

## Warm-up 10-30

1. Arianna and Samantha go to the movie theater and purchase refreshments for their friends. Arianna spends a total of \$118.75 on 10 drinks and 5 bags of popcorn. Samantha spends a total of \$157.75 on 9 drinks and 10 bags of popcorn. Write a system of equations that can be used to find the price of one drink and one bag of popcorn. What is the price on one drink to the nearest cent?
  
2. An animal shelter spends \$1.00 per day to care for each bird and \$3.00 per day to care for each cat. Logan noticed that the shelter spent \$52.00 caring for birds and cats on Friday. Logan found a record showing that there were a total of 28 birds and cats on Friday. How many Birds were at the shelter on Friday?

# Warm-up 10-29

1. Arianna and Samantha go to the movie theater and purchase refreshments for their friends. Arianna spends a total of \$118.75 on 10 drinks and 5 bags of popcorn. Samantha spends a total of \$157.75 on 9 drinks and 10 bags of popcorn. Write a system of equations that can be used to find the price of one drink and one bag of popcorn. What is the price on one drink to the nearest cent? \$7.25

$$\begin{array}{r}
 -2(10d + 5p = 118.75) \\
 9d + 10p = 157.75 \\
 \hline
 -20d - 10p = -237.50 \\
 9d + 10p = 118.75 \\
 \hline
 -11d = -79.75 \\
 \underline{-11} \quad \underline{-11} \\
 d = 7.25
 \end{array}$$

$10(7.25) + 5p = 118.75$

2. An animal shelter spends \$1.00 per day to care for each bird and \$3.00 per day to care for each cat. Logan noticed that the shelter spent \$52.00 caring for birds and cats on Friday. Logan found a record showing that there were a total of 28 birds and cats on Friday. How many Birds were at the shelter on Friday?

16 birds

$$\begin{array}{r}
 1b + 3c = 52 \\
 -1b + c = -28 \\
 \hline
 2c = 24 \\
 \underline{2} \quad \underline{2} \\
 c = 12 \\
 \\
 b + 12 = 28 \\
 \underline{-12} \quad \underline{-12} \\
 b = 16
 \end{array}$$

$$\begin{array}{l}
 1(16) + 3(12) = 52 \\
 16 + 36 = 52 \\
 52 = 52 \checkmark
 \end{array}$$

# Warm-up 10-29

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 \end{array}$$

$10(7.25) + 5p = 118.75$

2. An animal shelter spends \$1.00 per day to care for each bird and \$3.00 per day to care for each cat. Logan noticed that the shelter spent \$52.00 caring for birds and cats on Friday. Logan found a record showing that there were a total of 28 birds and cats on Friday. How many Birds were at the shelter on Friday?

$$\begin{array}{r}
 52 = 1x + 3y \\
 -28 = -x + y \\
 \hline
 24 = 2y \\
 \frac{24}{2} = \frac{2y}{2} \\
 12 = y
 \end{array}$$

$$\begin{array}{r}
 28 = x + 12 \\
 -12 \quad -12 \\
 \hline
 16 = x
 \end{array}$$

x - birds  
y - cat

12 cats

16 birds

$$\begin{array}{l}
 52 = 1(16) + 3(12) \\
 52 = 16 + 36 \\
 52 = 52 \checkmark
 \end{array}$$

## Warm-up 11-27

Solve the following systems by substitution.

$$1. \begin{array}{l} y = -3x + 2 \\ 3x + y = 2 \end{array}$$

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

$$3x - 3x + 2 = 2$$

$$2 = 2$$

infinite solutions

$$2. \begin{array}{l} -x - 4y = -6 \\ x + 4y = 12 \end{array}$$

$$-x - 4y = -6$$

$$x + 4y = 12$$

$$x = -4y + 12$$

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

$$4y - 12 - 4y = -6$$

$$-12 = -6$$

no solution

## 5.2

# Today's Goal

I can...

- solve systems of equations by using substitution

## Section 5.1~ Solving Systems of Equations

### System of Equations (Linear Systems)

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2 linear equations that have 2 unknowns (variables) which a common solution is desired.

