ms

ages 651–657

vish to preteach some of the key d in this chapter. Particularly for anguage Learners (ELL), g the vocabulary before the r lesson begins gives students a t into understanding the new Writing new words on poster inting to the words as you say en displaying the poster for a time is a useful technique.

property of equality
14)
(p. 138)
cation property of
lity (p. 119)
(p. 152)
of decrease (p. 157)
of increase (p. 157)
ion (p. 148)
148)

CHAPTER 3

What You'll Learn in Chapter 3

- How to solve equations by using the properties of equality
- How to solve problems by writing and solving equations
- How to solve problems involving proportions

Skills & Concepts You Need for Chapter 3

2-3 Add.

1. $-3 + (-8)$ **2.** $8 + (-3) + (-11)$ **3.** $-3.1 + 6.8$

2-4 Subtract.

4. $9 - (-13)$ **5.** $-7.2 - (-10.1)$ **6.** $\frac{2}{3} - \frac{9}{10}$

2-5 Multiply.

7. $9 \cdot (-4)$ **8.** $\frac{3}{2} \cdot \frac{-4}{7}$ **9.** $-\frac{2}{3} \cdot \frac{5}{8}$

10. $-6 \cdot 8$ **11.** $-11(-3)$ **12.** $-7(-5)$

2-6 Divide.

13. $\frac{3}{4} \div -\frac{1}{8}$ **14.** $-\frac{7}{9} \div -\frac{2}{3}$ **15.** $-9.37 \div -0.1$

2-7 Factor.

16. $9y - 45$ **17.** $bw + bx - by$

18. $3y + 15 - 21x$ **19.** $6w - 12x + 10$

2-7 Multiply.

20. $3(x - 5)$ **21.** $8(4 + w)$

2-8 Simplify.

22. $5x - (6 + 3x)$ **23.** $7w - 3 - (4w - 8)$

24. $[3(5 - 2) + 18] - [12 - (3 + 4)]$

25. $[2(4x + 7) - 3] + [5(3 + x) + 2x]$

Skills & Concepts You Need for Chapter 3

1. -11
2. -6
3. 3.7
4. 22
5. 2.9
6. $-\frac{7}{30}$
7. -36
8. $-\frac{6}{7}$
9. $\frac{-5}{12}$
10. -48
11. 33
12. 35
13. -6
14. $\frac{7}{6}$
15. 93.7
16. $9(y - 5)$
17. $b(w + x - y)$
18. $3(y + 5 - 7x)$
19. $2(3w - 6x + 5)$
20. $3x - 15$
21. $32 + 8w$
22. $2x - 6$
23. $3w + 5$
24. 22
25. $15x + 26$

CTICE/ASSESS

QUIZ

= 12

= 3
1
= −9
-17
$y = 14$
8
late to an equation and solve.
dawn to noon, the temperature
ased 14°F to reach 64°F. What was
emperature at dawn?
be the temperature at dawn.
$14 = 64$
50
temperature was 50°F.

gnment Guide

rovide flexible scheduling, this
on can be split into parts.
ore 1–35 odd, 46–51
xtension 41, 42, 54, 56–59
ore 2–36 even, 37–40, 43–45
xtension 52, 53, 55, 60

Mixed Review to maintain skills.

EXAMPLE 4

In a basketball game Paula scored 18 points. This was 4 points higher than her average. What was her average?

Let $a =$ Paula's average.

$$\underbrace{\text{Paula's average}}_{a} \underbrace{\text{plus}}_{+} \underbrace{\text{4 points}}_{4} \underbrace{\text{is}}_{=} \underbrace{\text{18 points.}}_{18}$$

Translating to an equation

$$a + 4 + (-4) = 18 + (-4)$$

Adding −4 to both sides

$$a + 0 = 14$$
$$a = 14$$

Paula's average was 14 points.
The answer is reasonable, since 14 is less than 18.

Try This Translate to an equation and solve.

d. The weekly rent on an ocean-front apartment was increased by $82. The new rental cost is $675. What was the previous rent?

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

3-1 Exercises

A

Solve.

1. $x + 2 = 6$
2. $x + 5 = 8$
3. $x + 15 = 26$
4. $y + 9 = 43$
5. $x + 6 = -8$
6. $t + 9 = -12$
7. $x + 16 = -2$
8. $y + 25 = -6$
9. $x - 9 = 6$
10. $x - 8 = 5$
11. $x - 7 = -21$
12. $x - 3 = -14$
13. $5 + t = 7$
14. $8 + y = 12$
15. $-7 + y = 13$
16. $-9 + z = 15$
17. $-3 + t = -9$
18. $-6 + y = -21$
19. $b - 31 = 12$
20. $-18 = y - 4$
21. $-14 = p + 6$
22. $a + 1.5 = 3$
23. $n - 0.6 = 4$
24. $x + 3.2 = 7$
25. $c + 4 = -2.5$
26. $x + 5.7 = 15$
27. $s - 10 = -3.1$
28. $r + \frac{1}{3} = \frac{8}{3}$
29. $t + \frac{3}{8} = \frac{5}{8}$
30. $m + \frac{5}{6} = -\frac{11}{12}$
31. $x + \frac{2}{3} = -\frac{5}{6}$
32. $x - \frac{5}{6} = \frac{7}{8}$
33. $y - \frac{3}{4} = \frac{5}{6}$
34. $x - \frac{3}{8} = \frac{1}{4}$
35. $a + \frac{4}{5} = \frac{1}{10}$
36. $m + \frac{2}{9} = \frac{2}{3}$

Translate to an equation and solve.

37. Six more than a number is 57. Find the number.

Try This

d. $x + 82 = 675$; $593

Exercises

1. 4
2. 3
3. 11
4. 34
5. −14
6. −21
7. −18
8. −31
9. 15
10. 13
11. −14
12. −11
13. 2
14. 4
15. 20
16. 24
17. −6
18. −15
19. 43
20. −14
21. −20
22. 1.5
23. 4.6
24. 3.8
25. −6.5
26. 9.3
27. 6.9
28. $\frac{7}{3}$
29. $\frac{1}{4}$
30. $-\frac{7}{4}$
31. $\frac{-3}{2}$
32. $\frac{41}{24}$
33. $\frac{19}{12}$
34. $\frac{5}{8}$

38. A number decreased by 18 is -53. Find the number.

39. Four less than a number is eleven. Find the number.

40. A number increased by 42 is -100. Find the number.

41. **TEST PREP** If $x + 4 = -4$, then $x - 4 = ?$

A. -12 **B.** -8 **C.** 0 **D.** 4

42. ***Write a Convincing Argument*** Tell why it is not necessary to state a subtraction property of equality.

43. In Churchill, Manitoba, the average daily low temperature in January is $-35°C$. This is 55° less than what it is in Key West, Florida. What is the average daily low temperature in Key West in January?
Let $t =$ the average low temperature for Key West in January.
   a. Write an expression, using t, that represents the average low temperature in Churchill.
   b. What is the average low temperature in Churchill in January?
   c. What are you asked to find in this problem?
   d. Write an equation using the information you know.
   e. Solve the equation and answer the problem.

44. For many years, the tallest building in Los Angeles was City Hall. As "earthquake-proof" construction improved, however, building heights soared. In 2000, the tallest building was the 1017-ft Library Tower. It is 565 ft taller than City Hall. How tall is City Hall?
Let $h =$ the height of City Hall.
   a. Write an expression, using h, that represents the height of Library Tower.
   b. What is the height of Library Tower?
   c. What are you asked to find?
   d. Write an equation using the information you know.
   e. Simply by looking at the equation, how can you tell that the height of City Hall is less than the height of Library Tower?
   f. Solve the equation and answer the problem.

Library Tower in Los Angeles is shorter than the Sears Tower in Chicago by 437 ft. How tall is the Sears Tower?

45. In 2000 a TV magazine had a circulation of 18,870,730. That was 15,918,215 more than the circulation of a certain newspaper. What was the newspaper's circulation?
Let $c =$ circulation for the newspaper.
   a. Write an expression, using c, for the circulation of the magazine.
   b. What was the actual circulation for the TV magazine?
   c. What are you asked to find in this problem?
   d. Write an equation using the information you know.
   e. Without solving the equation, decide whether the circulation for the newspaper is more than or less than the circulation for the magazine.
   f. Solve the equation and answer the problem.

35. $-\frac{7}{10}$
36. $\frac{4}{9}$
37. $x + 6 = 57$; 51
38. $x - 18 = -53$; -35
39. $x - 4 = 11$; 15
40. $x + 42 = -100$; -142
41. A
42. You can subtract a number from both sides of an equation by adding its opposite to both sides.
43. a. $t - 55$
    b. $-35°$
    c. The average daily low temperature in Key West in January
    d. $t - 55 = -35$
    e. $t = 20°$
44. a. $h + 565$
    b. 1017 ft
    c. the height of City Hall
    d. $h + 565 = 1017$
    e. 565 must be added to h to equal the height of Library Tower
    f. $h = 452$ ft

Photo caption: 1454 ft

45. a. $c + 15{,}918{,}215$
    b. 18,870,730
    c. The newspaper's circulation
    d. $c + 15{,}918{,}215 = 18{,}870{,}730$
    e. Less
    f. $c = 2{,}952{,}515$

Exercises
46. -4
47. -10
48. -8
49. a-b
50. b+c
51. 1-c-a
52. 386
53. $118.40
54. Answers may vary.
55. Sometimes; when x=0 and a=b. Always; if k+a=b, then x-b=-k. Using -k for x, x-a=-k-a=a-b-x=-b and -k is a solution of x-a=-b.

B

Solve each equation for x.

46. $8 - 25 = 8 + x - 21$

47. $16 + x - 22 = -16$

48. $x + 5 = x - (3 + x)$

49. $x + 3 = 3 + a - b$

50. $x + 7 = b + 10$

51. $1 - c = a + x$

Solve.

52. The end-of-month inventory indicated that there were 319 blank videocassettes in stock. This was after sales of 142 and a restocking of 75 during the month. How many videocassettes were in stock at the beginning of the month?

53. At the end of the week, Andrea found that she had $124.23 in her checking account. During the week, she had written checks for $12.24, $15.05, and $22.00, and she had deposited $55.12. How much was in her checking account at the beginning of the week?

54. ***Critical Thinking*** Write an equation for which the solution $-\frac{7}{12}$ is found using addition.

Challenge

55. ***Mathematical Reasoning*** If k is a solution of $x + a = b$, is $-k$ sometimes, always, or never a solution of $x + a = b$? Of $x - a = -b$? Explain.

56. Solve $x - 1 + 2x - 2 + 3x - 3 = 30 + 4x$.

57. If $x - 4720 = 1634$, find $x + 4720$.

58. Solve $x + x = x$.

59. ***Mathematical Reasoning*** Solve each equation. Explain each result.

a. $x + 3 = 3 + x$ **b.** $x - 3 = 3 + x$

60. ***Error Analysis*** One student solved the equation $6 - x = 10$ by subtracting 6 from both sides and got 4. Explain what that student did wrong.

Mixed Review

Simplify. **61.** $9y - (2y + 4)$ **62.** $7c - (8c + 2)$

63. $8w - 3(5w - 8)$ **64.** $6a + 2c - 3(2a + 3c)$

65. $3[5 + 4(3 - y)]$ **66.** $5t - (3 + 9t)$ *2-8*

Evaluate. **67.** $(5a)^2$ for $a = 2$ **68.** $5a^2$ for $a = 2$ **69.** s^1 for $s = 32$ *1-3*

Multiply. **70.** $3(-5)$ **71.** $\left(-\frac{1}{3}\right)\left(-\frac{3}{5}\right)$ **72.** $4(-2)(-1)(-3)$ *2-5*

Divide. **73.** $-4 \div 2$ **74.** $\frac{2}{7} \div \left(-\frac{3}{8}\right)$ **75.** $-\frac{14}{15} \div \frac{5}{7}$ *2-6*

76. Mario spent half of his weekly allowance to buy a book. The book cost $5.75. Write an equation to find Mario's allowance. *2-9*

56. 18
57. 11,074
58. 0
59. a. All values of x are solutions. Adding $-x$ to both sides gives $3 = 3$, which is true for all values of x.
b. No solution. Adding $-x$ to both sides gives $-3 = 3$, which is not true for any value of x.
60. The student solved for $-x$. $x = -4$.

Mixed Review

61. $7y - 4$
62. $-c - 2$
63. $-7w + 24$
64. $-7c$
65. $51 - 12y$
66. $-3 - 4t$
67. 100
68. 20
69. 32
70. -15
71. $\frac{1}{5}$
72. -24
73. -2
74. $-\frac{16}{21}$
75. $-\frac{98}{75}$
76. $\frac{1}{2}a = 5.75$ or $2(5.75) = a$

CTICE/ASSESS

QUIZ

56

$\frac{6}{} = 8$

-72

$\frac{72}{8} = -9$

$= -8$

$\frac{-8}{-5} = \frac{8}{5}$

$= 17.5$

$\frac{17.5}{3.5} = 5$

13

$6 \cdot 13 = 78$

gnment Guide

rovide flexible scheduling, this
on can be split into parts.
ore 1–12, 13–33 odd,
xtension 36, 42, 49–53
ore 14–32 even, 34, 35, 37–41,
3
xtension 44–48, 54, 55

Mixed Review to maintain skills.

There were about 370,800 people in Sacramento in 1990. If we estimate using 360,000 rather than 370,800, we get $\frac{1}{6} \cdot 360{,}000 = 60{,}000$, which is close to 61,800. Therefore, the number 370,800 seems reasonable.

Try This Solve.

j. Penny bought a 12-bottle case of juice on sale for \$6.72. What was the price for each bottle?

Extra Help On the Web

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www.phschool.com

3-2 Exercises

A

Solve.

