

# 7-4 Elimination Using Multiplication

(Pages 387–392)

An extension of the elimination method is to multiply one or both of the equations in a system by some number so that adding or subtracting eliminates a variable.

**Examples** Solve each system of equations using elimination.

**a.  $x - y = 5$  and  $3x + 2y = 15$**

Multiply the first equation by 2 so that the coefficient of the  $y$ -terms in the system will be opposites. Then, add the equations and solve for  $x$ .

$$\begin{array}{r} 2(x - y) = 2(5) \rightarrow 2x - 2y = 10 \\ 3x + 2y = 15 \quad \rightarrow \quad (+) 3x + 2y = 15 \\ \hline 5x = 25 \\ x = 5 \end{array}$$

$x - y = 5$                       Use the first equation.  
 $5 - y = 5$                     Substitute 5 for  $x$ .  
 $-y = 0 \Rightarrow y = 0$

The solution to this system is (5, 0).

**b.  $2x + 9y = 43$  and  $5x - 2y = -15$**

Multiply the first equation by 5 and the second equation by  $-2$  so that the coefficients of the  $x$ -terms in the system will be opposites. Then, add the equations and solve for  $y$ .

$$\begin{array}{r} 5(2x + 9y) = 5(43) \rightarrow 10x + 45y = 215 \\ -2(5x - 2y) = -2(-15) \rightarrow (+) -10x + 4y = 30 \\ \hline 49y = 245 \\ y = 5 \end{array}$$

$2x + 9y = 43$                       Use the first equation.  
 $2x + 45 = 43$                       Substitute 5 for  $y$ .  
 $2x = -2 \Rightarrow x = -1$

The solution to the system is (-1, 5).

**Try These Together**

Use elimination to solve each system of equations.

- |                 |                   |                  |                          |
|-----------------|-------------------|------------------|--------------------------|
| 1. $2x + y = 4$ | 2. $-5x + 2y = 5$ | 3. $4x + 7y = 6$ | 4. $\frac{x - y}{4} = 1$ |
| $3x - 2y = 6$   | $x - y = 2$       | $6x + 5y = 20$   | $\frac{2x - y}{3} = 4$   |

**Practice**

Use elimination to solve each system of equations.

- |                      |                              |                         |                   |
|----------------------|------------------------------|-------------------------|-------------------|
| 5. $18x + 24y = 288$ | 6. $3x + 8y = 11$            | 7. $y = 4x + 11$        | 8. $2x - 2y = 16$ |
| $-16x - 12y = -172$  | $2x + 5y = 18$               | $3x - 2y = -7$          | $3x + y = 4$      |
| 9. $2x + 3y = 0$     | 10. $2x + \frac{1}{3}y = -1$ | 11. $0.4x + 0.2y = 0.4$ |                   |
| $3x + y = 7$         | $x - \frac{1}{4}y = -8$      | $0.2x - 0.3y = 0.4$     |                   |
12. **Algebra** Solve using elimination:  $\frac{1}{2x - 4} - \frac{2}{y + 1} = 0$  and  $\frac{1}{x - 3} - \frac{1}{y + 4} = 0$ .

13. **Standardized Test Practice** By which number could you multiply the first equation of the following system to solve the system by elimination?  
 $-4x - 11y = -32$  and  $12x + 10y = 55$
- A** 3 or -3                      **B** 10 or -10                      **C** 11 or -11                      **D** 12 or -12

**Answers:** 1. (2, 0) 2. (-3, -5) 3. (5, -2) 4. (8, 4) 5. (4, 9) 6. (89, -32) 7. (-3, -1) 8. (3, -5) 9. (3, -2) 10.  $(-\frac{3}{2}, 18)$  11.  $(\frac{1}{4}, -\frac{1}{4})$  12.  $(\frac{3}{2}, -6\frac{3}{4})$  13. A