7-3 Solving Systems Using Elimination

What You'll Learn
- To solve systems by adding or subtracting
- To multiply first when solving systems

. . . And Why
To analyze a ticket-sales situation, as in Example 2

Check Skills You'll Need
GO for Help Lesson 7-2

Solve each system using substitution.

1. $y = 4x - 3$, $y = 2x + 13$ **(8, 29)**
2. $y + 5x = 4$, $y = 7x - 20$ **(2, −6)**
3. $y = -2x + 2$, $3x - 17 = 2y$ **(3, −4)**

New Vocabulary • elimination method

1 Adding or Subtracting to Solve Systems

Vocabulary Tip

Addition Property of Equality
If $a = b$, then $a + c = b + c$.

Subtraction Property of Equality
If $a = b$, then $a - c = b - c$.

The Addition and Subtraction Properties of Equality can be extended to state,

If $a = b$ and $c = d$, then $a + c = b + d$. If $a = b$ and $c = d$, then $a - c = b - d$.

You can use the Addition and Subtraction Properties of Equality to solve a system by the **elimination method.** You can add or subtract equations to eliminate a variable.

1 EXAMPLE Adding Equations

Solve by elimination. $5x - 6y = -32$, $3x + 6y = 48$

Step 1 Eliminate y because the sum of the coefficients of y is zero.

$$\begin{array}{rl} 5x - 6y = -32 & \\ 3x + 6y = 48 & \text{Add the two equations.} \\ \hline 8x + 0 = 16 & \text{Addition Property of Equality} \\ x = 2 & \text{Solve for } x. \end{array}$$

Step 2 Solve for the eliminated variable y using either of the original equations.

$$\begin{array}{rl} 3x + 6y = 48 & \text{Choose the second equation.} \\ 3(2) + 6y = 48 & \text{Substitute 2 for } x. \\ 6 + 6y = 48 & \text{Simplify. Then solve for } y. \\ y = 7 & \end{array}$$

Since $x = 2$ and $y = 7$, the solution is $(2, 7)$.

Check $5(2) - 6(7) \stackrel{?}{=} -32$ **See if (2, 7) solves $5x - 6y = -32$.**

$10 - 42 \stackrel{?}{=} -32$

$-32 = -32$ ✓

Quick Check 1 Solve by elimination. $6x - 3y = 3$, $-6x + 5y = 3$ **(2, 3)**

Differentiated Instruction Solutions for All Learners

Special Needs L1
To help students understand why they can add equations, remind them that an equation must always be in balance. So, on a set of scales, if you add one side of each equation on the left, and the other two sides on the right, the scales will still be in balance.
learning style: visual

Below Level L2
Help students understand that they can either add or subtract equations to solve a system by elimination. Have them examine the methods used in Examples 1 and 2.
learning style: verbal

7-3

1. Plan

Objectives
1 To solve systems by adding or subtracting
2 To multiply first when solving systems

Examples
1 Adding Equations
2 Real-World Problem Solving
3 Multiplying One Equation
4 Real-World Problem Solving
5 Multiplying Both Equations

Professional Development

Math Background
In Algebra 2, students will solve systems of equations that contain three equations in three variables. They will use the elimination method several times to solve one system.

More Math Background: p. 372C

Lesson Planning and Resources
See p. 372E for a list of the resources that support this lesson.

PowerPoint

Bell Ringer Practice
Check Skills You'll Need
For intervention, direct students to:

Solving Systems Using Substitution
Lesson 7-2: Example 1
Extra Skills and Word Problem Practice, Ch. 7

2. Teach

Guided Instruction

2 EXAMPLE Error Prevention

When subtracting the second equation, some students may fail to subtract every term. Suggest to students that they write parentheses around the whole second equation and then write a subtraction sign in front of the parentheses.

