

Week Two

Semester Algebra

Desoto County  
Schools

# 5-4 Study Guide and Intervention *(continued)*

## Elimination Using Multiplication

**Determine the Best Method** The methods to use for solving systems of linear equations are summarized in the table below.

Method	The Best Time to Use
Graphing	to estimate the solution, since graphing usually does not give an exact solution
Substitution	if one of the variables in either equation has a coefficient of 1 or $-1$
Elimination Using Addition	if one of the variables has opposite coefficients in the two equations
Elimination Using Subtraction	if one of the variables has the same coefficient in the two equations
Elimination Using Multiplication	if none of the coefficients are 1 or $-1$ and neither of the variables can be eliminated by simply adding or subtracting the equations

**Example** Determine the best method to solve the system of equations. Then solve the system.

$$\begin{aligned} 6x + 2y &= 20 \\ -2x + 4y &= -16 \end{aligned}$$

Since the coefficients of  $x$  will be additive inverses of each other if you multiply the second equation by 3, use elimination.

$$\begin{aligned} &6x + 2y = 20 \\ (+) &-6x + 12y = -48 \quad \text{Multiply the second equation by 3.} \\ \hline &14y = -28 \quad \text{Add the two equations. } x \text{ is eliminated.} \\ \frac{14y}{14} &= \frac{-28}{14} \quad \text{Divide each side by 14.} \\ y &= -2 \quad \text{Simplify.} \end{aligned}$$

$$\begin{aligned} &6x + 2(-2) = 20 \quad \text{Substitute } -2 \text{ for } y \text{ in} \\ &6x - 4 = 20 \quad \text{either equation.} \\ &6x - 4 + 4 = 20 + 4 \quad \text{Simplify.} \\ &6x = 24 \quad \text{Add 4 to each side.} \\ \frac{6x}{6} &= \frac{24}{6} \quad \text{Simplify.} \\ x &= 4 \quad \text{Divide each side by 6.} \\ &\quad \text{Simplify.} \end{aligned}$$

The solution is  $(4, -2)$ .

### Exercises

Determine the best method to solve each system of equations. Then solve the system.

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

2.  $\begin{cases} m + 6n = -8 \\ m = 2n + 8 \end{cases}$

3.  $\begin{cases} a - b = 6 \\ a = 2b + 7 \end{cases}$

4.  $\begin{cases} 4x + y = 15 \\ -x - 3y = -12 \end{cases}$

5.  $\begin{cases} 3c - d = 14 \\ c - d = 2 \end{cases}$

6.  $\begin{cases} x + 2y = -9 \\ y = 4x \end{cases}$

7.  $\begin{cases} 4x = 2y - 10 \\ x + 2y = 5 \end{cases}$

8.  $\begin{cases} x = -2y \\ 4x + 4y = -10 \end{cases}$

9.  $\begin{cases} 2s - 3t = 42 \\ 3s + 2t = 24 \end{cases}$

10.  $\begin{cases} 4a - 4b = -10 \\ 2a + 4b = -2 \end{cases}$

11.  $\begin{cases} 4x + 10y = -6 \\ -2x - 10y = 2 \end{cases}$

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

# 5-4 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.

$$\begin{aligned} x + 10y &= 3 \\ 4x + 5y &= 5 \end{aligned}$$

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

$$\begin{array}{r} x + 10y = 3 \\ (+) -8x - 10y = -10 \\ \hline -7x = -7 \\ \frac{-7x}{-7} = \frac{-7}{-7} \\ x = 1 \end{array}$$

Substitute 1 for  $x$  in either equation.

$$\begin{aligned} 1 + 10y &= 3 \\ 1 + 10y - 1 &= 3 - 1 \\ 10y &= 2 \\ \frac{10y}{10} &= \frac{2}{10} \\ y &= \frac{1}{5} \end{aligned}$$

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

**Example 2** Use elimination to solve the system of equations.

$$\begin{aligned} 3x - 2y &= -7 \\ 2x - 5y &= 10 \end{aligned}$$

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

$$\begin{array}{r} 6x - 4y = -14 \\ (+) -6x + 15y = -30 \\ \hline 11y = -44 \\ \frac{11y}{11} = \frac{-44}{11} \\ y = -4 \end{array}$$

Substitute  $-4$  for  $y$  in either equation.

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

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

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Use elimination to solve each system of equations.