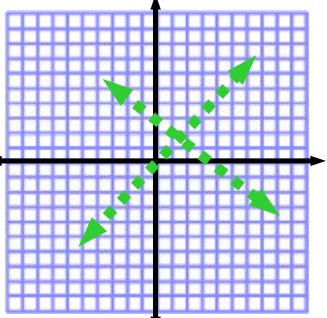
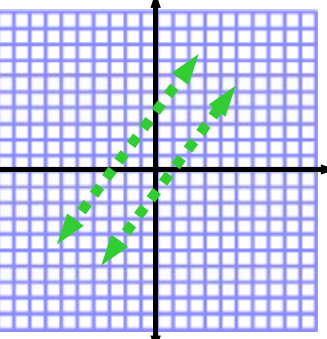
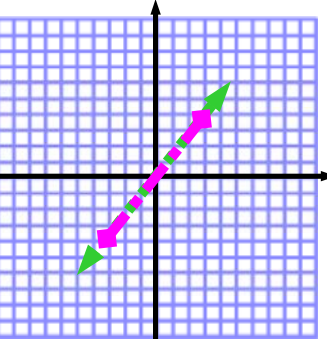
What is a solution of a linear equation?

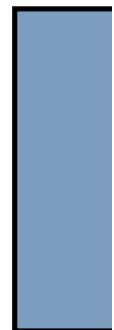
The x and y ordered pair where the lines intersect.

$(x,y)$

**How would two lines have a common solution?**



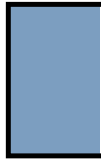
Type of lines	Picture of lines	Number of Solutions	Type of System
Intersecting		1	Consistent Independent
Parallel		0	Inconsistent
Collinear		$\infty$	Consistent Dependent



Section 5.2 : Solving Systems of equations by Substitution

What does "substitution" mean?

Replacing a value with something that is equal



Examples:

$$\begin{array}{r}
 x + y = 12 \\
 x = 10 \\
 \hline
 10 + y = 12 \\
 -10 \quad -10 \\
 \hline
 y = 2
 \end{array}$$

$$\begin{array}{r}
 x = 2y - 8 \\
 2x + y = 12 \\
 2(2y - 8) + y = 12 \\
 4y - 16 + y = 12 \\
 5y - 16 = 12 \\
 \quad +16 \quad +16 \\
 \hline
 5y = 28 \\
 \frac{5y}{5} = \frac{28}{5} \\
 y = \frac{28}{5} \\
 x = 2\left(\frac{28}{5}\right) - 8 \\
 x = \frac{56}{5} - 8 \\
 x = \frac{16}{5}
 \end{array}$$

$$\begin{array}{r}
 y = 2x - 8 \\
 y = x + 12 \\
 \hline
 \cancel{y} + 12 = 2x - \cancel{y} \\
 \hline
 12 = x - 8 \\
 +8 \quad +8 \\
 \hline
 20 = x
 \end{array}$$

$$\begin{array}{r}
 y = 20 + 12 \\
 y = 32
 \end{array}$$



If  $x=12$

What does  $3x - 4 = ?$

If  $x = 2w$

What does  $-4x + 2w = ?$



We use the same idea with the systems of equations.  
Use the following steps.

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

Step #1: Pick the equation that is the simplest or the one that already has a variable by itself. (circle it)

Step#2: Solve for one of the variables in that equation (if it isn't already done for you)

Step #3: Now substitute into the second equation

Step #4: There should only be one variable in the equation now. Solve for that variable.

Step #5: Now substitute that value into the first equation

Step #6: Solve for the variable that remains in the equation.

Step #7: Write the solution as an ordered pair.

