

5.3

Notetaking with Vocabulary

I can describe different methods for solving systems of linear equations.

I can solve linear systems by elimination.

I can use systems of linear equations to solve real-life problems.

Write the meaning of each vocabulary term.

coefficient - the number multiplied in front of the variable.
 $5x$ coefficient is 5

opposite - same #, different sign.

Core Concepts Step 0: System is standard form.

looking for opposite coefficients

Solving a System of Linear Equations by Elimination

Step 1 Multiply if necessary, one or both equations by a constant so at least 1 pair of like terms has the opposite coefficients.

$2x$

opp coef. -2

Step 2 Add the equations to eliminate one of the variables.

Step 3 Solve the resulting equation. (get's 1 coordinate - #)

Step 4 Substitute the # from Step 3 into one of the original equations and solve for the other variable. (get # - 2nd coordinate)

Step 5 Check the solution by substituting for x and y in each equation of the original system. both equations

In Exercises 1-18, solve the system of linear equations by elimination. Check your solution.

$$\begin{array}{r} 1. \ x + 3y = 17 \\ + \ x + 2y = 8 \\ \hline 0 \quad 5y = 25 \\ \quad \quad \frac{5}{5} \quad \frac{25}{5} \\ \quad \quad y = 5 \\ x + 3(5) = 17 \\ x + 15 = 17 \\ -15 \quad -15 \\ \hline x = 2 \end{array}$$

$(2, 5)$

$$\begin{array}{r} 2. \ 2x - y = 5 \\ \quad 5x + y = 16 \\ \hline \text{Check:} \\ 2 + 3(5) \stackrel{?}{=} 17 \\ 2 + 15 \stackrel{?}{=} 17 \\ 17 = 17 \checkmark \\ -2 + 2(5) \stackrel{?}{=} 8 \\ -2 + 10 \stackrel{?}{=} 8 \\ 8 = 8 \checkmark \end{array}$$

$$\begin{array}{r} 3. \ 2x + 3y = 10 \\ + \ -2x - y = -2 \\ \hline \quad \quad 2y = 8 \\ \quad \quad \frac{2y}{2} = \frac{8}{2} \\ \quad \quad y = 4 \\ 2x + 3(4) = 10 \\ 2x + 12 = 10 \\ -12 \quad -12 \\ \hline 2x = -2 \\ \frac{2x}{2} = \frac{-2}{2} \\ x = -1 \end{array}$$

Check $(-1, 4)$

$$\begin{array}{r} 2(-1) + 3(4) \stackrel{?}{=} 10 \\ 10 = 10 \checkmark \\ -2(-1) - (4) \stackrel{?}{=} -2 \\ 2 - 4 \stackrel{?}{=} -2 \\ -2 = -2 \checkmark \end{array}$$

5.3 Notetaking with Vocabulary (continued)

In Exercises 1–18, solve the system of linear equations by elimination. Check your solution.

4.
$$\begin{array}{r} 4(x+2y=20) \cdot -2 \\ 2x+y=19 \end{array} + \begin{array}{r} -2x-4y=-40 \\ 2x+y=19 \end{array}$$

$$\begin{array}{r} x+2(7)=20 \\ x+14=20 \\ x=6 \end{array}$$

$$\begin{array}{r} -3y=-21 \\ y=7 \end{array}$$

$$\boxed{(6,7)} \quad \underline{\text{Check}}$$

5.
$$\begin{array}{r} 3(3x-2y=-2) \cdot 3 \\ 4x-3y=-4 \end{array} \cdot -2 + \begin{array}{r} 9x-6y=-6 \\ -8x+6y=8 \end{array}$$

$$\begin{array}{r} 3(2)-2y=-2 \\ 6-2y=-2 \\ -6-2y=-2 \\ -2y=-8 \\ \frac{-2y}{-2}=\frac{-8}{-2} \\ y=4 \end{array}$$

$$\begin{array}{r} x=2 \\ \boxed{(2,4)} \\ \underline{\text{Check}} \end{array}$$

6.
$$\begin{array}{r} 2x+y=12 \\ 3x-18=y \end{array} + \begin{array}{r} 2x+y=12 \\ 3x-y=18 \end{array}$$

$$\begin{array}{r} 3x=y+18 \\ -y-y \\ 3x-y=18 \end{array}$$

$$\begin{array}{r} 5x=30 \\ x=6 \\ 2(6)+y=12 \\ 12+y=12 \\ -12-12 \\ y=0 \end{array}$$

$$\boxed{(6,0)} \quad \underline{\text{Check}}$$

7.
$$\begin{array}{r} -4x=-2+4y \\ -4y=1-4x \end{array} + \begin{array}{r} -4x-4y=-2 \\ 4x-4y=1 \end{array}$$

$$\begin{array}{r} -4x=-2+4\left(\frac{1}{8}\right) \\ -4x=-2+\frac{1}{2} \cdot -\frac{1}{2} \\ -4x=-\frac{3}{2} \cdot -\frac{1}{4} \\ \frac{-1}{4} \cdot -4x = \frac{-3}{2} \cdot -\frac{1}{4} \\ x=\frac{3}{8} \end{array}$$

$$\begin{array}{r} -8y=-1 \\ \frac{-8y}{-8}=\frac{-1}{-8} \\ y=\frac{1}{8} \\ \left(\frac{3}{8}, \frac{1}{8}\right) \\ \underline{\text{Check}} \end{array}$$

19. The sum of two numbers is 22. The difference is 6. What are the two numbers?

$$\begin{array}{r} x+y=22 \\ + x-y=6 \\ \hline 2x=28 \\ \frac{2x}{2}=\frac{28}{2} \\ x=14 \end{array}$$

$$\begin{array}{r} 14+y=22 \\ -14-14 \\ y=8 \\ (14,8) \quad \underline{\text{Check}} \end{array}$$

20. You and your friend are buying throw blankets with your names embroidered on them. The cost of the throw blanket is x dollars and the cost of each embroidered letter is y dollars. Your name has 6 letters and the total cost is \$29. Your friend's name has 3 letters and the total cost is \$24.50. Find the cost of the throw blanket and the cost of each embroidered letter.

$$\begin{array}{r} -1(x + 6y = 29) \\ x + 3y = 24.50 \end{array} \quad + \quad \begin{array}{r} -x - 6y = -29 \\ x + 3y = 24.50 \\ \hline -3y = -4.5 \\ \frac{-3y}{-3} = \frac{-4.5}{-3} \\ y = 1.5 \end{array}$$