6-4 Study Guide and Intervention

Elimination Using Multiplication

Elimination Using Multiplication Some systems of equations cannot be solved simply by adding or subtracting the equations. In such cases, one or both equations must first be multiplied by a number before the system can be solved by elimination.

Example 1 Use elimination to solve the system of equations.

$x + 10y = 3$
$4x + 5y = 5$

If you multiply the second equation by -2, you can eliminate the y terms.

$$x + 10y = 3$$
$$(+) -8x - 10y = -10$$
$$\overline{-7x \qquad = -7}$$
$$\frac{-7x}{-7} = \frac{-7}{-7}$$
$$x = 1$$

Substitute 1 for x in either equation.

$$1 + 10y = 3$$
$$1 + 10y - 1 = 3 - 1$$
$$10y = 2$$
$$\frac{10y}{10} = \frac{2}{10}$$
$$y = \frac{1}{5}$$

The solution is $\left(1, \frac{1}{5}\right)$.

Example 2 Use elimination to solve the system of equations.

$3x - 2y = -7$
$2x - 5y = 10$

If you multiply the first equation by 2 and the second equation by -3, you can eliminate the x terms.

$$6x - 4y \quad = -14$$
$$(+) -6x + 15y \quad = -30$$
$$\overline{11y \quad = -44}$$
$$\frac{11y}{11} = -\frac{44}{11}$$
$$y = -4$$

Substitute -4 for y in either equation.

$$3x - 2(-4) = -7$$
$$3x + 8 = -7$$
$$3x + 8 - 8 = -7 - 8$$
$$3x = -15$$
$$\frac{3x}{3} = -\frac{15}{3}$$
$$x = -5$$

The solution is $(-5, -4)$.

Exercises

Use elimination to solve each system of equations.

1. $2x + 3y = 6$
$x + 2y = 5$

2. $2m + 3n = 4$
$-m + 2n = 5$

3. $3a - b = 2$
$a + 2b = 3$

4. $4x + 5y = 6$
$6x - 7y = -20$

5. $4x - 3y = 22$
$2x - y = 10$

6. $3x - 4y = -4$
$x + 3y = -10$

7. $4x - y = 9$
$5x + 2y = 8$

8. $4a - 3b = -8$
$2a + 2b = 3$

9. $2x + 2y = 5$
$4x - 4y = 10$

10. $6x - 4y = -8$
$4x + 2y = -3$

11. $4x + 2y = -5$
$-2x - 4y = 1$

12. $2x + y = 3.5$
$-x + 2y = 2.5$

13. GARDENING The length of Sally's garden is 4 meters greater than 3 times the width. The perimeter of her garden is 72 meters. What are the dimensions of Sally's garden?

6-4 Study Guide and Intervention *(continued)*

Elimination Using Multiplication

Solve Real-World Problems Sometimes it is necessary to use multiplication before elimination in real-world problems.

> **Example** **CANOEING During a canoeing trip, it takes Raymond 4 hours to paddle 12 miles upstream. It takes him 3 hours to make the return trip paddling downstream. Find the speed of the canoe in still water.**

Read You are asked to find the speed of the canoe in still water.

Solve Let c = the rate of the canoe in still water.
Let w = the rate of the water current.

	r	t	d	$r \cdot t = d$
Against the Current	$c - w$	4	12	$(c - w)4 = 12$
With the Current	$c + w$	3	12	$(c + w)3 = 12$

So, our two equations are $4c - 4w = 12$ and $3c + 3w = 12$.

Use elimination with multiplication to solve the system. Since the problem asks for c, eliminate w.

$4c - 4w = 12$ ⇒ Multiply by 3 ⇒ $\quad\quad 12c - 12w = 36$
$3c + 3w = 12$ ⇒ Multiply by 4 ⇒ $\underline{(+)\ 12c + 12w = 48}$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad 24c \quad\quad\quad = 84 \quad\quad\quad$ *w* is eliminated.

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \dfrac{24c}{24} = \dfrac{84}{24} \quad\quad$ Divide each side by 24.

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad c = 3.5 \quad\quad$ Simplify.

The rate of the canoe in still water is 3.5 miles per hour.

Exercises

1. **FLIGHT** An airplane traveling with the wind flies 450 miles in 2 hours. On the return trip, the plane takes 3 hours to travel the same distance. Find the speed of the airplane if the wind is still.

2. **FUNDRAISING** Benji and Joel are raising money for their class trip by selling gift wrapping paper. Benji raises $39 by selling 5 rolls of red wrapping paper and 2 rolls of foil wrapping paper. Joel raises $57 by selling 3 rolls of red wrapping paper and 6 rolls of foil wrapping paper. For how much are Benji and Joel selling each roll of red and foil wrapping paper?

Lesson 6-4