We use the same idea with the systems of equations.  
Use the following steps.

$$\begin{aligned} y &= 2x + 3 \\ 4x + 2y &= -2 \\ 4x + 2(2x + 3) &= -2 \end{aligned}$$

$$4x + 4x + 6 = -2$$

$$\begin{array}{r} 8x + 6 = -2 \\ -6 \quad -6 \\ \hline 8x = -8 \end{array}$$

$$\frac{8x}{8} = \frac{-8}{8}$$

$$x = -1$$

$$\begin{aligned} y &= 2(-1) + 3 \\ &= -2 + 3 \end{aligned}$$

$$y = 1$$

$$(-1, 1)$$

(x, y)

Step #1: Pick the equation that is the simplest or the one that already has a variable by itself. (circle it)

Step #2: Solve for one of the variables in that equation (if it isn't already done for you)

Step #3: Now substitute into the second equation

Step #4: There should only be one variable in the equation now. Solve for that variable.

Step #5: Now substitute that value into the first equation

Step #6: Solve for the variable that remains in the equation.

Step #7: Write the solution as an ordered pair.

Solve the following by substitution. Be sure to check your answers.

1.  $y = 2x$   
 $2x + y = -12$

2.  $x = y - 4.2$   
 $2x - 3y = -9$

3.  $2x + 5y = -7$   
 $3x - y = -2$

Solve the following by substitution. Be sure to check your answers.

1.  $y = 2x$   
 $2x + y = -12$

$2x + 2x = -12$   
 $\frac{4x}{4} = \frac{-12}{4}$   
 $x = -3$

$y = 2(-3)$   
 $y = -6$

$(-3, -6)$

2.  $2x + 5y = -7$   
 $3x - y = -2$

$3x = y - 2$   
 $\frac{+2}{+2} \quad \frac{+2}{+2}$   
 $\underline{3x + 2 = y}$

$2x + 5(3x + 2) = -7$   
 $(2x) + (15x) + 10 = -7$   
 $17x + 10 = -7$   
 $\frac{-10}{17} \quad \frac{-10}{17}$   
 $\underline{17x = -17}$   
 $\frac{17}{17} \quad \frac{17}{17}$   
 $x = -1$

$y = 3(-1) + 2$   
 $y = -3 + 2$   
 $y = -1$

$(-1, -1)$

3.  $x = y - 4.2$   
 $2x - 3y = -9$

$2(y - 4.2) - 3y = -9$   
 $(2y) - 8.4 - 3y = -9$   
 $-y - 8.4 = -9$   
 $\frac{+8.4}{+8.4} \quad \frac{+8.4}{+8.4}$   
 $\underline{-y = -0.6}$   
 $\frac{-1}{-1} \quad \frac{-1}{-1}$   
 $y = 0.6$

$x = 0.6 - 4.2$   
 $x = -3.6$

$(-3.6, 0.6)$

$$y = \underline{2x + 8}$$

$$\underline{y} = -3x - 7$$

$$y = 2x + 8$$
$$y = -3x - 7$$

$$2x + 8 = -3x - 7$$
$$\begin{array}{r} +3x \qquad \qquad +3x \\ \hline 5x + 8 = -7 \\ \quad -8 \quad -8 \\ \hline 5x = -15 \\ \frac{5x}{5} = \frac{-15}{5} \quad x = -3 \end{array}$$

$$x = 2y - 8$$
$$2y + 3x = 10$$

$$y = 2(-3) + 8$$
$$= -6 + 8$$
$$= 2$$

$$(-3, 2)$$



**Recreation** Casey wants to buy a gym membership. One gym has a \$150 joining fee and costs \$35 per month. Another gym has no joining fee and costs \$60 per month.

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$$\begin{aligned} \textcircled{1} \quad y &= 150 + 35x \\ \textcircled{2} \quad y &= \underline{60x} \end{aligned}$$

$x$  - month  
 $y$  - cost (\$)

$$\begin{array}{r} 60x = 150 + 35x \\ -35x \quad \quad -35x \\ \hline 25x = 150 \\ \underline{25} \quad \underline{25} \end{array}$$

$$x = 6$$

<u>Hybrid</u>	vs.	<u>Non-Hybrid</u>
better mpg		cheaper
costs more \$		gas more \$
		costs
		insurance

# Homework

Group needs to have:

- Cost of each vehicle
- MPG of each vehicle
- insurance cost for each vehicle
- Maintenance cost for each vehicle