

Name:	Date:
Obj: solve linear systems by multiplying first	Class/Period:

Questions/Main Ideas: Notes:

SWBAT: Solve linear systems by multiplication

WARM UP:

$$\begin{array}{r} 2x - 5y = 2 \\ 2x - 5y = 1 \end{array}$$

1.
$$\begin{cases} 4x + 2y = 2 \\ -4x + 3y = 13 \end{cases}$$

$$\begin{array}{r} 4x + 2y = 2 \\ -4x + 3y = 13 \\ \hline 5y = 15 \\ \frac{5y}{5} = \frac{15}{5} \\ \boxed{y = 3} \end{array}$$

(1, 3)

$$\begin{array}{r} 4x + 6 = 2 \\ -6 \quad -6 \\ \hline 4x = -4 \\ \frac{4x}{4} = \frac{-4}{4} \quad \boxed{x = -1} \end{array}$$

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

$$\begin{array}{r} 2x - 5y = 2 \\ -3x + 5y = 2 \\ \hline -x = 4 \\ \boxed{x = -4} \end{array}$$

$$\begin{array}{r} 2(-4) - 5y = 2 \\ -8 - 5y = 2 \\ +8 \quad +8 \\ \hline -5y = 10 \\ \frac{-5y}{-5} = \frac{10}{-5} \quad (-4, -2) \\ \boxed{y = -2} \end{array}$$

Solving a System by Multiplying

1. Arrange the like variables in columns. This is already done
2. Pick a variable, x or y, and make the two equations opposites using multiplication.
3. Add the equations together (eliminating a variable) and solve for the remaining variable.
4. Substitute the answer into one of the ORIGINAL equations and solve.

2
$$\begin{cases} 2x + 3y = 12 \\ -4x + 5y = -2 \end{cases} \Rightarrow \begin{array}{r} 8x + 12y = 48 \\ -8x + 10y = -4 \\ \hline 22y = 44 \\ \frac{22y}{22} = \frac{44}{22} \\ \boxed{y = 2} \end{array}$$

$$\begin{array}{r} 8x + 12(2) = 48 \\ 8x + 24 = 48 \\ -24 \quad -24 \\ \hline 8x = 24 \\ \frac{8x}{8} = \frac{24}{8} \quad \boxed{x = 3} \end{array}$$

(3, 2)

Example 1:

$$\begin{aligned} -4 \begin{cases} 2x+4y=-18 \\ 3x+y=3 \end{cases} &\Rightarrow \begin{aligned} 2x+4y &= -18 \star \rightarrow 2(3)+4y=-18 \\ -12x-4y &= -12 \end{aligned} \\ \hline -10x &= -30 \\ \frac{-10}{-10} & \quad \frac{-30}{-10} \\ \boxed{x=3} & \end{aligned} \quad \begin{aligned} 6+4y &= -18 \\ -6 & \quad -6 \\ \hline 4y &= -24 \\ \frac{4}{4} & \quad \frac{-24}{4} \\ \boxed{y=-6} & \end{aligned} \\ & \quad (3, -6) \end{aligned}$$

Example 2:

$$\begin{aligned} - \begin{cases} 5x-7y=9 \\ 5x-3y=1 \end{cases} &\Rightarrow \begin{aligned} 5x-7y &= 9 \rightarrow 5x-7(-2)=9 \\ -5x+3y &= -1 \end{aligned} \\ \hline -4y &= 8 \\ \frac{-4}{-4} & \quad \frac{8}{-4} \\ \boxed{y=-2} & \end{aligned} \quad \begin{aligned} 5x+14 &= 9 \\ -14 & \quad -14 \\ \hline 5x &= -5 \\ \frac{5}{5} & \quad \frac{-5}{5} \\ \boxed{x=-1} & \end{aligned} \\ & \quad (-1, -2) \end{aligned}$$

Example 3:

$$\begin{aligned} 2 \begin{cases} 2x-5y=2 \\ -3x+2y=-14 \end{cases} &\Rightarrow \begin{aligned} 6x-15y &= 6 \star \\ -6x+4y &= -28 \end{aligned} \\ \hline -11y &= -22 \\ \frac{-11}{-11} & \quad \frac{-22}{-11} \\ \boxed{y=2} & \end{aligned} \\ \begin{aligned} 6x-15(2) &= 6 \\ 6x-30 &= 6 \\ +30 & \quad +30 \\ \hline 6x &= 36 \\ \frac{6}{6} & \quad \frac{36}{6} \\ \boxed{x=6} & \end{aligned} \quad (6, 2) \end{aligned}$$

Example 4:

$$\begin{array}{l} 4 \\ -3 \end{array} \left\{ \begin{array}{l} 3x - 4y = 6 \\ 4x - 5y = 7 \end{array} \right\} \Rightarrow \begin{array}{l} 12x - 16y = 24 \\ -12x + 15y = -21 \end{array} \star$$
$$\begin{array}{r} -y = 3 \\ \boxed{y = -3} \end{array}$$
$$12x - 16(-3) = 24$$
$$12x + 48 = 24$$
$$\begin{array}{r} -48 \quad -48 \\ \hline 12x = -24 \\ \hline 12 \quad 12 \\ \boxed{x = -2} \end{array}$$

$(-2, -3)$

Now you Try.....

$$\begin{array}{l} 7 \\ -9 \end{array} \left\{ \begin{array}{l} 9x - 3y = 12 \\ 7x + 2y = 5 \end{array} \right\} = \begin{array}{l} 63x - 21y = 84 \\ -63x - 18y = -45 \end{array} \left\{ \begin{array}{l} 3x - 4y = 6 \\ 4x - 5y = 7 \end{array} \right.$$
$$\begin{array}{r} -39y = 39 \\ \hline -39 \quad -39 \\ \boxed{y = -1} \end{array}$$
$$9x - 3(-1) = 12$$
$$9x + 3 = 12$$
$$\begin{array}{r} -3 \quad -3 \\ \hline 9x = 9 \\ \hline 9 \quad 9 \\ \boxed{x = 1} \end{array}$$

$(1, -1)$

Summary: