EXERCISES

For more practice, see *Extra Practice*.

Practice and Problem Solving

A Practice by Example

Examples 1 and 2 (pages 149 and 150)

Solve each system by elimination. Check your answers.

1. $\begin{cases} x - y + z = -1 \\ x + y + 3z = -3 \\ 2x - y + 2z = 0 \end{cases}$ (4, 2, −3)

2. $\begin{cases} x - y - 2z = 4 \\ -x + 2y + z = 1 \\ -x + y - 3z = 11 \end{cases}$ (0, 2, −3)

3. $\begin{cases} 2x - y + z = -2 \\ x + 3y - z = 10 \\ x + 2z = -8 \end{cases}$ (2, 1, −5)

4. $\begin{cases} a + b + c = -3 \\ 3b - c = 4 \\ 2a - b - 2c = -5 \end{cases}$ $(a, b, c) = (-3, 1, -1)$

5. $\begin{cases} 6q - r + 2s = 8 \\ 2q + 3r - s = -9 \\ 4q + 2r + 5s = 1 \end{cases}$ $(q, r, s) = (\frac{1}{2}, -3, 1)$

6. $\begin{cases} x - y + 2z = -7 \\ y + z = 1 \\ x = 2y + 3z \end{cases}$ (0, 3, −2)

7. $\begin{cases} x + y + 2z = 3 \\ 2x + y + 3z = 7 \\ -x - 2y + z = 10 \end{cases}$ (1, −4, 3)

8. $\begin{cases} 3x - y + z = 3 \\ x + y + 2z = 4 \\ x + 2y + z = 4 \end{cases}$ (1, 1, 1)

9. $\begin{cases} x - 2y + 3z = 12 \\ 2x - y - 2z = 5 \\ 2x + 2y - z = 4 \end{cases}$ (4, −1, 2)

10–18. See margin pp. 152–153.

Examples 3 and 4 (pages 151 and 152)

Solve each system by substitution. Check your answers.

10. $\begin{cases} x + 2y + 3z = 6 \\ y + 2z = 0 \\ z = 2 \end{cases}$

11. $\begin{cases} 3a + b + c = 7 \\ a + 3b - c = 13 \\ b = 2a - 1 \end{cases}$

12. $\begin{cases} 5r - 4s - 3t = 3 \\ t = s + r \\ r = 3s + 1 \end{cases}$

13. $\begin{cases} 13 = 3x - y \\ 4y - 3x + 2z = -3 \\ z = 2x - 4y \end{cases}$

14. $\begin{cases} x + 3y - z = -4 \\ 2x - y + 2z = 13 \\ 3x - 2y - z = -9 \end{cases}$

15. $\begin{cases} x - 4y + z = 6 \\ 2x + 5y - z = 7 \\ 2x - y - z = 1 \end{cases}$

16. $\begin{cases} x - y + 2z = 7 \\ 2x + y + z = 8 \\ x - z = 5 \end{cases}$

17. $\begin{cases} x + y + z = 2 \\ x + 2z = 5 \\ 2x + y - z = -1 \end{cases}$

18. $\begin{cases} 5x - y + z = 4 \\ x + 2y - z = 5 \\ 2x + 3y - 3z = 5 \end{cases}$

Real-World Connection

Stadium designers must take into account the durability of different types of seating.

19. **Finance** A company placed $1,000,000 in three different accounts. It placed part in short-term notes paying 4.5% per year, twice as much in government bonds paying 5%, and the rest in utility bonds paying 4%. The income after one year was $45,500. How much did the company place in each account? See margin.

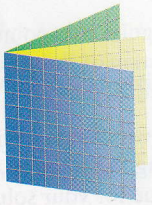
20. **Sports** A stadium has 49,000 seats. Seats sell for $25 in Section A, $20 in section B, and $15 in Section C. The number of seats in Section A equals the total number of seats in Sections B and C. Suppose the stadium takes in $1,052,000 from each sold-out event. How many seats does each section hold? See margin.

21. A change machine contains nickels, dimes, and quarters. There are 75 coins in the machine, and the value of the coins is $7.25. There are 5 times as many nickels as dimes. Find the number of coins of each type in the machine. 50 nickels, 10 dimes, and 15 quarters

B Apply Your Skills

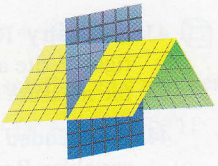
Find the number of solutions of each system.