PowerPoint

Additional Examples

1 Solve by elimination.
$2x + 3y = 11$
$-2x + 9y = 1$ **(4, 1)**

2 On a special day, tickets for a minor league baseball game cost \$5 for adults and \$1 for students. The attendance that day was 1139, and \$3067 was collected. Write and solve a system of equations to find the number of adults and the number of students that attended the game.
$a + s = 1139$
$5a + s = 3067$
482 adults and 657 students

Real-World Connection

There are 188 basketball teams in 26 conferences in the National Wheelchair Basketball Association.

2 EXAMPLE Real-World Problem Solving

Ticket Sales Suppose your community center sells a total of 292 tickets for a basketball game. An adult ticket costs \$3. A student ticket costs \$1. The sponsors collect \$470 in ticket sales. Write and solve a system to find the number of each type of ticket sold.

Define Let a = number of adult tickets.
Let s = number of student tickets.

Relate	total number of tickets	total amount of sales
Write	$a + s = 292$	$3a + 1s = 470$

Solve by elimination.

Step 1 Eliminate s because the difference of the coefficients of s is zero.

$$\begin{array}{rl} a + s = & 292 \\ 3a + s = & 470 \\ \hline -2a + 0 = & -178 \\ a = & 89 \end{array}$$

Subtract the two equations.
Subtraction Property of Equality
Solve for *a*.

Step 2 Solve for the eliminated variable using either of the original equations.

$a + s = 292$ **Choose the first equation.**
$89 + s = 292$ **Substitute 89 for *a*.**
$s = 203$ **Solve for *s*.**

There were 89 adult tickets sold and 203 student tickets sold.

Check Is the solution reasonable? The answers 89 and 203 are close to 90 and 200. The total number of tickets is about $90 + 200 = 290$, close to 292. The total sales is about $\$3(90) + \$1(200)$ or \$470. The solution is reasonable.

Quick Check

2 Your class sells a total of 64 tickets to a play. A student ticket costs \$1, and an adult ticket costs \$2.50. Your class collects \$109 in total ticket sales. How many adult tickets did you sell? How many student tickets did you sell? **30 adult; 34 student**

2 Multiplying First to Solve Systems

From Examples 1 and 2 you can see that to eliminate a variable its coefficients must have a sum or difference of zero. Sometimes you may need to multiply one or both of the equations by a nonzero number first.

3 EXAMPLE Multiplying One Equation

Solve by the elimination method. $2x + 5y = -22$
$10x + 3y = 22$

Step 1 Eliminate one variable.

Start with the given system.	To prepare for eliminating x, multiply the first equation by 5.	Subtract the equations to eliminate x.
$2x + 5y = -22 \rightarrow$	$5(2x + 5y = -22) \rightarrow$	$10x + 25y = -110$
$10x + 3y = 22 \rightarrow$	$10x + 3y = 22$	$10x + 3y = 22$
		$0 + 22y = -132$

Differentiated Instruction Solutions for All Learners

Advanced Learners L4
Have students solve by elimination then describe the solution.
$2x + y = 4$
$-6x - 3y = -12$
learning style: verbal

English Language Learners ELL
Explain that *elimination* is a process of removing. Display the system in Example 1, cross out and then erase $-6y$ and $6y$, and write only $8x$ below the left side of the system. Explain that you *eliminated* the variable y.
learning style: verbal

Step 2 Solve for y.

$22y = -132$

$y = -6$

Step 3 Solve for the eliminated variable using either of the original equations.

$2x + 5y = -22$ **Choose the first equation.**

$2x + 5(-6) = -22$ **Substitute −6 for *y*.**

$2x - 30 = -22$ **Solve for *x*.**

$2x = 8$

$x = 4$

The solution is $(4, -6)$.

Quick Check 3 Solve by elimination. $-2x + 15y = -32$, $7x - 5y = 17$ **(1, −2)**

To solve problems that arise from real-world situations, you can also use the elimination method.

4 EXAMPLE Real-World Problem Solving

Gridded Response Suppose your class sells gift wrap for $4 per package and greeting cards for $10 per package. Your class sells 205 packages in all and receives a total of $1084. Find the number of packages of gift wrap and the number of packages of greeting cards sold.

Define Let w = number of packages of gift wrap sold.
Let c = number of packages of greeting cards sold.

	total number of packages	total amount of sales
Relate		
Write	$w + c = 205$	$4w + 10c = 1084$

Step 1 Eliminate one variable.

Start with the given system.	To prepare for eliminating *w*, multiply the first equation by 4.	Subtract the equations to eliminate *w*.
$w + c = 205 \rightarrow$	$4(w + c = 205) \rightarrow$	$4w + 4c = 820$
$4w + 10c = 1084 \rightarrow$	$4w + 10c = 1084 \rightarrow$	$4w + 10c = 1084$
		$0 - 6c = -264$

Step 2 Solve for c.

$-6c = -264$

$c = 44$

Step 3 Solve for the eliminated variable using either of the original equations.

$w + c = 205$ **Use the first equation.**

$w + 44 = 205$ **Substitute 44 for *c*.**

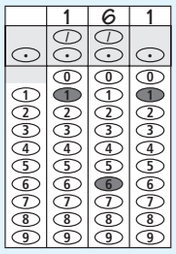
$w = 161$ **Solve for *w*.**

The class sold 161 packages of gift wrap and 44 packages of greeting cards.

Quick Check 4 Suppose your younger brother's elementary school class sells a different brand of gift wrap, which costs $2 per package, and cards, which cost $5 per package. His class sells 220 packages in all and earns a total of $695. Find the number of each type of package sold. **85 cards, 135 gift wrap**

Test-Taking Tip

If you are asked to grid one of the solutions of a system, such as the number of packages of gift wrap, be sure to select the correct variable.



3 EXAMPLE Teaching Tip

Some students may be unsure of the number by which they should multiply the equation. Direct students' attention to the coefficients of each variable. Ask: *Is one coefficient a factor of the other coefficient for the same variable?* **Yes, 2 is a factor of 10.** Point out that the equation with the coefficient 2 can be multiplied by 5 so that the new coefficient becomes 10.

4 EXAMPLE Error Prevention

Students commonly forget to multiply the constant on the right side of the equation. Remind them that the Multiplication Property of Equality requires that all terms on both sides must be multiplied to preserve equality.

PowerPoint Additional Examples

3 Solve by elimination.
$3x + 6y = -6$
$-5x - 2y = -14$ **(4, −3)**

4 Suppose the band sells cans of popcorn for $5 per can and cans of mixed nuts for $8 per can. The band sells a total of 240 cans and receives a total of $1614. Find the number of cans of popcorn and the number of cans of mixed nuts sold. **102 cans of popcorn, 138 cans of nuts**

5 EXAMPLE Math Tip

Encourage students to find the least common multiple of the coefficients of one variable, since working with lesser numbers tends to reduce the likelihood of errors.

Additional Examples

5 Solve by elimination.
$3x + 5y = 10$
$5x + 7y = 10$ **(−5, 5)**

Resources
- Daily Notetaking Guide 7-3 L3
- Daily Notetaking Guide 7-3—Adapted Instruction L1

Closure

Ask students to explain when it is best to solve a system by using elimination, and when it is best to use substitution. **You should use elimination if the two coefficients of a variable are the same or opposites, or one is a multiple of the other. Use substitution if one equation is easy to solve, or is already solved, for one of the variables.**

pages 390–393 Exercises

3. **(5, −17)**
4. **(−3, 4)**
5. **$\left(-9, \frac{1}{2}\right)$**
6. **$\left(-\frac{1}{2}, 10\right)$**

15a. **$30w + \ell = 17.65$, $20w + 3\ell = 25.65$**

b. **$0.39 for a wallet size, $5.95 for an 8 × 10**

23–28. **Choice of method may vary. Samples are given.**

23. **(−1, −2); substitution; both solved for *y***
24. **(15, −10); elimination; equations not solved for *y***
25. **(10, 2); substitution; one eq. solved for *x***
26. **(−3, 11); elimination; eqs. not solved for a variable**
27. **(5, 1); substitution; one eq. solved for *x***
28. **$\left(\frac{1}{3}, 2\frac{1}{3}\right)$; substitution; eqs. solved for *y***

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To eliminate a variable, you may need to multiply both equations in a system by a nonzero number. Multiply each equation by values such that when you write equivalent equations, you can then add or subtract to eliminate a variable.

5 EXAMPLE Multiplying Both Equations

Solve by elimination. $4x + 2y = 14$
$7x - 3y = -8$

Step 1 Eliminate one variable.

Start with the given system.		To prepare for eliminating *y*, multiply one equation by 3 and the other equation by 2.		Add the equations to eliminate *y*.
$4x + 2y = 14$	→	$3(4x + 2y = 14)$	→	$12x + 6y = 42$
$7x - 3y = -8$	→	$2(7x - 3y = -8)$	→	$14x - 6y = -16$
				$26x + 0 = 26$

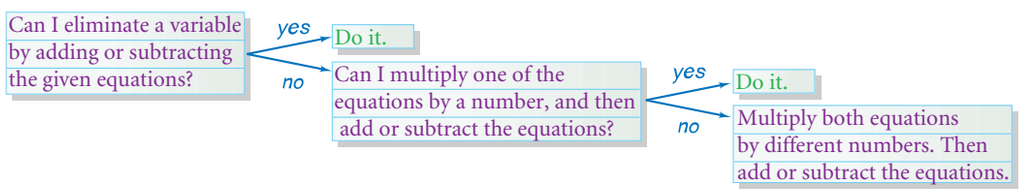
Step 2 Solve for x.
$26x = 26$
$x = 1$

Step 3 Solve for the eliminated variable y using either of the original equations.
$4x + 2y = 14$ **Use the first equation.**
$4(1) + 2y = 14$ **Substitute 1 for *x*.**
$2y = 10$
$y = 5$

The solution is $(1, 5)$.

Quick Check 5 Solve by elimination. $15x + 3y = 9$ **(1, −2)**
$10x + 7y = -4$

When you solve systems using elimination, plan a strategy. A flowchart like the one below can help you to decide how to eliminate a variable.



EXERCISES

For more exercises, see *Extra Skill and Word Problem Practice.*

Practice and Problem Solving

A Practice by Example

Example 1 (page 387)

GO for Help

Solve by elimination. 3–6. See margin.

1. $2x + 5y = 17$
   $6x - 5y = -9$ **(1, 3)**
2. $7x + 2y = 10$
   $-7x + y = -16$ **(2, −2)**
3. $2x - 3y = 61$
   $2x + y = -7$
4. $8x + 11y = 20$
   $5x - 11y = -59$
5. $2x + 18y = -9$
   $4x + 18y = -27$
6. $20x + 3y = 20$
   $-20x + 5y = 60$

Example 2 (page 388)

7. The sum of two numbers is 20. Their difference is 4. $x + y = 20$, $x - y = 4$
a. Write a system of equations that describes this situation.
b. Solve by elimination to find the two numbers. **12 and 8**

8. Ticket Sales Your school sold 456 tickets for a high school play. An adult ticket cost \$3.50. A student ticket cost \$1. Total ticket sales equaled \$1131. Let a equal the number of adult tickets sold, and let s equal the number of student tickets sold. **a. $a + s = 456$, $3.5a + s = 1131$**
a. Write a system of equations that relates the number of adult and student tickets sold to the total number of tickets sold and to the total ticket sales.
b. Solve by elimination to find the number of each type of ticket sold. **270 adult, 186 student**

Example 3 (page 388)

Solve by elimination.

