

4-3

Solving Systems of Equations by Elimination

CRITIQUE & EXPLAIN

Sadie and Micah used different methods to solve the system of equations.

$$y = 2x + 3$$

$$4x - y = 5$$

Sadie's work

$$\begin{aligned} 4x - (2x + 3) &= 5 \\ 4x - 2x - 3 &= 5 \\ 2x - 3 &= 5 \\ 2x &= 8 \\ x &= 4 \\ y &= 2(4) + 3 = 11 \\ \text{The solution is } (4, 11). \end{aligned}$$

Micah's work

$$\begin{aligned} y &= 2x + 3 \text{ and } y = 4x - 5 \\ 2x + 3 &= 4x - 5 \\ 8 &= 2x \\ x &= 4 \\ y &= 2(4) + 3 \\ y &= 11 \\ \text{The solution is } (4, 11). \end{aligned}$$

- A. In what ways are Sadie's and Micah's approaches similar? In what ways are they different?
- B. Are both Sadie's and Micah's approaches valid solution methods? Explain.
- C. **Reason** Which method of solving systems of equations do you prefer when solving, Sadie's method, or Micah's method? Explain. © MP.2

HABITS OF MIND

Reason Can you think of an instance when it is more convenient to use Sadie's method? When is it more convenient to use Micah's method? © MP.2

**EXAMPLE 1** **Try It!** Solve a System of Equations by Adding

1. Solve each system of equations.

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

b.
$$\begin{aligned} 2x + 3y &= 1 \\ -2x + 2y &= -6 \end{aligned}$$

EXAMPLE 2 **Try It!** Understand Equivalent Systems of Equations

2. Solve each system of equations.

a.
$$\begin{aligned} x + 2y &= 4 \\ 2x - 5y &= -1 \end{aligned}$$

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

HABITS OF MIND

Look for Relationships How could you write an equivalent system of equations for both of the systems in Try It! 2? © MP.7

**EXAMPLE 3** **Try It! Apply Elimination**

3. Before the florist has a chance to finish the bouquets, a large order is placed. After the order, only 85 roses and 163 peonies remain. How many regular bouquets and mini bouquets can the florist make now?

EXAMPLE 4 **Try It! Choose a Method of Solving**

4. What is the solution of each system of equations? Explain your choice of solution method.

a. $6x + 12y = -6$
 $3x - 2y = -27$

b. $3x - 2y = 38$
 $x = 6 - y$

HABITS OF MIND

Communicate Precisely Explain the difference between solving a system of equations using substitution and solving a system of equations using elimination. © MP.6

Do You UNDERSTAND?

- ESSENTIAL QUESTION** Why does the elimination method work when solving a system of equations?
- Error Analysis** Esteban tries to solve the following system.

$$7x - 4y = -12$$

$$x - 2y = 4$$

His first step is to multiply the second equation by 3.

$$7x - 4y = -12$$

$$6x - 12y = 12$$

Then he adds the equations to eliminate a term. What is Esteban's error? © MP.3
- Construct Arguments** How can you determine whether two systems of equations are equivalent? © MP.3
- Mathematical Connections** The sum of 5 times the width of a rectangle and twice its length is 26 units. The difference of 15 times the width and three times the length is 6 units. Write and solve a system of equations to find the length and width of the rectangle.

Do You KNOW HOW?

Solve each system of equations.

5. $4x - 2y = -2$
 $3x + 2y = -12$

6. $3x + 2y = 4$
 $3x + 6y = -24$

7. $4x - 3y = -9$
 $3x + 2y = -11$

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

9. Ella is a landscape photographer. One weekend at her gallery she sells a total of 52 prints for a total of \$2,975. How many of each size print did Ella sell?



Small print:
\$50



Large print:
\$75