

6.3 Solve Linear Systems Using Elimination

The idea behind this method is that we want to **ELIMINATE** one of the variables.

When do terms cancel??

When their coefficients are **opposites!**

Solve each linear system.

$$\begin{array}{r}
 1. \quad 4x + 3y = 16 \\
 + \quad 2x - 3y = 8 \\
 \hline
 6x \qquad = 24 \\
 \underline{6} \qquad \underline{6} \\
 x = 4
 \end{array}$$

$$\begin{array}{r}
 4(4) + 3y = 16 \\
 16 + 3y = 16 \\
 \underline{-16} \qquad \underline{-16} \\
 3y = 0 \\
 \underline{3} \qquad \underline{3} \\
 y = 0
 \end{array}$$

$(4, 0)$

$$\begin{array}{r}
 2. \quad 3a + 2b = 7 \\
 + \quad -3a + 4b = 5 \\
 \hline
 \qquad 6b = 12 \\
 \qquad \underline{6} \qquad \underline{6} \\
 \qquad b = 2
 \end{array}$$

$$\begin{array}{r}
 3a + 2(2) = 7 \\
 3a + 4 = 7 \\
 \underline{-4} \qquad \underline{-4} \\
 3a = 3 \\
 \underline{3} \qquad \underline{3} \\
 a = 1
 \end{array}$$

$(1, 2)$

Solve each linear system.

$$\begin{array}{r}
 3. \quad 4m - 2n = 2 \\
 +3m + 2n = +12 \quad \text{mult. by } -1 \\
 \hline
 7m = 14 \\
 \frac{7m}{7} = \frac{14}{7} \\
 m = 2
 \end{array}$$

$$\begin{array}{r}
 4(2) - 2n = 2 \\
 8 - 2n = 2 \\
 \frac{-8}{-8} \quad \frac{-8}{-8} \\
 \hline
 -2n = -6 \\
 \frac{-2}{-2} \quad \frac{-2}{-2} \\
 n = 3 \quad (2, 3)
 \end{array}$$

$$\begin{array}{r}
 4. \quad 5g + 2h = -4 \\
 -5g + 3h = -19 \quad \text{mult. by } -1 \\
 \hline
 5h = 15 \\
 \frac{5h}{5} = \frac{15}{5} \\
 h = 3
 \end{array}$$

$$\begin{array}{r}
 5g + 2(3) = -4 \\
 5g + 6 = -4 \\
 \frac{-6}{-6} \quad \frac{-6}{-6} \\
 \hline
 5g = -10 \\
 \frac{5g}{5} = \frac{-10}{5} \\
 g = -2 \\
 (-2, 3)
 \end{array}$$

Solve each linear system.

$$\begin{array}{r}
 5. \quad 9x - 3y = 18 \\
 3y = -7x + 30 \\
 \frac{+7x}{+7x} \quad \frac{+7x}{+7x} \\
 \hline
 7x + 3y = 30 \\
 9x - 3y = 18 \\
 \hline
 16x = 48 \\
 \frac{16x}{16} = \frac{48}{16} \\
 x = 3
 \end{array}$$

$$\begin{array}{r}
 9(3) - 3y = 18 \\
 27 - 3y = 18 \\
 \frac{-27}{-27} \quad \frac{-27}{-27} \\
 \hline
 -3y = -9 \\
 \frac{-3y}{-3} = \frac{-9}{-3} \\
 y = 3
 \end{array}$$

$$(3, 3)$$

$$\begin{array}{r}
 6. \quad 3c = 2d - 6 \\
 3c + 4d = -6 \\
 \frac{-3c}{-3c} \quad \frac{-3c}{-3c} \quad \text{mult. by } -1 \\
 \hline
 6d = 0 \\
 \frac{6d}{6} = \frac{0}{6} \\
 d = 0
 \end{array}$$

$$\begin{array}{r}
 3c + 4(0) = -6 \\
 3c = -6 \\
 \frac{3c}{3} = \frac{-6}{3} \\
 c = -2 \\
 (-2, 0)
 \end{array}$$

Write and solve a system of equations.

7. The sum of two numbers is 42.
Their difference is 6.
Find the numbers.

$$\begin{aligned} x &= \text{1st \#} \\ y &= \text{2nd \#} \end{aligned}$$

$$\begin{array}{r} 1x + y = 42 \\ 1x - y = 6 \\ \hline 2x = 48 \\ \hline \frac{2x}{2} = \frac{48}{2} \end{array}$$

$$x = 24$$

$$\begin{array}{r} 24 + y = 42 \\ -24 \quad -24 \\ \hline y = 18 \end{array}$$

The numbers are
24 & 18.

Write and solve a system of equations.

8. Roger is older than Ken.
The difference of their ages is 12
and the sum of their ages is 50.
Find the age of each.

$$\begin{aligned} x &= \text{Roger's age} \\ y &= \text{Ken's age} \end{aligned}$$

$$\begin{array}{r} x - y = 12 \\ x + y = 50 \\ \hline 2x = 62 \\ \hline \frac{2x}{2} = \frac{62}{2} \end{array}$$

$$x = 31$$

$$\begin{array}{r} 31 + y = 50 \\ -31 \quad -31 \\ \hline y = 19 \end{array}$$

Roger is
31 &
Ken is 19.