9. $3x - 10y = -25$, $4x + 40y = 20$ **(−5, 1)**

10. $7x + 15y = 32$, $x - 3y = 20$ **(11, −3)**

11. $x - 8y = 18$, $-16x + 16y = -8$

12. $24x + 2y = 52$, $6x - 3y = -36$ **(1, 14)**

13. $88x - 5y = 39$, $-8x + 3y = -1$ **$\left(\frac{1}{2}, 1\right)$**

14. $2x + 4y = 8$ **$\left(-2, -\frac{5}{2}\right)$**, $5x + y = -7$ **(−2, 3)**

Example 4 (page 389)

15. Sales A photo studio that takes school pictures offers several different packages. Let w equal the cost of a wallet-sized portrait, and let ℓ equal the cost of an 8×10 portrait.

Basic Package
30 wallet-sized photos
1 8" x 10" portrait
\$17.65

Deluxe Package
20 wallet-sized photos
3 8" x 10" portraits
\$25.65

a. Write a system of equations that relates the cost of wallet-sized portraits and 8×10 portraits to the cost of the basic and deluxe packages.
b. Find the cost of each type of portrait. **a–b. See margin.**

16. Two groups of students order burritos and tacos at a local restaurant. One order of 3 burritos and 4 tacos costs \$11.33. The other order of 9 burritos and 5 tacos costs \$23.56.
a. Write a system of equations that describes this situation. **See left.**
b. Solve by elimination to find the cost of a burrito and the cost of a taco. **\$1.79 for a burrito, \$1.49 for a taco**

16a. x = burritos, y = tacos, $3x + 4y = 11.33$, $9x + 5y = 23.56$

Example 5 (page 390)

Solve by elimination.

17. $3x + 2y = -9$ **(−1, −3)**, $-10x + 5y = -5$

18. $4x + 5y = 15$, $6x - 4y = 11$ **(2.5, 1)**

19. $3x - 2y = 10$ **(2, −2)**, $2x + 3y = -2$

20. $-2x + 5y = 20$, $3x - 7y = -26$ **(10, 8)**

21. $10x + 8y = 2$, $8x + 6y = 1$ **$\left(-1, \frac{3}{2}\right)$**

22. $9x + 5y = 34$, $8x - 2y = -2$ **(1, 5)**

B Apply Your Skills

Solve each system using any method. Tell why you chose the method you used. **23–28. See margin.**

23. $y = 2x$, $y = x - 1$

24. $7x + 8y = 25$, $9x + 10y = 35$

25. $x = 12y - 14$, $3y + 2x = 26$

26. $-20x + 7y = 137$, $4x + 5y = 43$

27. $5y = x$, $2x - 3y = 7$

28. $y = x + 2$, $y = -2x + 3$

3. Practice

Assignment Guide

1	A B	1-8, 32, 39-41
2	A B	9-31, 33-38
C	Challenge	42-46
	Test Prep	47-50
	Mixed Review	51-60

Homework Quick Check

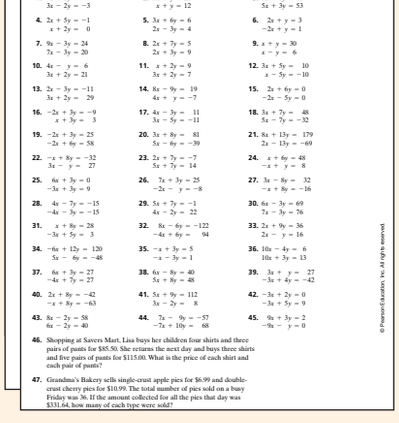
To check students' understanding of key skills and concepts, go over Exercises 8, 16, 30, 34, 40.

Exercises 23–28 Suggest to students that they first write the equations in standard form, making sure they align matching variables.

Exercises 33–38 Suggest to students that they first multiply by the least common denominator or the appropriate multiple of 10 to eliminate fractions and decimals.

Differentiated Instruction Resources

- GPS Guided Problem Solving L3
- Enrichment L4
- Reteaching L2
- Adapted Practice L1
- Practice L3



Practice 7-3 Solving Systems Using Elimination

Solve by elimination. Show your work.

