7-3 Elimination Using Addition and Subtraction *(Pages 382–386)*

In systems of equations where the coefficients of terms containing the same variable are *opposites*, the **elimination** method can be applied by adding the equations. If the coefficients of those terms are the *same*, the elimination method can be applied by subtracting the equations.

Examples Solve each system of equations using elimination.

a. $x - 2y = 13$ and $3x + 2y = 15$

Add the two equations, since the coefficients of the y-terms, −2 and 2, are opposites.

$$\begin{array}{r} x - 2y = 13 \\ (+)\ 3x + 2y = 15 \\ \hline 4x\qquad = 28 \end{array}$$ Solve for x.

$x = 7$ Divide each side by 4.

$x - 2y = 13$ Use the first equation.
$7 - 2y = 13$ Substitute 7 for x.
$-2y = 6 \Rightarrow y = -3$

The solution of the system is (7, −3).

b. $3x + 4y = 5$ and $3x - y = -5$

Subtract the two equations, since the coefficients of the x-terms are the same.

$$\begin{array}{r} 3x + 4y = 5 \\ (-)\ 3x - y = -5 \\ \hline 5y = 10 \end{array}$$ Solve for y.

$y = 2$ Divide each side by 5.

$3x - y = -5$ Use the second equation.
$3x - 2 = -5$ Substitute 2 for y.
$3x = -3 \Rightarrow x = -1$

The solution of the system is (−1, 2).

Try These Together

State whether addition, subtraction, or substitution would be most convenient to solve each system of equations. Then solve the system.

1. $x - y = 3$
$3x + y = 1$

2. $3x + 4y = 2$
$2x + 4y = 8$

3. $2x + 4y = 8$
$y - 3 = x$

Practice

State whether addition, subtraction, or substitution would be most convenient to solve each system of equations. Then solve the system.

4. $x + 2y = 3$
$-x + y = 6$

5. $x + y = -2$
$x - y = 8$

6. $2y - 3x = 12$
$-2y + 6x = -5$

7. $2x + y = -5$
$x + 3y = 25$

8. $x - 4y = 16$
$2x - 4y = 18$

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

10. $8x + y = 1$
$-8x - 4y = 3$

11. $2x - 5y = -6$
$2x + 3y = -9$

12. Shopping A can of juice and a can of beef stew together cost $2.05. Two cans of juice and a can of beef stew cost $2.70. How much does a single can of juice cost?

13. Standardized Test Practice Solve the system. $2y - 5x = 1$
$3y + 5x = 14$

A (3, 1)   **B** (1, 3)   **C** (−1, 3)   **D** (3, −1)