6-2 Solve Systems of Linear Equations by Substitution

Name _____ Date _____

Solve: $\begin{cases} 2x + y = 13 \\ 3x - 2y = 2 \end{cases}$

Solve the first equation for y.

$2x + y = 13$ ← first equation

$-2x + 2x + y = -2x + 13$ ← Use the Subtraction Property of Equality.

$y = -2x + 13$

Substitute: $3x - 2y = 2$ ← second equation

$3x - 2(-2x + 13) = 2$ ← Substitute $-2x + 13$ for y.

$3x + 4x - 26 = 2$ ← Then use the Distributive Property.

$7x - 26 = 2$ ← Combine like terms.

$7x - 26 + 26 = 2 + 26$ ← Use the Addition Property of Equality.

$7x = 28$

$\frac{7x}{7} = \frac{28}{7}$ ← Use the Division Property of Equality.

$x = 4$

$2(4) + y = 13$ ← Substitute 4 for x into the equation $2x + y = 13$. Solve for y.

$8 + y = 13$

$-8 + 8 + y = -8 + 13$ ← Use the Subtraction Property of Equality.

$y = 5$

Check: Substitute 4 for x and 5 for y in both of the original equations.

First equation:

$2x + y = 13$

$2(\mathbf{4}) + \mathbf{5} \stackrel{?}{=} 13$

$\mathbf{8} + \mathbf{5} \stackrel{?}{=} 13$

$13 = 13$ **True**

Second equation:

$3x - 2y = 2$

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

$\mathbf{12} - \mathbf{10} \stackrel{?}{=} 2$

$2 = 2$ **True**

So the solution of the system of equations is (4, 5).

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

1. $\begin{cases} y = x + 3 \\ 3x + 2y = 11 \end{cases}$

3x + 2y = 11
3x + 2(x + 3) = 11
3x + 2x + 6 = 11
5x + 6 = 11
5x = 5
x = 1
y = (1) + 3 = 4
(1, 4)

2. $\begin{cases} y = x - 3 \\ 3x + 2y = 14 \end{cases}$

3. $\begin{cases} x - 3y = -10 \\ 5x + 3y = 4 \end{cases}$

4. $\begin{cases} x + 4y = 6 \\ 6x + 2y = -8 \end{cases}$

5. $\begin{cases} 4x - 5y = 8 \\ 0.5x + 1.5y = -7.5 \end{cases}$

6. $\begin{cases} 6x - 2y = -28 \\ 0.7x + 2.8y = -6.3 \end{cases}$

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

7. $\begin{cases} 16x - 2y = 8 \\ 8x + 3y = 12 \end{cases}$

8. $\begin{cases} 9x - 3y = 3 \\ 12x + 5y = 13 \end{cases}$

9. $\begin{cases} 2x - 5y = 0 \\ 3x + 2y = 57 \end{cases}$

$y = -4 + 8x$; $8x + 3(-4 + 8x) = 12$
$8x - 12 + 24x = 12$; $32x = 24$; $x = \frac{3}{4}$
$16\left(\frac{3}{4}\right) - 2y = 8$; $12 - 2y = 8$
$-2y = -4$; $y = 2$
$\left(\frac{3}{4}, 2\right)$

10. $\begin{cases} 7x - 4y = 0 \\ 2x + 3y = 58 \end{cases}$

11. $\begin{cases} \frac{1}{2}x - \frac{3}{5}y = \frac{13}{20} \\ \frac{2}{3}x + \frac{3}{4}y = -\frac{1}{6} \end{cases}$

12. $\begin{cases} \frac{4}{5}x - \frac{1}{4}y = \frac{7}{10} \\ -\frac{1}{3}x + \frac{5}{16}y = -\frac{3}{8} \end{cases}$

Solve. Show your work.

13. Age Julio's father is 4 times as old as Julio. In 10 years, he will be 2 less than Julio's age times 3. How old are Julio and his father?

14. Money Mary collected $2.75 in nickels and dimes. Ten less than twice the number of nickels represents the number of dimes she has. How many of each kind of coin did Mary collect?

CHALLENGE

15. Solve: $\begin{cases} y = ax \\ 2ax + 3y = 4a \end{cases}$