1. $x + 2y = 7$, $3x - 2y = -3$
2. $3x + y = 20$, $x + y = 12$
3. $5x + 7y = 77$, $5x + 3y = 53$
4. $2x + 5y = -1$, $x + 2y = 0$
5. $3x + 6y = 6$, $2x - 3y = 4$
6. $2x + y = 3$, $-2x + y = 1$
7. $9x - 3y = 24$, $7x + 3y = 20$
8. $2x + 7y = 5$, $2x + 3y = 9$
9. $x + y = 30$, $x - y = 6$
10. $4x - y = 6$, $3x + 2y = 21$
11. $x + 2y = 9$, $3x + 2y = 7$
12. $3x + 5y = 10$, $x - 5y = -10$
13. $2x - 3y = -11$, $3x + 2y = 29$
14. $8x - 9y = 19$, $4x + y = -7$
15. $2x + 6y = 0$, $-2x - 5y = 0$
16. $-2x + 3y = -9$, $x + 3y = 3$
17. $4x - 3y = 11$, $3x - 5y = -11$
18. $3x + 7y = 48$, $5x - 7y = -32$
19. $-2x + 3y = 25$, $-2x + 6y = 58$
20. $3x + 8y = 81$, $5x - 6y = -39$
21. $8x + 13y = 179$, $2x - 13y = -69$
22. $-x + 8y = -32$, $3x - y = 27$
23. $2x + 7y = -7$, $5x + 7y = 14$
24. $x + 6y = 48$, $-x + y = 8$
25. $6x + 3y = 0$, $-3x + 3y = 9$
26. $7x + 3y = 25$, $-2x - y = -8$
27. $3x - 8y = 32$, $-x + 8y = -16$
28. $4x - 7y = -15$, $-4x - 3y = -15$
29. $5x + 7y = -1$, $4x - 2y = 22$
30. $6x - 3y = 69$, $7x - 3y = 76$
31. $x + 8y = 28$, $-3x + 5y = 3$
32. $8x - 6y = -122$, $-4x + 6y = 94$
33. $2x + 9y = 36$, $2x - y = 16$
34. $-6x + 12y = 120$, $5x - 6y = -48$
35. $-x + 3y = 5$, $-x - 3y = 1$
36. $10x - 4y = 6$, $10x + 3y = 13$
37. $6x + 3y = 27$, $-4x + 7y = 27$
38. $6x - 8y = 40$, $5x + 8y = 48$
39. $3x + y = 27$, $-3x + 4y = -42$
40. $2x + 8y = -42$, $-x + 8y = -63$
41. $5x + 9y = 112$, $3x - 2y = 8$
42. $-3x + 2y = 0$, $-3x + 5y = 9$
43. $8x - 2y = 58$, $6x - 2y = 40$
44. $7x - 9y = -57$, $-7x + 10y = 68$
45. $9x + 3y = 2$, $-9x - y = 0$

46. Shopping at Savers Mart, Lisa buys her children four shirts and three pairs of pants for \$85.50. She returns the next day and buys three shirts and five pairs of pants for \$115.00. What is the price of each shirt and each pair of pants?

47. Grandma's Bakery sells single-crust apple pies for \$6.99 and double-crust cherry pies for \$10.99. The total number of pies sold on a busy Friday was 36. If the amount collected for all the pies that day was \$331.64, how many of each type were sold?

4. Assess & Reteach

Lesson Quiz

Solve using elimination.