1. $6x = 36$
2. $3x = 39$
3. $5x = 45$
4. $9x = 72$
5. $84 = 7x$
6. $56 = 8x$
7. $-x = 40$
8. $100 = -x$
9. $-x = -1$
10. $-68 = -r$
11. $7x = -49$
12. $9x = -36$
13. $-12x = 72$
14. $-15x = 105$
15. $-21x = -126$
16. $-13x = -104$
17. $\frac{t}{7} = -9$
18. $\frac{y}{-8} = 11$
19. $\frac{3}{4}x = 27$
20. $\frac{4}{5}x = 16$
21. $\frac{-t}{3} = 7$
22. $\frac{-x}{6} = 9$
23. $-\frac{m}{3} = \frac{1}{5}$
24. $\frac{1}{9} = -\frac{z}{7}$
25. $-\frac{3}{5}r = -\frac{9}{10}$
26. $-\frac{2}{5}y = -\frac{4}{15}$
27. $-\frac{3}{2}r = -\frac{27}{4}$
28. $\frac{5}{7}x = -\frac{10}{14}$
29. $6.3x = 44.1$
30. $2.7y = 54$
31. $-3.1y = 21.7$
32. $-3.3y = 6.6$
33. $38.7m = 309.6$

Translate to an equation and solve.

34. Eighteen times a number is -1008. Find the number.

35. Some number multiplied by negative eight is 744. Find the number.

36. ***Critical Thinking*** If a, b, and c are rational numbers such that $a = b$ and $c = 0$, does $ac = bc$? Explain.

37. Katha paid the same price for each of 8 tickets to a concert. If she paid a total of \$170, what was the price of each ticket?
Let p = price of each ticket.
a. Write an expression using p that represents the price of all 8 tickets.
b. What did Katha pay for all 8 tickets?
c. What are you asked to find in this problem?
d. Write an equation using the information you know.
e. Without solving the equation, decide whether the price of each ticket is more than or less than \$30. How do you know?
f. Solve the equation and answer the problem.

Try This

j. $12x = \$6.72$; \$0.56

Exercises

1. 6
2. 13
3. 9
4. 8
5. 12
6. 7
7. -40
8. -100
9. 1
10. 68
11. -7
12. -4
13. -6
14. -7
15. 6
16. 8
17. -63
18. -88
19. 36
20. 20
21. -21
22. -54
23. $\frac{-3}{5}$
24. $\frac{-7}{9}$
25. $\frac{3}{2}$
26. $\frac{2}{3}$
27. $\frac{9}{2}$
28. -1
29. 7
30. 20
31. -7
32. -2
33. 8
34. $18x = -1008$; -56
35. $-8x = 744$; -93
36. Yes; $ac = 0$ and $bc = 0$

38. Deployment of the Chandra X-ray Observatory, named in honor of the Indian-American scientist Subrahmanyan Chandrasekhar, was the main objective of the 26th mission of the shuttle *Columbia*. When main engine cut-off occurred at about 8 min after launch, the *Columbia* was traveling about 16,700 mi/h. This is about 5.8 times its speed at about 2 min when it jettisoned its huge solid rocket boosters. What was *Columbia's* speed 2 min into flight?

Let s = speed at 2 min.

a. Write an expression, using s, that represents the speed at 8 min.

b. What was the speed at 8 min?

c. What are you asked to find in this problem?

d. Write an equation using the information you know.

e. Without solving the equation, estimate the speed at 2 min.

f. Solve the equation and answer the problem.

The 1999 *Columbia* space-shuttle mission commanded by Eileen Collins was launched just after midnight in Florida. The *Columbia* landed in Florida after averaging about 15,100 miles each hour for 1,796,000 miles. Did it land in the daylight or the dark?

39. In 1990 the population of Las Vegas, the largest city in Nevada, was 258,295. That was about 42 times the population of Winnemucca, Nevada's tenth largest city. What was the population of Winnemucca?

Let w = the population of Winnemucca, Nevada.

a. Write an expression, using w, for the population of Las Vegas in 1990.

b. What was the population of Las Vegas in 1990?

c. What are you asked to find in this problem?

d. Write an equation using the information you know.

e. Without solving the equation, estimate the population of Winnemucca, Nevada, in 1990.

f. Solve the equation and answer the problem.

40. A case of a dozen videocassette tapes costs $23.40. Find the cost of a single tape.

41. A wildlife expert estimates that in a certain year the number of male fawns born will be about $\frac{1}{3}$ the number of adult female deer. Suppose 1131 male fawns are born. About how many female deer are there?

42. ***Write a Convincing Argument*** Tell why it is not necessary to state a division property of equality.