22.



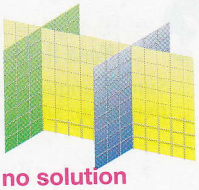
infinitely many solutions

23.



one solution

24.



no solution

16. (5, −2, 0)
17. (1, −1, 2)
18. (1, 3, 2)

19. $220,000 was placed in short-term notes. $440,000 was placed in government bonds. $340,000 was placed in utility bonds.

20. Section A has 24,500 seats. Section B has 14,400 seats. Section C has 10,100 seats.

3. Practice

Assignment Guide

1 Objective
- A B Core 1–9, 22–2 39–40
- C Extension 42, 44

2 Objective
- A B Core 10–21, 25–38, 41
- C Extension 43, 45

Standardized Test Prep 4

Mixed Review 50–67

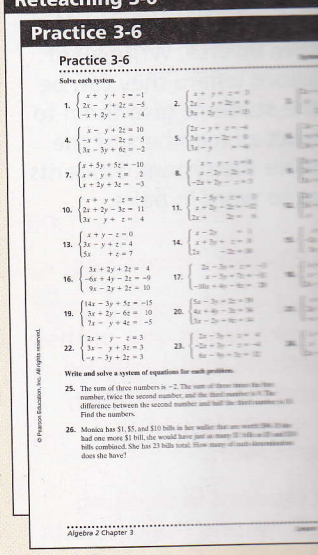
Error Prevention

Exercises 5–9 When studen need to multiply to elimina variable, they may not mul terms by the number they for the multiplication. Urge students to be careful and thorough in using propert equality and operations.

Enrichment 3-6

Reteaching 3-6

Practice 3-6



. Assess

Lesson Quiz 3-6

olve each system by elimination.

1. $\begin{cases} -3x + 2y - 5z = -3 \\ 3x - y + 3z = 4 \\ 3x + 5y - 8z = 6 \end{cases}$
(3, −7, −4)

2. $\begin{cases} 7x - y - z = 2 \\ 13x - 4y + 5z = -7 \\ -4x + 3y - 4z = -5 \end{cases}$
(−2, −11, −5)

3. Solve by substitution.
$\begin{cases} 2x - 3y + 6z = -21 \\ -5x + 4y + z = 3 \\ 7x - 7y - 4z = -6 \end{cases}$
(3, 5, −2)

lternative Assessment

k a student to state a three-riable equation. Ask another dent to state a three variable uation that contains an ditive inverse of one of the rms in the first equation. Ask other student to state an uation that has a multiple of e additive inverse. Write all of e equations where they can be en as the students give them to u. Instruct all members of the ss to solve the system. Students ay want to work in pairs.

ges 153–155 Exercises

1. Answers may vary. Sample: When one of the equations can easily be solved for one variable, it is easier to use substitution.

2. The student is thinking that 0 means that there is no solution. The point (0, 0, 0) is the solution.

4. Answers may vary. Sample: Solution is (1, 2, 3)
$x + y + 2 = 6$
$2x - y + 2z = 6$
$3x + 3y + z = 12$

5. Let E, F, and V represent the numbers of edges, faces, and vertices, respectively. From the statement Every face has five edges, and the number of edges is 5 times the number of faces: $E = 5F$. But since each edge is part of two faces, this counts each edge twice. So $E = \frac{5}{2}F$. Since every face has five vertices and every vertex is shared by three faces, $3V = 5F$ or $V = \frac{5}{3}F$. Euler's formula: $V + F = E + 2$. Solving this system of three equations yields $E = 30$, $F = 12$, and $V = 20$

Solve each system.

