* When both equations are in Standard Form

Linear Systems LS6

Solving Linear Systems by Linear Combination Explore - Day 1

Name _____ SK

Date _____ Period 1

$$\begin{array}{r} 3+5=8 \\ 7+2=9 \\ \hline 10+7=17 \end{array} \qquad \begin{array}{r} 9+7=16 \\ 4-7=-3 \\ \hline 13 \quad =13 \end{array}$$

1. Are all of the equations above true? Yes

2. In each example, where did the third equation come from?
By combing the first & 2nd equations terms

3. Create another example to determine if this will always happen.
$6-4=2$
$9+5=17$
$15+4=19$ ✓

4. Add the two equations in this system. $\begin{cases} 2x+4y=10 \\ -2x-3y=-8 \end{cases}$
$y=2$

   a. Which variable was eliminated from the equations?
   X - variable

   b. What is the value of y? $y=2$

   c. Find the value of x. $2x+4y=10$ $\quad 2x+4(2)=10$ $\quad 2x=2$ $\quad x=1$

   d. What is the solution to this system of equations?
   $(1, 2)$

The process that you just performed is called linear combination or elimination. Linear combination is a process that involves adding two linear equations to create one equation with only one variable.

5. How is solving a system using the linear combination method similar to solving a system using the substitution method?
In both methods we combine the equations to make 1 equation with one variable so we can solve.

Mr. Nguyen bought a package of 3 chicken legs and a package of 7 chicken wings. Ms. Dawes bought a package of 3 chicken legs and 4 chicken wings. Mr. Nguyen bought 45 ounces of chicken. Ms. Dawes bought 36 ounces of chicken. Together they wrote this system of equations to find the weight of each chicken leg and chicken wing.

$Ax + By = C$

$$\begin{cases} 3\ell + 7w = 45 \\ 3\ell + 4w = 36 \end{cases}$$

6. Use the system of equations above to answer the following questions.

   a. Add the two equations. $6\ell + 11w = 81$

   b. Was a variable eliminated? Why or why not?
   No, because the coefficients must be opposites in order to be eliminated

   c. Multiply both sides of the second equation by -1.
   $-1(3\ell + 4w) = (36)-1 \longrightarrow -3\ell - 4w = -36$

   d. Write the resulting system of equations and add these two equations.
   $3\ell + 7w = 45$
   $-3\ell - 4w = -36$
   $3w = 9$

   e. Was a variable eliminated?
   yes, the ℓ's were eliminated

   f. We could have multiplied both sides of either equation by any number. Why did we choose to multiply the second equation by -1?
   that made the coefficients of ℓ, opposites

   g. Return to 6d and find the solution to the system.
   $3w = 9$
   $w = 3$
   $3\ell + 4w = 36$
   $3\ell + 4(3) = 36$
   $3\ell = 24$
   $\ell = 8$
   (8, 3)

7. Solve the system using linear combination.
   (-1, -3)

$$\begin{cases} 2x + y = -5 \\ 2x - 5y = 13 \end{cases} \cdot -1$$

$-2x + 5y = -13$

$6y = -18$

$y = -3$

$2x + (-3) = -5$

$2x = -2$

$x = -1$

8. Write a system of equations that could easily be solved by linear combination. Do not solve the system.