6-4 Solve Equivalent Systems of Linear Equations with the Same Solution

Name _____ Date _____

Solve: $\begin{cases} 4x + 5y = -7 \\ 6x - 7y = 33 \end{cases}$

1 Add the equations.

$$\begin{array}{r} 7(4x + 5y = -7) \\ +\ 5(6x - 7y = 33) \\ \hline 28x + 35y = -49 \\ +\ 30x - 35y = 165 \\ \hline 58x \quad = 116 \end{array}$$

← Use the Multiplication Property of Equality.

$$\frac{58x}{58} = \frac{116}{58}$$ ← Use the Division Property of Equality.

$$x = 2$$

2 Substitute 2 for x in one of the original equations. Solve for y.

$4(2) + 5y = -7$ ← Solve for y by substituting 2 for x.

$8 + 5y = -7$

$8 - 8 + 5y = -7 - 8$

$5y = -15$

$5y \div 5 = -15 \div 5$ ← Use the Division Property of Equality.

$y = -3$

Check: Substitute 2 for x and -3 for y in both of the original equations to check.

$4x + 5y = -7$

$4(\mathbf{2}) + 5(\mathbf{-3}) \stackrel{?}{=} -7$

$\mathbf{8 - 15} \stackrel{?}{=} -7$

$-7 = -7$ **True**

$6x - 7y = 33$

$6(\mathbf{2}) - 7(\mathbf{-3}) \stackrel{?}{=} 33$

$\mathbf{12 + 21} \stackrel{?}{=} 33$

$33 = 33$ **True**

So the solution of the system of equations is $(2, -3)$.

Solve each system of equations. Check your answer on a separate sheet of paper.

1. $\begin{cases} 3x + 2y = 22 \\ 2x + 4y = 28 \end{cases}$

$-2(3x + 2y = 22)$
$+\ 2x + 4y = 28$
$-6x - 4y = -44$
$+\ 2x + 4y = 28$
$-4x \quad = -16$
$x = 4$
$3(4) + 2y = 22$
$2y = 10$
$y = 5$; (4, 5)

2. $\begin{cases} 5x + 3y = 42 \\ 2x + 6y = 60 \end{cases}$

3. $\begin{cases} 3x - 5y = -36 \\ 5x + 2y = 2 \end{cases}$

4. $\begin{cases} 6x + 4y = 30 \\ 2x - 5y = 29 \end{cases}$

5. $\begin{cases} 8c + 2d = 1 \\ 12c + 4d = 1 \end{cases}$

6. $\begin{cases} 9a + 6b = -1 \\ 6a + 9b = 1 \end{cases}$

7. $\begin{cases} 14 - 8s = -10r \\ 5r = 5 - 12s \end{cases}$

8. $\begin{cases} -10 - 12q = -6p \\ 24p + 37 = -18q \end{cases}$

Solve each system of equations. Check your answer on a separate sheet of paper.

9. $\begin{cases} 3x - 5y = 12 \\ 12.6x - 21y = 1 \end{cases}$

10. $\begin{cases} 13.8x + 9.2y = -4 \\ 6x + 4y = 8 \end{cases}$

11. $\begin{cases} \frac{1}{2}x - \frac{2}{3}y = 8 \\ \frac{3}{20}x - \frac{1}{5}y = 2\frac{2}{5} \end{cases}$

Solve. Show your work.

12. Three apples and 2 oranges cost \$0.65. Two apples and 5 oranges cost \$0.80. What is the cost of 1 apple and 1 orange?

13. On Monday, Ming works 4 h 30 min, and Dahlia works 3.5 h. Together, they earn \$78.15. On Tuesday, Ming works 5 h 12 min, and Dahlia works 4.8 h. Together, they earn \$98.92. What is each person's hourly rate?

14. Geometry Two angles are complementary. One angle is 2° less than 3 times the other angle. Find the measure of each angle. (*Hint:* The sum of the measures of complementary angles is 90°.)

15. Geometry Two angles are supplementary. One angle is 15° less than 2 times the other angle. Find the measure of each angle. (*Hint:* The sum of the measures of supplementary angles is 180°.)

WRITE ABOUT IT

16. By which variables should you multiply each equation in the system of equations to eliminate x? Explain your answer.

$\begin{cases} ax + by = c \\ dx - ey = f \end{cases}$