1. $3x - 4y = 7$
   $2x + 4y = 8$ **(3, 0.5)**
2. $5m + 3n = 22$
   $5m + 6n = 34$ **(2, 4)**
3. $-6x + 5y = 4$
   $3x + 4y = 11$ **(1, 2)**
4. $7p + 5q = 2$
   $8p - 9q = 17$ **(1, −1)**

Alternative Assessment

Give students blue, red, green, and yellow counters. Let blue represent positive x and red represent negative x. Let green represent positive y and yellow represent negative y. Give students systems of equations in standard form to model and solve using the counters. Pairs of blue and red counters eliminate each other, as do pairs of green and yellow counters.

pages 390–393 Exercises

40. Answers may vary. Sample: You solve a system using the elimination method by adding or subtracting the eqs. to eliminate one of the variables. This sum or difference is one eq. with one variable that can be solved.
Use addition:
$3x + 2y = 6$
$-x - 2y = 4$
Use subtraction:
$5x + 3y = 15$
$5x - 2y = 10$
Use multiplication:
$4x + 5y = 20$
$2x - y = 10$

29. Vacation A weekend at the Beach Bay Hotel in Florida includes 2 nights and 4 meals. A week includes 7 nights and 10 meals. Let n = the cost of 1 night and m = the cost of 1 meal. Find the cost of 1 night and the cost of 1 meal. **one night: $81.25; one meal: $8.13**

30. a. Business GPS A company sells brass and steel machine parts. One shipment contains 3 brass and 10 steel parts and costs $48. A second shipment contains 7 brass and 4 steel parts and costs $54. Find the cost of each type of machine part. **brass: $6; steel: $3**

b. How much would a shipment containing 10 brass and 13 steel machine parts cost? **$99**

31. Error Analysis Beth is solving a system by elimination. Her work is shown below. What error did she make? **She forgot to multiply −8 by 6.**

$4x - 6y = 1 \longrightarrow 20x - 30y = 5$
$3x + 5y = -8 \longrightarrow 18x + 30y = -8$

32. Open-Ended Write a system of equations that can be solved by elimination. Solve your system. **See left.**

32. Answers may vary. Sample: $2x - 3y = 6$, $x + 3y = 9$; $\left(5, \frac{4}{3}\right)$

Solve by elimination.

33. $\frac{1}{2}x + y = -1$
$16x - \frac{1}{2}y = 163$ **(10, −6)**

34. $\frac{1}{4}x - 6y = -70$
$5x + \frac{3}{4}y = 49$ **(8, 12)**

35. $-0.2x + 4y = -1$
$x + 0.5y = -15.5$
(−15, −1)

36. $y = 0.5x + 2$
$1.5x + y = 42$ **(20, 12)**

37. $\frac{1}{4}x + \frac{33}{2} = y$
$y - 12 = -2x$ **(−2, 16)**

38. $\frac{2}{3}x - y = 70$
$\frac{1}{3}x - \frac{2}{3}y = 43$
(33, −48)

39. Critical Thinking Find a value of n such that the x-value of the solution of the system at the right is 4. **9**

$5x - 10y = 50$
$nx + 10y = 6$

40. Writing Explain how to solve a system using elimination. Give examples of when you use addition, subtraction, and multiplication. **See margin.**

41. Electricity Two batteries produce a total voltage of 4.5 volts ($B_1 + B_2 = 4.5$). The difference in their voltages is 1.5 volts ($B_1 - B_2 = 1.5$). Find the voltages of the two batteries. **B_1 = 3 volts; B_2 = 1.5 volts**

Challenge

Solve by elimination.

42. $\frac{6}{x} - \frac{4}{y} = -4$
$\frac{3}{x} + \frac{8}{y} = 3$ **(−3, 2)**

43. $ax + y = c$
$ax + by = c$
$\left(\frac{c}{a}, 0\right)$ **($a \neq 0, b \neq 1$)**

44. $x + y + z = 41$
$x - y + z = 15$
$3x - z = 4$
(8, 13, 20)

45. Music Suppose your band wants to sell CDs and cassette tapes of your music. You use a production company that offers two different production packages.

	CDs	Tapes	Mastering	Artwork	Total Cost
Package #1	300	400	✓	✓	$2080
Package #2	500	600	✓	✓	$3120

Both companies charge $100 to master your original recording and $240 to create cover artwork. Find the average production cost of each CD and cassette tape. **CD: $3.40, cassette: $1.80**

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Vocabulary Tip

Density is the ratio of mass to volume.

