

Algebra 11-5 Solving Systems by Multiplication

Warm-Up

Solve.

1. $2x + 3 = 7$

$$\begin{array}{r} 2x + 3 = 7 \\ -3 \quad -3 \\ \hline 2x = 4 \\ \frac{2}{2} \quad \frac{2}{2} \\ \hline x = 2 \end{array}$$

2. $4x + 6 = 14$

$$\begin{array}{r} 4x + 6 = 14 \\ -6 \quad -6 \\ \hline 4x = 8 \\ \frac{4}{4} \quad \frac{4}{4} \\ \hline x = 2 \end{array}$$

3. What do you notice about the equations you just solved?

Same solution

$$\begin{array}{l} 2(2x + 3 = 7) \\ 4x + 6 = 14 \end{array}$$

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Goal: To have opposite coefficients in front of the same variable. Then, add the equations together to eliminate a variable.

Examples

Solve each system of equation.

1. $\begin{cases} 5x + 2y = 11 \\ x + 6y = 19 \end{cases}$

$(1, 3)$

$$\begin{array}{r} -15x - 6y = -33 \\ x + 6y = 19 \\ \hline -14x = -14 \\ \hline x = 1 \end{array}$$

$$\begin{array}{l} 5x + 2y = 11 \\ 5 \cdot 1 + 2y = 11 \\ 5 + 2y = 11 \\ -5 \quad -5 \\ \hline 2y = 6 \\ \hline y = 3 \end{array}$$

2. $\begin{cases} 5a + 3b = -15 \\ a + 5b = -3 \end{cases}$

$(-3, 0)$

$$\begin{array}{r} 5a + 3b = -15 \\ -5a - 2.5b = 15 \\ \hline .5b = 0 \\ \hline b = 0 \end{array}$$

$$\begin{array}{l} 5a + 3b = -15 \\ 5a + 3(0) = -15 \\ 5a = -15 \\ \hline a = -3 \end{array}$$

Assignment: 11-5 #'s 9-16, 18, 20

$$9. \begin{cases} 5x + y = 30 \\ 3x - 4y = 41 \end{cases}$$

$$\begin{array}{r} 5x + y = 30 \\ 5 \cdot 7 + y = 30 \\ \hline \cancel{35} + y = \cancel{30} \\ -\cancel{35} = -\cancel{35} \\ \hline y = -5 \end{array}$$

$$\begin{array}{r} 20x + 4y = 120 \\ 3x - 4y = 41 \\ \hline 23x = 161 \\ \frac{23x}{23} = \frac{161}{23} \\ \boxed{x = 7} \end{array}$$

$$\boxed{(7, -5)}$$

$$12.7 \begin{cases} 6m - 7n = 6 \\ -6 \begin{cases} 7m - 8n = 15 \end{cases} \end{cases}$$

$$\begin{aligned} 6m - 7n &= 6 \\ 6m - 7(48) &= 6 \\ 6m - 336 &= 6 \\ +336 + 336 & \end{aligned}$$

$$\frac{6m}{6} = \frac{342}{6} \quad m = 57$$

$$\begin{array}{r} 42m - 49n = 42 \\ -42m + 48n = -90 \\ \hline \end{array}$$

$$\frac{-1n}{-1} = \frac{-48}{-1}$$

$$n = 48$$

$$(57, 48)$$

$$10 \cdot \begin{matrix} -3 \\ 4a + b = 38 \\ 2a + 3b = 24 \end{matrix}$$

$$\begin{array}{r} -12a + -3b = -114 \\ 2a + 3b = 24 \\ \hline \end{array}$$

$$\begin{array}{r} -10a = -90 \\ \hline -10 \quad -10 \end{array}$$

$$a = 9$$

$$\begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 9 \\ 2 \end{pmatrix}$$

$$\begin{array}{r} 2(9) + 3b = 24 \\ 18 + 3b = 24 \\ \hline -18 \\ \hline 3b = 6 \\ \hline -3 \quad -3 \\ \hline b = 2 \end{array}$$