

**Worksheet 6-5: Solving Linear Systems by Elimination**

We can also solve a system of linear equations by the method of elimination which involves eliminating one of the variables by adding or subtracting the two equations.

**\*\*FIRST identify the variable to be eliminated\*\***

**Practice: Adding two linear equations (When you have “opposite” signs)**

$$1. \quad (a) \quad \begin{array}{l} x + y = 10 \\ 2x - y = 5 \end{array} \qquad (b) \quad \begin{array}{l} 2x + 3y = 12 \\ -2x - 5y = -8 \end{array}$$

**Practice: Subtracting two linear equations (When you have “same” signs)**

$$2. \quad (a) \quad \begin{array}{l} -x + 13y = -22 \\ -x - 15y = 6 \end{array} \qquad (b) \quad \begin{array}{l} -5x - 7y = 27 \\ 2x - 7y = 20 \end{array}$$

**Eliminating by Addition then Solve (When you have “opposite” signs)**

Step 1: Eliminate one of the variables by **adding** or subtracting to create an equation with only one variable. (\*\***Multiply** the equation(s) to eliminate terms *if necessary*.)

Step 2: Solve for the remaining variable.

Step 3: Substitute the value for  $x$  or  $y$  back into one of the original equations to determine the value of the other variable.

$$3. \quad \begin{array}{l} 3x + y = 19 \\ 4x - y = 2 \end{array}$$

4.  $x + 2y = 9$   
 $4x - 2y = -4$

5.  $-4x - 2y = -12$   
 $4x + 8y = -24$

6.  $-6x + 5y = 1$   
 $6x + 4y = -10$

**Answers:** 1. (a)  $3x = 15, x = 5$ , (b)  $-2y = 4, y = -2$ ; 2. (a)  $28y = -28, y = -1$ , (b)  $-7x = 7, x = -1$ ;  
3. The solution is  $(3, 10)$ ; 4. The solution is  $(1, 4)$ ; 5. The solution is  $(6, -6)$ ;  
6. The solution is  $(-1, -1)$

**Eliminating by Subtraction then Solve** (*When you have same signs*)

Step 1: Eliminate one of the variables by adding or **subtracting** to create an equation with only one variable. (\*\*Multiply the equation(s) to eliminate terms *if necessary*.)

Step 2: Solve for the remaining variable.

Step 3: Substitute the value for  $x$  or  $y$  back into one of the original equations to determine the value of the other variable.

7.  $3x - 4y = 14$   
 $3x + 7y = -8$

8.  $7x + 2y = 24$   
 $8x + 2y = 30$

9.  $-2x - 9y = -25$   
 $-4x - 9y = -23$

**“Multiply” before Elimination**

When there are no common coefficients in the given equations, it is necessary to write the original equations into equivalent equations by **multiplying** one or both equations **by a constant** or number first in order to eliminate terms by addition or subtraction.

**10.**  $5x + y = 9$   
 $10x - 7y = -18$

**11.**  $4x - 2y = 6$   
 $x + y = 6$

**12.**  $3x + 2y = 28$   
 $5x - 3y = 15$

**13.**  $-4x - 2y = 14$   
 $-10x + 7y = -25$

**Answers:** **7.** The solution is  $(2, -2)$ ; **8.** The solution is  $(6, -9)$ ; **9.** The solution is  $(-1, 3)$ ;  
**10.** The solution is  $(1, 4)$ ; **11.** The solution is  $(3, 3)$ ; **12.** The solution is  $(6, 5)$ ;  
**13.** The solution is  $(-1, -5)$