37. a. $8p$
b. \$170
c. The price of one ticket
d. $8p = 170$
e. Less; if each ticket costs \$30, 8 tickets would cost \$240.
f. $p = \$21.25$

38. a. $5.8s$
b. 16,700 mi/h
c. the speed of Columbia 2 min into the flight
d. $5.8s = 16{,}700$
e. about 3,000 mi/h
f. $s = 2{,}879.3$ mi/h (approximately)

Photo caption: the dark

39. a. $42w$
b. 258,295
c. the population of Winnemucca
d. $42w = 258{,}295$
e. about 6000
f. $w = 6150$ (approximately)

40. $12t = 23.40$; \$1.95

41. $1131 = \frac{1}{3}f$; 3393

42. You can divide both sides of an equation by a nonzero number by multiplying both sides by the reciprocal of the number.

43. The 1996 population of San Diego, California, was estimated to be about 1,170,000. This was about $\frac{3}{7}$ of the estimate for Chicago. What was the approximate population of Chicago?

B

44. ***Multi-Step Problem*** Joe Montana and John Elway were pro football quarterbacks. Montana completed 3409 passes in his career. This is about $\frac{7}{11}$ of the passes he threw. It is also about $\frac{3}{4}$ the number that Elway completed. Elway completed about $\frac{4}{7}$ of the passes he threw. Who threw more passes? About how many more?

Mathematical Reasoning Use the first equation to find the missing value in the second equation. Justify your result.

45. $6a + 6b = 72$
$a + b = ??$

46. $\frac{x}{3} + 2 = 12$
$x + 6 = ??$

47. $\frac{2m}{5} - 2 = 12$
$2m - 10 = ??$

48. $\frac{2a^2}{3} + 1 = 8$
$2a^2 + 3 = ??$

Solve each equation for x.

49. $ax = 5a \ (a \neq 0)$

50. $3x = \frac{b}{a} \ (a \neq 0)$

51. $cx = a^2 + 1 \ (c \neq 0)$

52. $abx = 1 \ (ab \neq 0)$

53. ***Critical Thinking*** Write two different equations that each have the solution 2 and could be solved using the multiplication property.

Challenge

54. ***Mathematical Reasoning*** Solve each equation. Explain each result.
a. $0 \cdot x = 0$ **b.** $0 \cdot x = 9$

55. Explain or give a counterexample. a and b are integers.
a. If $a = b$, does $a^2 = b^2$? **b.** If $a^2 = b^2$, does $a = b$?

Mixed Review

Simplify. **56.** $8x + 4y - (4x - 5y)$ **57.** $3 - (4a + 7)$
58. $7r - (s + 2r) - 4s$ **59.** $(2a + 4b) - (2a + 4b)$ *2-8*

Multiply. **60.** $-5 \cdot 8 \cdot 2$ **61.** $(-7) \cdot (-24) \cdot 0$ **62.** $(-2.1)(-1.2)$
63. $(-3)(-7)(-2)$ **64.** $(-4)(-2.2)(-5)$ **65.** $(-2)(-3.1)3$ *2-5*

Evaluate. **66.** $t^4 + 1$ for $t = 2$ **67.** $8y^3$ for $y = 3$
68. $3|x|$ for $x = -8$ **69.** $y^2 + 2y$ for $y = -3$
70. $4z + |z|$ for $z = -1$ *1-3, 2-1*

Factor. **71.** $4x + 8y - 12z$ **72.** $6a - 12b - 9c$ *2-7*

Exercises

43. 2,730,000
44. Montana threw about 5357 passes. Elway completed about 4545 passes. Elway threw about 7954 passes. Elway threw about 2597 more passes than Montana.
45. 12
46. 36
47. 60
48. 24
49. 5
50. $\frac{b}{3a}$

51. $\frac{a^2 + 1}{c}$
52. $\frac{1}{ab}$
53. Answers may vary.
54. a. All values of x are solutions. Zero times any number is zero.
b. No solution. Zero times any number is zero.
55. a. Yes; If $a = b$, then $a^2 = ab$. Also, $ab = b^2$. Therefore, $a^2 = b^2$.
b. No; for example, $3^2 = (-3)^2$, but $3 \neq -3$.

Mixed Review
56. $4x + 9y$
57. $-4a - 4$
58. $5r - 5s$
59. 0
60. -80
61. 0
62. 2.52
63. -42
64. -44
65. 18.6
66. 17
67. 216
68. 24
69. 3
70. -3
71. $4(x + 2y - 3z)$
72. $3(2a - 4b - 3c)$

Solve.

$4(3x - 2) + 12x = 40$

$12x - 8 + 12x = 40$ Using the distributive property

$24x - 8 = 40$ Collecting like terms

$24x - 8 + 8 = 40 + 8$ Using the addition property

$24x = 48$

$\frac{1}{24} \cdot 24x = \frac{1}{24} \cdot 48$ Using the multiplication property

$1 \cdot x = 2$

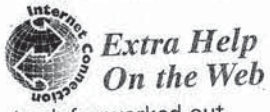
$x = 2$

Substitution will show that 2 checks.
The solution is 2.

