NAME _____ DATE _____

8-3 Elimination Using Addition and Subtraction (Pages 469–474)

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.

$$\begin{array}{rl} x - 2y = 13 & \\ (+)\ 3x + 2y = 15 & \\ \hline 4x \quad\ = 28 & \text{Solve for } x. \\ x = 7 & \end{array}$$

$x - 2y = 13$ *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.

$$\begin{array}{rl} 3x + 4y = 5 & \\ (-)\ 3x - y = -5 & \\ \hline 5y = 10 & \text{Solve for } y. \\ y = 2 & \end{array}$$

$3x - y = -5$ *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** $(3, -1)$

Answers: **1.** addition; (1, −2) **2.** subtraction; (−6, 5) **3.** substitution; $\left(-\frac{2}{3}, 2\frac{1}{3}\right)$ **4.** addition; (−3, 3) **5.** addition or subtraction; (3, −5) **6.** addition; $\left(2\frac{1}{3}, 9\frac{1}{2}\right)$ **7.** substitution; (−8, 11) **8.** subtraction; $\left(2, -3\frac{1}{2}\right)$ **9.** addition; $\left(1\frac{3}{5}, \frac{7}{10}\right)$ **10.** addition; $\left(\frac{7}{24}, -1\frac{1}{3}\right)$ **11.** subtraction; $\left(-3\frac{15}{16}, -\frac{3}{8}\right)$ **12.** $0.65 **13.** B