- |                                      |                                      |                                       |
|--------------------------------------|--------------------------------------|---------------------------------------|
| 1. $2x + 3y = 6$<br>$x + 2y = 5$     | 2. $2m + 3n = 4$<br>$-m + 2n = 5$    | 3. $3a - b = 2$<br>$a + 2b = 3$       |
| 4. $4x + 5y = 6$<br>$6x - 7y = -20$  | 5. $4c - 3d = 22$<br>$2c - d = 10$   | 6. $3x - 4y = -4$<br>$x + 3y = -10$   |
| 7. $4s - t = 9$<br>$5s + 2t = 8$     | 8. $4a - 3b = -8$<br>$2a + 2b = 3$   | 9. $2x + 2y = 5$<br>$4x - 4y = 10$    |
| 10. $6x - 4y = -8$<br>$4x + 2y = -3$ | 11. $4x + 2y = -5$<br>$-2x - 4y = 1$ | 12. $2x + y = 3.5$<br>$-x + 2y = 2.5$ |

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?

14. Anita is  $4\frac{1}{2}$  years older than Basilio. Three times Anita's age added to six times Basilio's age is 36. How old are Anita and Basilio?

**5-4 Skills Practice****Elimination Using Multiplication**

Use elimination to solve each system of equations.

$$\begin{aligned} 1. \quad x + y &= -9 \\ 5x - 2y &= 32 \end{aligned}$$

$$\begin{aligned} 2. \quad 3x + 2y &= -9 \\ x - y &= -13 \end{aligned}$$

$$\begin{aligned} 3. \quad 2x + 5y &= 3 \\ -x + 3y &= -7 \end{aligned}$$

$$\begin{aligned} 4. \quad 2x + y &= 3 \\ -4x - 4y &= -8 \end{aligned}$$

$$\begin{aligned} 5. \quad 4x - 2y &= -14 \\ 3x - y &= -8 \end{aligned}$$

$$\begin{aligned} 6. \quad 2x + y &= 0 \\ 5x + 3y &= 2 \end{aligned}$$

$$\begin{aligned} 7. \quad 5x + 3y &= -10 \\ 3x + 5y &= -6 \end{aligned}$$

$$\begin{aligned} 8. \quad 2x + 3y &= 14 \\ 3x - 4y &= 4 \end{aligned}$$

$$\begin{aligned} 9. \quad 2x - 3y &= 21 \\ 5x - 2y &= 25 \end{aligned}$$

$$\begin{aligned} 10. \quad 3x + 2y &= -26 \\ 4x - 5y &= -4 \end{aligned}$$

$$\begin{aligned} 11. \quad 3x - 6y &= -3 \\ 2x + 4y &= 30 \end{aligned}$$

$$\begin{aligned} 12. \quad 5x + 2y &= -3 \\ 3x + 3y &= 9 \end{aligned}$$

13. Two times a number plus three times another number equals 13. The sum of the two numbers is 7. What are the numbers?

14. Four times a number minus twice another number is  $-16$ . The sum of the two numbers is  $-1$ . Find the numbers.

Determine the best method to solve each system of equations. Then solve the system.

$$\begin{aligned} 15. \quad 2x + 3y &= 10 \\ 5x + 2y &= -8 \end{aligned}$$

$$\begin{aligned} 16. \quad 8x - 7y &= 18 \\ 3x + 7y &= 26 \end{aligned}$$

$$\begin{aligned} 17. \quad y &= 2x \\ 3x + 2y &= 35 \end{aligned}$$

$$\begin{aligned} 18. \quad 3x + y &= 6 \\ 3x + y &= 3 \end{aligned}$$

$$\begin{aligned} 19. \quad 3x - 4y &= 17 \\ 4x + 5y &= 2 \end{aligned}$$

$$\begin{aligned} 20. \quad y &= 3x + 1 \\ 3x - y &= -1 \end{aligned}$$

**5-5 Skills Practice****Applying Systems of Linear Equations**

Determine the best method to solve each system of equations. Then solve the system.

1.  $5x + 3y = 16$   
 $3x - 5y = -4$

2.  $3x - 5y = 7$   
 $2x + 5y = 13$

3.  $y = 3x - 24$   
 $5x - y = 8$

4.  $-11x - 10y = 17$   
 $5x - 7y = 50$

5.  $4x + y = 24$   
 $5x - y = 12$

6.  $6x - y = -145$   
 $x = 4 - 2y$

**7. VEGETABLE STAND** A roadside vegetable stand sells pumpkins for \$5 each and squashes for \$3 each. One day they sold 6 more squash than pumpkins, and their sales totaled \$98. Write and solve a system of equations to find how many pumpkins and squash they sold?

**8. INCOME** Ramiro earns \$20 per hour during the week and \$30 per hour for overtime on the weekends. One week Ramiro earned a total of \$650. He worked 5 times as many hours during the week as he did on the weekend. Write and solve a system of equations to determine how many hours of overtime Ramiro worked on the weekend.