Try This Solve.

g. $9 = 3(x + 6)$ **h.** $24 - 2(2m + 1) = -6$
i. $3a + 5(a - 2) = 6$

3-3 Exercises



Extra Help On the Web

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www.phschool.com

A

Solve.

1. $5x + 6 = 31$
2. $3x + 6 = 30$
3. $8x + 4 = 68$
4. $7z + 9 = 72$
5. $4x - 6 = 34$
6. $6x - 3 = 15$
7. $3x - 9 = 33$
8. $5x - 7 = 48$
9. $7x + 2 = -54$
10. $5x + 4 = -41$
11. $-4x + 7 = 35$
12. $-5x - 7 = 108$
13. $-7x - 24 = -129$
14. $-6z - 18 = -132$

Solve.

15. $5x + 7x = 72$
16. $4x + 5x = 45$
17. $4x + 3x = 42$
18. $6x + 19x = 100$
19. $4y - 2y = 10$
20. $8y - 5y = 48$
21. $-6y - 3y = 27$
22. $-4y - 8y = 48$
23. $-7y - 8y = -15$
24. $-10y - 3y = -39$
25. $10.2y - 7.3y = -58$
26. $6.8y - 2.4y = -88$

27. ***Critical Thinking*** Solve $4x - 8 = 32$ by using the multiplication property first. Then solve it using the addition property first. Are the results the same?

Solve.

28. $5(3x - 2) = 35$
29. $3(2y - 3) = 27$
30. $-2(4y - 3) = 6$
31. $(4 + 3x)(-3) = -9$

Teach the Mathematics (con

LESSON ENRICHMENT

Have students solve the following equation by two different methods

$4(x - 2) = 4$

$4x - 8 = 4$ $(x - 2) =$
$4x = 12$ $x - 2 =$
$x = 3$ $x =$

3. PRACTICE/ASSESS

LESSON QUIZ

Solve.

1. $4z + 5 = 13$
$4z = 8$
$z = 2$
2. $9u - 3 = -4$
$9u = -1$
$u = -\frac{1}{9}$
3. $-2y + 7y = 6$
$5y = 6$
$y = \frac{6}{5}$
4. $4(x + 2) + 2 = 8$
$4x + 8 + 2 = 8$
$4x + 10 = 8$
$4x = -2$
$x = -\frac{2}{4}$ or $-\frac{1}{2}$

Assignment Guide

To provide flexible scheduling, lesson can be split into parts.
▼ Core 1–14, 27
Extension 56
▼ Core 15–26, 47–50, 53
Extension 54
▼ Core 28–46, 51, 52
Extension 55

Use Mixed Review to maintain

Try This

g. -3
h. 7
i. 2

Exercises

1. 5
2. 8
3. 8
4. 9
5. 10
6. 3
7. 14
8. 11
9. -8
10. -9
11. -7
12. -23
13. 15
14. 19
15. 6
16. 5
17. 6
18. 4
19. 5
20. 16
21. -3
22. -4
23. 1
24. 3
25. -20
26. -20
27. $4x - 8 = 32$
$\frac{1}{4}(4x - 8) = \frac{1}{4}(32)$
$x - 2 = 8$
$x = 10$
$4x - 8 = 32$
$4x = 40$
$x = 10$
Yes.
28. 3
29. 6
30. 0
31. $-\frac{1}{3}$

Practice Multiple Choice

Choose the best answer.

1. To solve
$9x + (4 - 3x) = 34$, (1)
rewrite it as
$9x + (-3 + 4) = 34$. (2)
Then rewrite it as
$(9x - 3x) + 4 = 34$. (3)
What property changes equation (2) to equation (3)?

A Distributive property

B Associative property of addition

C Inverse property of multiplication

D Associative property of multiplication

2. If you solve the above equation, what solution do you get?

F $x = 5$

G $x = 6\frac{1}{3}$

H $x = 3.4$

J A value cannot be found for x.

1. B; Algebra 4.0
2. F; Algebra 4.0

Solve.

32. $2(3 + 4m) - 9 = 45$
33. $3(5 + 3m) - 8 = 88$
34. $12 - 3(x - 5) = 21$
35. $5 - 2(y + 1) = 21$
36. $5r - 2(2r + 8) = 16$
37. $6b - 4(2b + 8) = 16$
38. $2(2x - 4) + 3x = -1$
39. $-5a + 4(2 + 2a) = -1$
40. $\frac{1}{3}x + 2\left(\frac{1}{3}x + 5\right) = 12$
41. $3\left(\frac{1}{8}m - \frac{1}{2}\right) + \frac{3}{4}m = \frac{3}{2}$

42. When Erica learned that her company matches employee gifts to schools, she added \$15 to her gift. This made the value of her gift \$90. How much did Erica originally intend to give?

