

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.

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

$$\frac{6x}{6} = \frac{24}{6}$$

$$x = 4$$

(4, 0)

$$4(4) + 3y = 16$$

$$\begin{array}{r} 16 + 3y = 16 \\ -16 \quad -16 \\ \hline \end{array}$$

$$\frac{3y}{3} = \frac{0}{3}$$

$$y = 0$$

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

$$\frac{6b}{6} = \frac{12}{6}$$

$$b = 2$$

$$3a + 2(2) = 7$$

$$\begin{array}{r} 3a + 4 = 7 \\ -4 \quad -4 \\ \hline \end{array}$$

$$\frac{3a}{3} = \frac{3}{3}$$

$$a = 1$$

(1, 2)

Solve each linear system.

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

$$m = 2 \quad (2, 3)$$

$$\begin{array}{r}
 3(2) + 2n = 12 \\
 6 + 2n = 12 \\
 \frac{6}{-6} \quad \frac{2n}{-6} = \frac{12}{-6} \\
 \hline
 2n = 6 \\
 \frac{2n}{2} = \frac{6}{2} \\
 n = 3
 \end{array}$$

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

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

Solve each linear system.

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

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

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

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

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

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

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

Write and solve a system of equations.

7. The ^{add} sum of two numbers is 42.
 Their ^{subtract} difference is 6.
 Find the numbers.

$$\begin{array}{r}
 1x + y = 42 \\
 1x - y = 6 \\
 \hline
 2x = 48 \\
 \frac{2x}{2} = \frac{48}{2} \\
 x = 24
 \end{array}
 \quad \longrightarrow \quad
 \begin{array}{r}
 24 + y = 42 \\
 -24 \quad -24 \\
 \hline
 y = 18
 \end{array}$$

$$x = 24$$

$$24 \text{ \& } 18$$

Write and solve a system of equations.

8. Roger is older than Ken. $x = \text{Roger's age}$
 $y = \text{Ken's age}$
 The difference of their ages is 12
 and the sum of their ages is 50.
 Find the age of each.

$$\begin{array}{r}
 x - y = 12 \\
 x + y = 50 \\
 \hline
 2x = 62 \\
 \frac{2x}{2} = \frac{62}{2} \\
 x = 31
 \end{array}
 \quad \longrightarrow \quad
 \begin{array}{r}
 31 + y = 50 \\
 -31 \quad -31 \\
 \hline
 y = 19
 \end{array}$$

$$x = 31$$

$$\begin{array}{l}
 \text{Roger's age} = 31 \\
 \text{Ken's age} = 19
 \end{array}$$