25. $\begin{cases} x - 3y + 2z = 11 \\ -x + 4y + 3z = 5 \\ 2x - 2y - 4z = 2 \end{cases}$ (8, 1, 3)

26. $\begin{cases} x + 2y + z = 4 \\ 2x - y + 4z = -8 \\ -3x + y - 2z = -1 \end{cases}$ (3, 2, −

27. $\begin{cases} 4x - y + 2z = -6 \\ -2x + 3y - z = 8 \\ 2y + 3z = -5 \end{cases}$ $\left(\frac{1}{2}, 2, -3\right)$

28. $\begin{cases} 4A + 2U + I = 2 \\ 5A - 3U + 2I = 17 \\ A - 5U = 3 \end{cases}$ (−2, −1,

29. $\begin{cases} 4x - 2y + 5z = 6 \\ 3x + 3y + 8z = 4 \\ x - 5y - 3z = 5 \end{cases}$ no solution

30. $\begin{cases} 2\ell + 2w + h = 72 \\ \ell = 3w \\ h = 2w \end{cases}$ (21.6, 7.2, 1

31. $\begin{cases} 3x + 2y - z = 17.8 \\ x - 3y + 2z = 7.9 \\ 2x + y - 3z = 3.9 \end{cases}$ (6, 1.5, 3.2)

32. $\begin{cases} x + 2y = 2 \\ 2x + 3y - z = -9 \\ 4x + 2y + 5z = 1 \end{cases}$ $\left(-\frac{122}{11}, \frac{72}{11}\right.$

33. $\begin{cases} 3x + 2y + 2z = -2 \\ 2x + y - z = -2 \\ x - 3y + z = 0 \end{cases}$ $\left(-\frac{10}{13}, -\frac{2}{13}, \frac{4}{13}\right)$

34. $\begin{cases} 6x + y - 4z = -8 \\ \frac{y}{4} - \frac{z}{6} = 0 \\ 2x - z = -2 \end{cases}$ (2, 4, 6)

35. $\begin{cases} 4y + 2x = 6 - 3z \\ x + z - 2y = -5 \\ x - 2z = 3y - 7 \end{cases}$ (−1, 2, 0)

36. $\begin{cases} 5z + 4y = 4 \\ 3x - 2y = 0 \\ x + 3z = -8 \end{cases}$ (4, 6, −4)

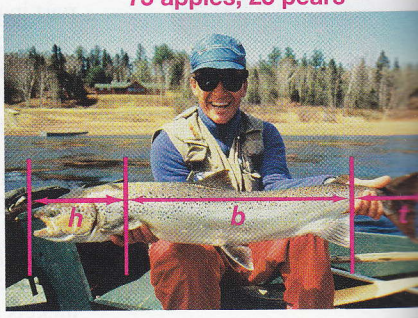
37. $\begin{cases} x + 6z = 12 \\ -2x + 3y = 6 \\ y - \frac{z}{2} = \frac{5}{2} \end{cases}$ $\left(2, \frac{10}{3}, \frac{5}{3}\right)$

38. $\begin{cases} 4x - y + z = -5 \\ -x + y - z = 5 \\ 2x - z - 1 = y \end{cases}$ (0, 2, −3)

History **Exercises 39 and 40 appeared in the book *Algebraical Problems*, published in 1824. Write and solve a system for each problem.**

39. Ten apples cost a penny, and 25 pears cost two pennies. Suppose I buy 100 apples and pears for $9\frac{1}{2}$ pennies. How many of each shall I have? 75 apples; 25 pears

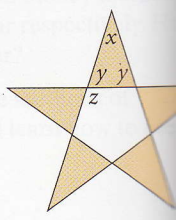
40. A fish was caught whose tail weighed 9 lb. Its head weighed as much as its tail plus half its body. Its body weighed as much as its head and tail. What did the fish weigh? 72 pounds



41. **Writing** How do you decide whether substitution is the best method to solve a system in three variables? See margin.

42. **Error Analysis** A student says that the system consisting of $x = 0$, $y = 0$, an $z = 0$ has no solutions. Explain the student's error. See margin.

43. **Geometry** Refer to the regular five-pointed star at the right. Write and solve a system of three equations to find the measure of each labeled angle. See above left.



44. **Open-Ended** Write your own system having three variables. Begin by choosing the solution. Then write three equations that are true for your solution. Use elimination to solve the system. See margin.

43. $x + 2y = 180$
$y + z = 180$
$5z = 540$
$x = 36, y = 72, z = 108$

Challenge

Need Help?
Sum of angles in a pentagon: 540°

45. **Geometry** In the regular polyhedron described below, all faces are congruent polygons. Use a system of three linear equations to find the numbers of vertices, edges, and faces. See margin p. 154.

