



Unit 9:
Lesson 04

Solving two linear equations by elimination

Elimination method (sometimes called the addition method):

- A system of two equations in two variables can be solved by adding the two equations together so that one of the variables is eliminated.
- Solve the resulting equation for the remaining variable.
- Substitute this solved variable back into one of the original equations and solve for the other variable.

Example 1: Solve the system $-2x + 3y = 11$; $2x + y = 1$.

$$\begin{array}{r}
 \cancel{-2x} + 3y = 11 \\
 2x + y = 1 \\
 \hline
 4y = 12 \\
 y = \frac{12}{4} \\
 y = \boxed{3}
 \end{array}
 \qquad
 \begin{array}{r}
 2x + y = 1 \\
 + 3 = 1 \\
 2x = 1 - 3 \\
 2x = -2 \\
 x = \frac{-2}{2} = \boxed{-1}
 \end{array}$$

Example 2: Solve the system $6a + 7b = -15$; $6a - 2b = 12$.

$$\begin{array}{r}
 6a + 7b = -15 \longrightarrow \\
 -1(6a - 2b) = 12(-1) \longrightarrow \\
 \hline
 6a + 7b = -15 \\
 6a + 7(-3) = -15 \\
 6a = 21 - 15 = 6 \\
 a = \frac{6}{6} = \boxed{1}
 \end{array}
 \qquad
 \begin{array}{r}
 6a + 7b = -15 \\
 \cancel{-6a} + 2b = -12 \\
 \hline
 9b = -27 \\
 b = \frac{-27}{9} = \boxed{-3}
 \end{array}$$

Example 3: Solve the system $2x - 3y = 4$; $x + 4y = -9$.

$$\begin{array}{r}
 2x - 3y = 4 \longrightarrow 2x - 3y = 4 \\
 -2(x + 4y) = -9(-2) \longrightarrow \underline{-2x - 8y = 18} \\
 \hline
 -11y = 22 \\
 y = \frac{22}{-11} = \boxed{-2} \\
 \\
 x + 4y = -9 \\
 x + 4(-2) = -9 \\
 x - 8 = -9 \\
 x = -9 + 8 \\
 x = \boxed{-1}
 \end{array}$$

Example 4: Solve the system $3x - 8y = 13$; $4x - 5y = 6$.

$$\begin{array}{r}
 4(3x - 8y) = 4(13) \longrightarrow 12x - 32y = 52 \\
 -3(4x - 5y) = 6(-3) \longrightarrow \underline{-12x + 15y = -18} \\
 \hline
 -17y = 34 \\
 y = \frac{34}{-17} = \boxed{-2} \\
 \\
 4x - 5y = 6 \\
 4x - 5(-2) = 6 \\
 4x + 10 = 6 \\
 4x = 6 - 10 \\
 4x = -4 \\
 x = \frac{-4}{4} = \boxed{-1}
 \end{array}$$

Assignment: Solve the following systems using the elimination method.

1. $4x - 3y = -2$; $2x + 3y = 26$

2. $a - b = 4$; $a + b = 8$

3. $2x - 5y = -6$; $2x - 7y = -14$

4. $3x + y = 4$; $5x - y = 12$

5. $5p + 2q = 6$; $9p + 2q = 22$

6. $5x + 12y = -1$; $8x + 12y = 20$

7. $3h - 5g = -35$; $2h - 5g = -30$

8. $4a - 5b = 23$; $3a + 10b = 31$

9. $2x + 7y = 4$; $3x - 7y = 6$

10. $m + 5n = 4$; $3m - 7n = -10$

11. $5x + 9y = 1$; $3x + 4y = 2$

12. $3x - 4y = 8$; $4x + 3y = 19$