B

Mathematical Reasoning Provide a reason to justify each step.

43. $6(2x - 8) = 36$
- **a.** $12x - 48 = 36$ _____
- **b.** $12x - 48 + 48 = 36 + 48$ _____
- **c.** $12x = 84$ _____
- **d.** $\frac{1}{12} \cdot 12x = \frac{1}{12} \cdot 84$ _____
- **e.** $x = 7$ _____

44. $6(2x - 8) = 36$
- **a.** $\frac{1}{6} \cdot 6(2x - 8) = \frac{1}{6} \cdot 36$ _____
- **b.** $2x - 8 = 6$ _____
- **c.** $2x - 8 + 8 = 6 + 8$ _____
- **d.** $2x = 14$ _____
- **e.** $\frac{1}{2} \cdot 2x = \frac{1}{2} \cdot 14$ _____
- **f.** $x = 7$ _____

45. $7y + (8 + 3y) = 38$
- **a.** $7y + (3y + 8) = 38$ _____
- **b.** $(7y + 3y) + 8 = 38$ _____
- **c.** $10y + 8 = 38$ _____
- **d.** $10y + 8 - 8 = 38 - 8$ _____
- **e.** $10y = 30$ _____
- **f.** $\frac{1}{10} \cdot 10y = \frac{1}{10} \cdot 30$ _____
- **g.** $y = 3$ _____

46. $9m - 2(2m + 6) = 28$
- **a.** $9m - 4m - 12 = 28$ _____
- **b.** $5m - 12 = 28$ _____
- **c.** $5m - 12 + 12 = 28 + 12$ _____
- **d.** $5m = 40$ _____
- **e.** $\frac{1}{5} \cdot 5m = \frac{1}{5} \cdot 40$ _____
- **f.** $m = 8$ _____

Exercises

32. 6
33. 9
34. 2
35. −9
36. 32
37. −24
38. 1
39. −3
40. 2
41. $\frac{8}{3}$
42. \$30
43. a. Using the distributive property
    b. Using the addition property
    c. Simplifying
    d. Using the multiplication property
    e. Simplifying
44. a. Using the multiplication property
    b. Simplifying
    c. Using the addition property
    d. Simplifying
    e. Using the multiplication property
    f. Simplifying
45. a. Using the commutative property
    b. Using the associative prop.
    c. Collecting like terms
    d. Using the addition property
    e. Simplifying
    f. Using the multiplication property
    g. Simplifying
46. a. Using the distributive property
    b. Collecting like terms
    c. Using the addition property
    d. Simplifying
    e. Using the multiplication property
    f. Simplifying

Solve.

47. $(0.26 + y) + 3y = 0.98$

48. $0 = y - (-14) - (-3y)$

49. $12 - (-5m) + 3m + 12 = 0$

50. $4a + 5a - 2(2a) + 35 = 0$

51. $4(a - 2) + 3(2a + 1) = 5$

52. $2(3x + 5) + 3(2x + 5) = 1$

53. Rafael spent \$2011 to operate his car last year. He drove 12,500 miles. He paid \$972 for insurance and \$114 for the registration fee. Rafael's only other expense was for gas. How much did the gas cost per mile?

Challenge

Solve the first equation for x. Substitute your result into the second equation. Then solve for y. Check your work.

54. $9x - 5 = 22$
$4x + 2y = 2$

55. $9x + 2 = -1$
$4x - y = \frac{11}{3}$

56. ***Error Analysis*** The "Check" suggests an error was made. Explain.

Solve:

$$1.2x + 7.7 = 2.9$$
$$1.2x + 7.7 + (-7.7) = 2.9 + (-7.7)$$
$$1.2x = -4.8$$
$$\frac{1}{1.2} \cdot 1.2x = \frac{1}{1.2} \cdot -4.8$$
$$x = -4$$

Check:

$$1.2x + 7.7 = 2.9$$
$$1.2x + 7.7 \mid 2.9$$
$$1.2(-4) + 7.7 \mid 2.9$$
$$-4.8 + 7.7 \mid 2.9$$
$$3.9 \neq 2.9$$

Mixed Review

Use $>$ or $<$ to write a true sentence. **57.** $-5.2 \square 4$ **58.** $-2.3 \square 2.2$

59. $\frac{2}{3} \square \frac{3}{5}$ **60.** $\frac{1}{5} \square -\frac{3}{5}$ **61.** $-6.7 \square -3.9$ *2-2*

Divide. **62.** $\frac{5}{12} \div \frac{3}{4}$ **63.** $-\frac{2}{5} \div -\frac{5}{6}$ **64.** $\frac{2}{9} \div -\frac{1}{2}$ *2-6*

Solve. **65.** $x + 10 = 25$ **66.** $t - 84 = 72$ **67.** $5y = 30$ *3-1, 3-2*

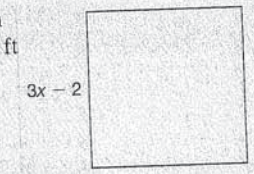
Factor. **68.** $4t + 4n - 12m$ **69.** $3a - 3c - 3d$ **70.** $4c - 12d$ *2-7*

Multiply. **71.** $4(3x - 4y)$ **72.** $3(2q - r - 4)$ *2-7*

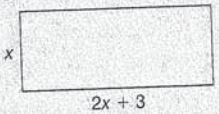
Connections: Geometry

Find the length of each side, given the perimeter.

