Unit 6 Lesson 2: Solving Systems of Equations using Elimination

Name Key

Objectives:

- Use the elimination method to solve a system of linear equations.
- Identify "special cases" that result in 'no solution' or 'infinitely many solutions' when solving systems using elimination.

Elimination Method (The "adding" method)

STEP 1	STEP 2	STEP 3	STEP 4
Vertically line up the like terms from each equation. **When looking up and down your x's should match. Your y's should match.**	**Find the variable with same coefficients (# in front of the variable). Make sure they are** opposites**.** **If they are not opposites, multiply one equation by** -1**.**	**Add the equations together. Since you had opposites, that variable disappears.** **Solve the equation for the variable that's left.**	**Plug your answer into** either **equation and solve for the other variable.** **Write your answer as an** ordered pair**.**

Practice 1: Solve each system of equations using the elimination method.

a) $-6y - 5x = 8$
$5x + 2y = 4$

$$-6y \cancel{-5x} = 8$$
$$2y \cancel{+5x} = 4$$
$$-4y = 12$$
$$\frac{-4y}{-4} = \frac{12}{-4}$$
$$\boxed{y = -3}$$

$$5x + 2(-3) = 4$$
$$5x - 6 = 4$$
$$+6 \quad +6$$
$$\frac{5x}{5} = \frac{10}{5}$$
$$\boxed{x = 2}$$

Answer $(2, -3)$

b) $8x - 4y = -4$
$-4y = -3x - 14$
$+3x \quad +3x$
$3x - 4y = -14$

$$8x - 4y = -4$$
$$3x - 4y = -14 \leftarrow \text{not opposites!}$$
$$(-1) \quad (-1) \quad (-1)$$

$$8x \cancel{-4y} = -4$$
$$-3x \cancel{+4y} = 14$$
$$\frac{5x}{5} = \frac{10}{5}$$
$$x = 2$$

$$8(2) - 4y = -4$$
$$16 - 4y = -4$$
$$\frac{-4y}{-4} = \frac{-20}{-4}$$
$$y = 5$$

Answer $(2, 5)$

Using elimination when you DON'T have matching coefficients:
Not every equation will have matching coefficients. When this happens, we can make our own matching coefficients by multiplying the entire equation or both equations by the same number. As long as you multiply the entire equation by the same number, you are not changing the equation. Each student could choose a different way to do this, but you will always get the same answer.

Special Cases
When we solve systems, we have the possibility of getting infinitely many Solutions or No Solution.

Infinitely Many Solutions → TRUE!
When using the elimination method, we know that the system has IMS when we get a true statement on both sides of the equation.

Example: 3=3 , -1=-1, 100=100

No Solution → FALSE!
When using the elimination method, we know that the system has no solution when we get a false Statement.

Example: 4=2 , -3=2, 4=9, 6=5

Practice 2: Solve each system using the elimination method.

a) $6x+3y=9$
$2x+9y=27$
(-3) (-3) (-3)

$\cancel{6x}+3y=9$
$-\cancel{6x}-27y=-81$
$-24y=-72$
$\frac{-24y}{-24} = \frac{-72}{-24}$
$y=3$

$6x+3(3)=9$
$6x+9=9$
$-9 \quad -9$
$\frac{6x}{6}=\frac{0}{6}$
$x=0$

Answer $(0,3)$

b) $2x+5y=7$
$-6+3x=-12y$
$+6 \qquad +6$
$3x=6-12y$
$+12y \qquad +12y$
$3x+12y=6$

Line it up:
$2x+5y=7$ ← times 3
$3x+12y=6$ ← times -2

$\cancel{6x}+15y=21$
$-\cancel{6x}-24y=-12$
$\frac{-9y}{-9}=\frac{9}{-9}$
$y=-1$

$2x+5(-1)=7$
$2x-5=7$
$2x=12$
$x=6$

Answer $(6,-1)$

c) $4y-2x=4$
$2-x=-2y$
$-2 \qquad -2$
$-x=-2y-2$
$+2y \quad +2y$
$2y-x=-2$

Line it up:
$4y-2x=4$
$2y-x=-2$ ← multiply by -2

$4y-2x=4$
$-4y+2x=4$
$0+0=8$
$\boxed{0=8}$

FALSE!

Answer No Solution

d) $y-3x=4$
$-12x+4y=16$

$y-3x=4$ ← multiply by -4
$4y-12x=16$

$-4y+12x=-16$
$4y-12x=16$
$0+0=0$
$0=0$

TRUE!

Answer infinitely many solutions