$

$y = 5$

$\boxed{(1, 5)}$

8) $\begin{cases} 5x - 3y = 19 \\ -1(5x + 4y = 5) \end{cases}$

$5x - 3y = 19$

$-5x - 4y = -5$

$\frac{-7y}{-7} = \frac{14}{-7}$

$y = -2$

$5x + 6 = 19$
$-6 \qquad -6$

$\frac{5x}{5} = \frac{13}{5}$

$x = \frac{13}{5}$ or 2.6

$\boxed{(2.6, -2)}$

Unusual Situations: Use elimination to solve each system below. What do you think this means?

9) $\begin{cases} 4x - 2y = 7 \\ -4x + 2y = 8 \end{cases}$

$+$

$0 = 15$

false

$\boxed{\emptyset}$

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

$0 = 0$

true

$\boxed{\text{IMS}}$

4.4 Notes: Solving Systems of Linear Equations by Elimination, Day 2

Objectives:

- **Students will solve systems by using elimination with multiplication.**
- **Students will correctly interpret unusual solutions.**

Key Concept

Steps for using Elimination with Multiplication to Solve Systems

1. Both equations are standard form
2. If needed, multiply one (or both) equations to create opposite coefficients.
3. Add vertically → eliminate a variable
4. Solve for 1st variable
5. Solve for 2nd variable

Examples 1 – 4: Solve each system with elimination. Use multiplication as needed.

1) $\begin{cases} 3x - 4y = 10 \\ x + 2y = 0 \end{cases}$

$-3(x + 2y = 0)$

$3x - 4y = 10$
$+\ -3x - 6y = 0$
$-10y = 10$
$y = -1$

$x - 2 = 0$
$x = 2$

$\boxed{(2, -1)}$

2) **You try!** $\begin{cases} -2x + 3y = -5 \\ 5x - 6y = 12 \end{cases}$

$2(-2x + 3y = -5) \rightarrow -4x + 6y = -10$
$5x - 6y = 12 \rightarrow 5x - 6y = 12$
$x = 2$

$10 - 6y = 12$
$-6y = 2$
$y = -\frac{1}{3}$

$\boxed{(2, -\frac{1}{3})}$
$\boxed{(2, -0.\overline{3})}$

3) $\begin{cases} 2x - 7y = 20 \\ 5x + 8y = -1 \end{cases}$

$5[2x - 7y = 20] \rightarrow 10x - 35y = 100$
$-2[5x + 8y = -1] \rightarrow -10x - 16y = 2$
$-51y = 102$
$y = -2$

$2x + 14 = 20$
$2x = 6$
$x = 3$

$(3, -2)$

4) **You try!** $\begin{cases} 3x + 2y = 16 \\ 7x - 3y = -1 \end{cases}$

$3[3x + 2y = 16] \rightarrow 9x + 6y = 48$
$2[7x - 3y = -1] \rightarrow 14x - 6y = -2$
$23x = 46$
$x = 2$

$6 + 2y = 16$
$2y = 10$
$y = 5$

$(2, 5)$

Examples 5 – 8: Solve each system by using elimination. Make sure each system is in standard form, and use multiplication as needed.

5) $\begin{cases} 2x = y + 10 \\ x + 2y = 5 \end{cases}$ $\rightarrow$ $2x - y = 10$, $-2(x + 2y = 5) \rightarrow -2x - 4y = -10$

$-5y = 0$

$y = 0$

$x = 5$

$(5, 0)$

6) **You try!** $\begin{cases} 3x = 4y - 5 \\ -6x + 8y = 2 \end{cases}$ $\rightarrow$ $2(3x - 4y = -5) \rightarrow 6x - 8y = -10$, $-6x + 8y = 2 \rightarrow -6x + 8y = 2$

$0 = -8$

false

$\varnothing$

7) $\begin{cases} -6x + 2y = 12 \\ y = 3x + 6 \end{cases}$ $\rightarrow$ $-6x + 2y = 12 \rightarrow -6x + 2y = 12$, $-2[-3x + y = 6] \rightarrow 6x - 2y = -12$

$0 = 0$

True

IMS

8) **You try!** $\begin{cases} x = 5y + 2 \\ -4x + 20y = 7 \end{cases}$ $\rightarrow$ $4[x - 5y = 2] \rightarrow 4x - 20y = 8$, $-4x + 20y = 7 \rightarrow -4x + 20y = 7$

$0 = 15$

False

$\varnothing$

9) Solve the system from #8 again, but this time use substitution. $\begin{cases} x = 5y + 2 \\ -4x + 20y = 7 \end{cases}$

$-4(5y + 2) + 20y = 7$

$-20y - 8 + 20y = 7$

$-8 = 7$

false

$\varnothing$

Reflect: Explain how you know is better to use elimination versus substitution to solve a system of equations? When is substitution easier to use? When is elimination easier to use?

one variable is isolated

Standard form

Example 10: Determine which method of solving is easiest for each system. Write "Elimination" or "Substitution." **Do not solve the systems.**

a) $\begin{cases} 4x - 3y = 9 \\ 7x + 3y = 2 \end{cases}$

elimination

b) $\begin{cases} y = 6x - 3 \\ x = 2y \end{cases}$

Substition

4.5 Notes: Modeling Systems of Linear Equations

Objective: Students will write and solve systems of linear equations to model situations.