Since $d = \frac{m}{v}$, $m = dv$.

46. Jewelry A ring is made out of gold and copper. Gold has a density of 19.3 g/cm^3. Copper has a density of 9 g/cm^3. Mass m, density d, and volume v are related by the formula $m = dv$. The ring has a volume of 4.2 cm^3, and a mass of 52.22 g.

Let a = volume of gold. mass of gold $= dv = 19.3a$

Let c = volume of copper. mass of copper $= dv = 9c$

a. Solve the following system by elimination to find out how many grams of gold are in the ring. **27.02 g of gold**

$$a + c = 4.2$$
$$19.3a + 9c = 52.22$$

b. What is the percent of gold by mass? **about 51.7%**

Test Prep

Multiple Choice

47. Which of the following systems does NOT have the same solution as the system at the right? **D**

$7x - 4y = 5$
$6x + 7y = -11$

A. $49x - 28y = 35$
$24x + 28y = -44$

B. $42x - 24y = 30$
$42x + 49y = -77$

C. $-14x + 8y = -10$
$12x + 14y = -22$

D. $21x + 12y = 15$
$-24x - 28y = 44$

48. Use the solution of the system below to find $x - y$. **H**

$4x - 2y = 11$
$3x - 4y = -6$

F. 11.3 **G.** 0.1 **H.** −0.1 **J.** −11.3

Short Response

49. Solve the following system by elimination. Show your work. **See margin.**

$y - x = 13$
$7y + x = 11$

Extended Response

50. A trapezoid is formed by lines with the following equations.

$2x + 4y = 16$ $x = 4$ $x = 0$ $y = 0$

Find the area of the trapezoid. **See margin.**

Mixed Review

Lesson 7-2 **Solve using substitution. Give the solutions in alphabetical order.**

51. $y = 4x + 2$, $y = 6x - 10$ **(6, 26)**

52. $p = q - 5$, $3p + q = 1$ **(−1, 4)**

53. $w + a = 4$, $w + 2a = 13$ **(9, −5)**

Lesson 2-7 **You have a bag with two red marbles, three blue marbles, and five green marbles. You choose a marble at random. Without replacing the marble, you choose a second marble. Find each probability.**

54. P(red then green) $\frac{1}{9}$

55. P(two greens) $\frac{2}{9}$

56. P(blue then red) $\frac{1}{15}$

Lesson 1-7 **Write and solve an equation to find the value of x.** **57–60. See margin.**

57. 5, 7, 3, 4, 8, x; mean 5

58. 1.2, 1.4, 1.5, 1.1, x; mean 1.2

59. 10, 15, 9, 11, 8, x; mean 10.5

60. 4, 1, 3, x; mean 3.25

Test Prep

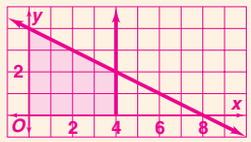
Resources

For additional practice with a variety of test item formats:

- Standardized Test Prep, p. 425
- Test-Taking Strategies, p. 420
- Test-Taking Strategies with Transparencies

49. [2] $y - x = 13$
$7y + x = 11$
$8y = 24$
$y = 3$
$3 - x = 13$
$x = -10$ (−10, 3)
[1] no work shown

50. [4]



$A = \frac{1}{2}h(b_1 + b_2)$
$= \frac{1}{2}(4)(4 + 2)$
$= 2(6)$
$= 12$
The area is 12 square units.

57. $\frac{5 + 7 + 3 + 4 + 8 + x}{6} = 5$; $x = 3$

58. $\frac{1.2 + 1.4 + 1.5 + 1.1 + x}{5} = 1.2$; $x = 0.8$

59. $\frac{10 + 15 + 9 + 11 + 8 + x}{6} = 10.5$; $x = 10$

60. $\frac{4 + 1 + 3 + x}{4} = 3.25$; $x = 5$