

**5.3****Solving Systems of Linear Equations by Elimination**

For use with Exploration 5.3

**Essential Question** How can you use elimination to solve a system of linear equations?

**1 EXPLORATION: Writing and Solving a System of Equations**

**Work with a partner.** You purchase a drink and a sandwich for \$4.50. Your friend purchases a drink and five sandwiches for \$16.50. You want to determine the price of a drink and the price of a sandwich.

- a. Let  $x$  represent the price (in dollars) of one drink. Let  $y$  represent the price (in dollars) of one sandwich. Write a system of equations for the situation. Use the following verbal model.

Number of drinks	•	Price per drink	+	Number of sandwiches	•	Price per sandwich	=	Total price
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Label one of the equations Equation 1 and the other equation Equation 2.

- b. Subtract Equation 1 from Equation 2. Explain how you can use the result to solve the system of equations. Then find and interpret the solution.

**2 EXPLORATION: Using Elimination to Solve Systems**

**Work with a partner.** Solve each system of linear equations using two methods.

**Method 1 Subtract.** Subtract Equation 2 from Equation 1. Then use the result to solve the system.

**Method 2 Add.** Add the two equations. Then use the result to solve the system.

Is the solution the same using both methods? Which method do you prefer?

a.  $3x - y = 6$

$3x + y = 0$

b.  $2x + y = 6$

$2x - y = 2$

c.  $x - 2y = -7$

$x + 2y = 5$

**5.3 Solving Systems of Linear Equations by Elimination (continued)****3 EXPLORATION:** Using Elimination to Solve a System

Work with a partner.

$$2x + y = 7 \quad \text{Equation 1}$$

$$x + 5y = 17 \quad \text{Equation 2}$$

- a. Can you eliminate a variable by adding or subtracting the equations as they are? If not, what do you need to do to one or both equations so that you can?
  
  
  
  
  
  
  
  
  
  
- b. Solve the system individually. Then exchange solutions with your partner and compare and check the solutions.

**Communicate Your Answer**

4. How can you use elimination to solve a system of linear equations?
  
  
  
  
  
  
  
  
  
  
5. When can you add or subtract the equations in a system to solve the system? When do you have to multiply first? Justify your answers with examples.
  
  
  
  
  
  
  
  
  
  
6. In Exploration 3, why can you multiply an equation in the system by a constant and not change the solution of the system? Explain your reasoning.

## 5.3

### Notetaking with Vocabulary

For use after Lesson 5.3

In your own words, write the meaning of each vocabulary term.

coefficient

### Core Concepts

#### Solving a System of Linear Equations by Elimination

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

**Step 2** Add or subtract the equations to eliminate one of the variables.

**Step 3** Solve the resulting equation.

**Step 4** Substitute the value from Step 3 into one of the original equations and solve for the other variable.

**Notes:**

**5.3** Notetaking with Vocabulary (continued)**Extra Practice**

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

1.  $x + 3y = 17$   
 $-x + 2y = 8$

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

3.  $2x + 3y = 10$   
 $-2x - y = -2$

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

5.  $5x + 2y = -28$   
 $-5x + 3y = 8$

6.  $2x - 5y = 8$   
 $3x + 5y = -13$

7.  $2x + y = 12$   
 $3x - 18 = y$

8.  $4x + 3y = 14$   
 $2y = 6 + 4x$

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

**5.3** Notetaking with Vocabulary (continued)

10.  $x + 2y = 20$   
 $2x + y = 19$

11.  $3x - 2y = -2$   
 $4x - 3y = -4$

12.  $9x + 4y = 11$   
 $3x - 10y = -2$

13.  $4x + 3y = 21$   
 $5x + 2y = 21$

14.  $-3x - 5y = -7$   
 $-4x - 3y = -2$

15.  $8x + 4y = 12$   
 $7x + 3y = 10$

16.  $4x + 3y = -7$   
 $-2x - 5y = 7$

17.  $8x - 3y = -9$   
 $5x + 4y = 12$

18.  $-3x + 5y = -2$   
 $2x - 2y = 1$

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