Every face has five edges and every edge is shared by two faces. Every face has five vertices and every vertex is shared by three faces. The sum of the number of vertices and faces is two more than the number of edges.

FCAT Practice

Multiple Choice

46. What is the solution of the system? $\begin{cases} -3x + 2y - z = 6 \\ 3x + y + 2z = 5 \\ 2x - 2y - z = -5 \end{cases}$ B

A. (6, 5, −3) B. (1, 4, −1)
C. $\left(0, \frac{17}{5}, \frac{4}{5}\right)$ D. no solution

47. What is the solution of the system? $\begin{cases} x + 3y - 2z = -8 \\ 3x - y + z = 11 \\ 2x + 4y + 2z = 14 \end{cases}$ F

F. (2, 0, 5) G. (−8, 11, 14)
H. $\left(-2, \frac{4}{3}, 5\right)$ I. no solution

FCAT Online
FCAT Format quiz at www.PHSchool.com
Web Code: aga-0306

48. What is the solution of the system? $\begin{cases} y = -2x + 10 \\ -x + y - 2z = -2 \\ 3x - 2y + 4z = 7 \end{cases}$ D

A. $\left(3, -4, \frac{3}{2}\right)$ B. $\left(3, 16, \frac{15}{2}\right)$
C. $\left(-3, 16, \frac{15}{2}\right)$ D. $\left(3, 4, \frac{3}{2}\right)$

Short Response

49. Why is there no solution to the system? Explain your answer in terms of intersecting planes. See back of book.

$$\begin{cases} ① \; 2x - 3y + z = 5 \\ ② \; 2x - 3y + z = -2 \\ ③ \; -4x + 6y - 2z = 10 \end{cases}$$

Mixed Review

Graph each equation. 50–52. See margin. 53–55. See back of book.

Lesson 3-5

50. $x + y + 4z = 8$ 51. $2x + 3y - z = 12$ 52. $-3x + y + 5z = 15$
53. $-2x + 3y - z = 6$ 54. $6x + 4y - 3z = -12$ 55. $3x - 6y - 2z = 18$

Graph each equation. 56–61. See margin.

Lesson 2-5

56. $y = |x + 4|$ 57. $y = |3x - 2|$ 58. $y = \left|\frac{1}{2}x + 3\right| - 2$
59. $y = |x - 2| + 1$ 60. $y = |2x + 1|$ 61. $y = |x + 3| - 2$

Lesson 1-4

Solve each inequality. Graph the solution on a number line. 62–67. See back of book.

62. $-4x + 3 \le 9$ 63. $-(x + 4) - 3 \ge 11$ 64. $2(3x - 1) < x - 7$
65. $6 - 2x > 2$ 66. $3x + 2 < -x + 10$ 67. $-2(x + 3) \ge x$

FCAT Practice

Resources
For additional practice with a variety of test item formats:
- FCAT Practice, p. 161
- FCAT Strategies, p. 156
- FCAT Daily Practice and Strategies Transparencies

Exercise 48 One approach is to test the answer choices in the equations of the system. A good way to begin is first to test choices in the first equation, since the first equation contains only two of the three variables.

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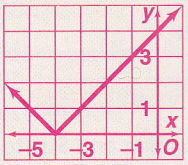

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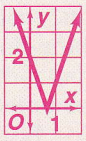

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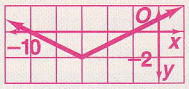

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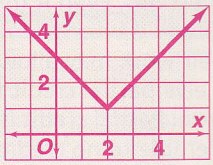

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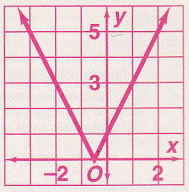

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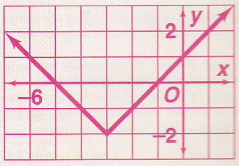

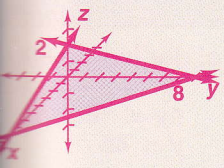

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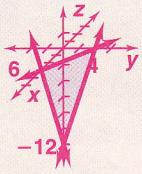

52.