Key Concepts

Equations that should be written in slope-intercept form: • buying one type of item • set-up fee/one-time fee starting amount	$y = mx + b$ y: total cost m: cost, rate of change, "per" "each" x: item buying b: one-time fee, or starting value
Equations that should be written in standard form: • buying two types of item • total amount is given	$Ax + By = C$ A: cost of 1st item "per" "each" B: cost of 2nd item "per" "each" C: total

Examples #1 – 4: Write a system of linear equations to model each situation. Do NOT solve the systems.

1) Two snails are moving along a branch. (They have a very exciting life!) Snail #1 starts at a position of 15 cm from the start of the branch and moves at 3 cm/min. Snail #2 starts at a position of 9 cm from the start of the branch and moves at 4 cm/min. After how many minutes will they be at the same position?

Snail #1: $y = 3x + 15$

Snail #2: $y = 4x + 9$

2) Josie owns a nail shop that charges $12 for a manicure and $20 for a pedicure. Her cousin owns a shop and charges $16 for a manicure and $30 for a pedicure. On Monday they compared how much they made. Josie made $520 and her cousin made $760. If they both sold the same number of pedicures and manicures, how many pedicures and manicures did they each sell?

Josie: $12x + 20y = 520$

Cousin: $16x + 30y = 760$

You try! 3) The Spanish club sells food at sporting events. At the football game they charge $3 for the popcorn and $1 for the sodas. They made $75 at the football game. At the track meet they sold the popcorn for $2 and the sodas for $1. They made $55 at the track meet. How many bags of popcorn and sodas did they sell, if they sold the same at both games?

FB: $3x + y = 75$

track: $2x + y = 55$

You try! 4) Lindsey and Rob work at two different hair salons and pay different amounts for their station. Lindsey pays $140 for rent, and $25 per customer that she works on that month. Rob only pays $100 for rent, but has to pay $35 per customer. How many customers would it take for them to pay the same amount?

Lindsey: $y = 25x + 140$

Rob: $y = 35x + 100$

Examples #5 – 7: Write a system to model each situation. Then SOLVE the system by any method of your choosing.

5) Two numbers have a sum of 16. The larger number is one more than two times the smaller number. Find each number.

x =   y

$x + y = 16$

$x = \boxed{2y + 1}$

$2y + 1 + y = 16$

$3y + 1 = 16$

$3y = 15$

$y = 5$

$x = 11$

smaller # is 5

larger # is 11

6) Susan is buying black and green olives from the olive bar for her party. She buys 4 lb of olives. Black olives cost \$3.00 a pound. Green olives cost \$5.00 a pound. She spends \$15.50. Find the number of each type of olives that Susan purchases. Set up a system and solve.

$3x + 5y = 15.50 \rightarrow \cancel{3x} + 5y = 15.50$

$-3(x + y = 4) \rightarrow \cancel{-3x} - 3y = -12$

$\frac{2y}{2} = \frac{3.50}{2}$

$y = 1.75$

$x + 1.75 = 4$

$-1.75 \quad -1.75$

$x = 2.25$

black: 2.25 lbs
green: 1.75 lbs

You try! 7) A store sells guitars and basses. In one day, a total of 5 instruments were sold. If guitars sell for \$200 each and basses sell for \$150 each, and the total cost was \$900, then find the number of each type of instruments that were sold. Set up a system and solve.

$-200(x + y = 5) \rightarrow \cancel{-200x} - 200y = -1000$

$200x + 150y = 900 \rightarrow \cancel{200x} + 150y = 900$

$-50y = -100$

$y = 2$

3 guitars
2 basses

Example 8: Which equation would make this system have an ~~infinite number of solutions~~? Choose all that apply. No Solution

$\begin{cases} y = 1x + 2 \\ \_\_\_\_\_\_\_\_ \end{cases}$

B, C, D

parallel lines → same slope → diff y-int

A) $2y = 4x + 8$ → $y = 2x + 4$

B) $y - x = 3$ → $y = 1x + 3$

C) $5x - 5y = 10$ → $\frac{-5y}{-5} = \frac{-5x}{-5} + \frac{10}{-5}$ → $y = 1x - 2$

D) $-4x + 4y = 12$ → $\frac{4y}{4} = \frac{4x}{4} + \frac{12}{4}$ → $y = 1x + 3$