

**Lesson 6.3 Notes (Elimination using Addition and Subtraction)**

**Objectives:**

- Solve systems of equations by using elimination with addition.
- Solve systems of equations by using elimination with subtraction.

• **Elimination Method (Addition/Subtraction):**

**KeyConcept Solving by Elimination**

**Step 1** Write the system so like terms with the same or opposite coefficients are aligned.

**Step 2** Add or subtract the equations, eliminating one variable. Then solve the equation.

**Step 3** Substitute the value from Step 2 into one of the equations and solve for the other variable. Write the solution as an ordered pair.

Example: Use elimination to solve each system of equations.

1.  $\begin{cases} 4x + 6y = 32 \\ 3x - 6y = 3 \end{cases}$

2.  $\begin{cases} 2t + 5r = 6 \\ 9r + 2t = 22 \end{cases} \Rightarrow -2t + 9r = 22$

$$\begin{array}{r} 4x + 6y = 32 \\ + (3x - 6y = 3) \\ \hline 7x = 35 \\ x = 5 \end{array}$$

$$\begin{array}{r} 4(5) + 6y = 32 \\ 20 + 6y = 32 \\ 6y = 12 \\ y = 2 \end{array}$$

**(5, 2)**

$$\begin{array}{r} 2t + 5r = 6 \\ - (2t + 9r = 22) \\ \hline -4r = -16 \\ r = 4 \end{array}$$

$$\begin{array}{r} 2t + 5(4) = 6 \\ 2t + 20 = 6 \\ 2t = -14 \\ t = -7 \end{array}$$

Practice: Use elimination to solve each system of equations.

3.  $\begin{cases} 8b + 3c = 11 \\ 8b + 7c = 7 \end{cases}$

4.  $\begin{cases} 4y + 3x = 22 \\ 3x - 4y = 14 \end{cases} \Rightarrow -4y + 3x = 14$

$$\begin{array}{r} 8b + 3c = 11 \\ - (8b + 7c = 7) \\ \hline -4c = 4 \\ c = -1 \end{array}$$

$$\begin{array}{r} 8b + 3(-1) = 11 \\ 8b - 3 = 11 \\ 8b = 14 \\ b = \frac{14}{8} \\ b = \frac{7}{4} \end{array}$$

**(6, 1)**

$$\begin{array}{r} 4y + 3x = 22 \\ + (-4y + 3x = 14) \\ \hline 6x = 36 \\ x = 6 \end{array}$$

$$\begin{array}{r} 4y + 3(6) = 22 \\ 4y + 18 = 22 \\ 4y = 4 \\ y = 1 \end{array}$$

• **Write and Solve a System of Equations:**

Examples: Use elimination to solve each system of equations.

5. Negative three times one number plus five times another number is -11. Three times the first number plus seven times the other number is -1. Find the numbers.

$$\begin{array}{r} -3x + 5y = -11 \\ + (3x + 7y = -1) \\ \hline 12y = -12 \\ y = -1 \end{array}$$

$$\begin{array}{r} -3x + 5(-1) = -11 \\ -3x - 5 = -11 \\ -3x = -6 \\ x = 2 \end{array}$$

6. The sum of two numbers is -10. Negative three times the first number minus the second number equals 2. Find the numbers.

$$\begin{array}{r} x + y = -10 \\ + (-3x - y = 2) \\ \hline -2x = -8 \\ x = 4 \end{array}$$

$$\begin{array}{r} x + y = -10 \\ 4 + y = -10 \\ y = -14 \end{array}$$

• **Real-world Applications**

7. Cheryl earns \$8.50 per hour and Jackie earns \$7.50 per hour. During a typical week, they earn \$299.50 altogether. One week, when Jackie doubles her work hours, the girls earn \$412 altogether. How many hours does each girl work during a typical week?

$$\begin{array}{r} 8.5c + 7.5j = 299.5 \\ - [8.5c + 15j = 412] \\ \hline -7.5j = -112.5 \\ j = 15 \end{array}$$

$$\begin{array}{r} 8.5c + 7.5(15) = 299.5 \\ 8.5c + 112.5 = 299.5 \\ 8.5c = 187 \\ c = 22 \end{array}$$

Jackie: 15 hr      Cheryl: 22 hr

8. Tamera and Adelina are throwing a birthday party for their friend. Tamera invited 5 fewer friends than Adelina. Together they invited 47 guests. How many guests did each girl invite?

$$\begin{array}{r} t + a = 47 \\ t = a - 5 \end{array}$$

$$\begin{array}{r} (t) + a = 47 \\ a - 5 + a = 47 \\ 2a - 5 = 47 \\ 2a = 52 \\ a = 26 \end{array}$$

$$\begin{array}{r} t = a - 5 \\ t = 26 - 5 \\ t = 21 \end{array}$$

Tamera: 21 guests  
Adelina: 26 guests