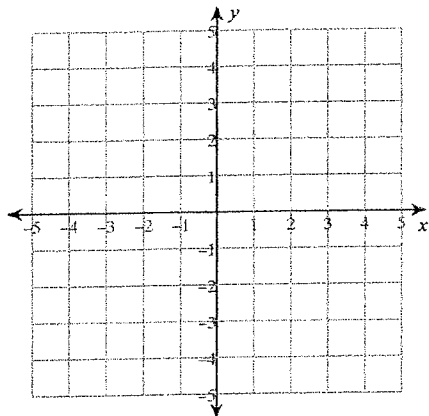
**9. BASKETBALL** Anya makes 14 baskets during her game. Some of these baskets were worth 2-points and others were worth 3-points. In total, she scored 30 points. Write and solve a system of equations to find how 2-points baskets she made.

## Assignment

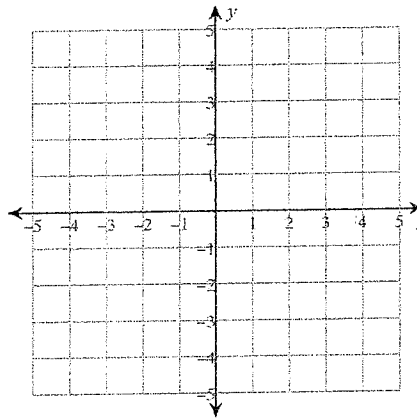
Date \_\_\_\_\_ Period \_\_\_\_\_

**Solve each system by graphing.**

$$\begin{aligned} 1) \quad & 2x + 3y = -12 \\ & 5x - 3y = -9 \end{aligned}$$



$$\begin{aligned} 2) \quad & x + 2y = 2 \\ & 3x - 4y = 16 \end{aligned}$$

**Solve each system by elimination.**

$$\begin{aligned} 3) \quad & 3x - 3y = 9 \\ & -9x + 2y = 8 \end{aligned}$$

$$\begin{aligned} 4) \quad & -4x - 10y = -22 \\ & 3x + 2y = 11 \end{aligned}$$

$$\begin{aligned} 5) \quad & 3x - 7y = 22 \\ & -x + 14y = -19 \end{aligned}$$

$$\begin{aligned} 6) \quad & -x + 3y = -14 \\ & -7x - 4y = -23 \end{aligned}$$

**Solve each system by substitution.**

$$\begin{aligned} 7) \quad & -4x + 2y = 4 \\ & y = -2x - 6 \end{aligned}$$

$$\begin{aligned} 8) \quad & 2x + 2y = 0 \\ & y = 3 \end{aligned}$$

$$\begin{aligned} 9) \quad & -x - 4y = 15 \\ & y = -5 \end{aligned}$$

$$\begin{aligned} 10) \quad & -2x + 2y = -4 \\ & y = 6x + 8 \end{aligned}$$

- 11) Eugene and Micaela each improved their yards by planting hostas and shrubs. They bought their supplies from the same store. Eugene spent \$50 on 2 hostas and 7 shrubs. Micaela spent \$56 on 4 hostas and 3 shrubs. Find the cost of one hosta and the cost of one shrub.
- 12) A boat traveled 120 miles downstream and back. The trip downstream took 6 hours. The trip back took 30 hours. Find the speed of the boat in still water and the speed of the current.

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Solve each pair of equations by addition or subtraction.

1.  $x + y = 10$   
 $x - y = 8$       $(9, 1)$

2.  $x + y = 13$   
 $x - y = 7$

3.  $x + 3y = 7$   
 $3x + 3y = 9$

4.  $x + 5y = -11$   
 $2x + 5y = -12$

5.  $3x + y = 5$   
 $6x + 2y = 10$

6.  $4x + 3y = 0$   
 $5x - 3y = 27$

7.  $5x + 2y = -8$   
 $3x - 2y = -8$

8.  $3x - 2y = -4$   
 $6x + 5y = 37$

9.  $4x - 5y = -9$   
 $2x + 3y = 1$

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

11.  $x + 3y = 7$   
 $x + 3y = -4$

12.  $5x - 3y = -18$   
 $x - 6y = -9$

13.  $3x - 2y = 12$   
 $2x + y = 1$

14.  $4x - y = -14$   
 $3x + 2y = -16$

15.  $4x - 7y = -30$   
 $5x - 7y = -34$

16.  $3x - y = -2$   
 $3x - y = -1$

17.  $3x + 2y = 9$   
 $3x + 4y = 3$

18.  $4x + 3y = 19$   
 $7x - 6y = -23$

19.  $5x - 3y = -36$   
 $2x + 3y = 15$

20.  $4x + 5y = 2$   
 $2x - 5y = 16$

21.  $3x + y = 13$   
 $6x + 2y = 26$

22.  $2x - 3y = 20$   
 $11x + 2y = -1$

23.  $4x - 7y = -5$   
 $3x - 2y = -7$

24.  $3x + 2y = -1$   
 $4x - 5y = -32$