1. a square with perimeter 64 ft



2. a rectangle with perimeter 36 in.



47. 0.18
48. $-\frac{7}{2}$
49. -3
50. -7
51. 1
52. -2
53. Let x = cost of gas per mile.
$972 + 114 + 12{,}500x = 2011$
$12{,}500x = 925$
$x = 0.074$
\$0.074/mi or 7.4¢ per mile
54. $x = 3, y = -5$
55. $x = -\frac{1}{3}, y = -5$
56. In the Check,
$-4.8 + 7.7 = 2.9$, not 3.9.

Mixed Review

57. $<$
58. $<$
59. $>$
60. $>$
61. $<$
62. $\frac{5}{9}$
63. $\frac{12}{25}$
64. $-\frac{4}{9}$
65. $x = 15$
66. $t = 156$
67. $y = 6$
68. $4(t + n - 3m)$
69. $3(a - c - d)$
70. $4(c - 3d)$
71. $12x - 16y$
72. $6q - 3r - 12$

Connections: Geometry

1. 16 ft
2. 5 in., 13 in.

$55h + 75$ = the total distance for the trip
Since $55h + 75$ represents the total distance for the trip, and we know that the total distance is 350 miles, we have the equation

$$55h + 75 = 350$$

We can solve this equation.

$$\begin{aligned} 55h + 75 &= 350 \\ 55h + 75 + (-75) &= 350 + (-75) \\ 55h &= 275 \\ \tfrac{1}{55} \cdot 55h &= \tfrac{1}{55} \cdot 275 \\ h &= 5 \end{aligned}$$

Find the ANSWER and CHECK

Kara must drive for 5 more hours.
$5 \cdot 55 = 275$ miles. This plus 75 miles gives the total of 350 miles. The answer checks.

Try This Solve.

g. When Jill sells 2 more buckets, she will have sold 3 times as many buckets as Jack sold. Jill has sold 19 buckets. How many buckets has Jack sold?

h. An 18-mile section of highway is being paved. The first 3 miles are done. The same number of miles will be paved each day. How many miles should be paved each day to complete this section in the next 10 days?

3-4 Exercises

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

A

Write as an algebraic expression.

1. 3 less than the product of 5 and a number
2. 5 more than twice a number
3. 18 fewer than half a number
4. 12 more than half a number
5. 3 less than the quotient of a number and 5
6. 3 more than the quotient of a number and 2
7. 4 times the quantity 1 less than a number
8. 2 times the quantity 4 greater than a number
9. $\frac{1}{2}$ the sum of a number and 6
10. $\frac{3}{4}$ the difference of a number and 3
11. 4 less than a third of a number
12. 7 greater than half a number

3. PRACTICE/ASSESS

LESSON QUIZ

Write as an algebraic expression.

1. 7 more than the quantity three
   number
   $3n + 7$
2. twice the sum of a number and
   $2(n + 6)$
3. 9 less than twice a number
   $2n - 9$
4. The repair bill totaled \$150 for
   and parts. The labor cost was t
   parts cost. What did the parts c
   Let p be the parts cost.
   The labor cost is $2p$.
   The total 150 is the sum of the
   and labor costs, hence
   $p + 2p = 150$
   $3p = 150$
   $p = \frac{150}{3} = 50$
   The parts cost \$50.
5. There are 3 more women than
   the Glee Club. There are 45 pe
   the club altogether. How many
   are in the club?
   Let m be the number of men.
   The number of women is $m +$
   The number of men plus the n
   of women equals 45, hence
   $m + (m + 3) = 45$
   $2m + 3 = 45$
   $2m = 42$
   $m = \frac{42}{2} = 21$
   There are 21 men in the club.

Assignment Guide

To provide flexible scheduling, lesson can be split into parts.

- Core 1–12, 13, 15, 21
  Extension 17, 18
- Core 14, 16, 19, 20, 22–25
  Extension 26–29

Use Mixed Review to maintain

Try This

g. 7
h. 1.5

Exercises

1. $5n - 3$
2. $2n + 5$
3. $\frac{1}{2}n - 18$
4. $\frac{1}{2}n + 12$
5. $\frac{n}{5} - 3$
6. $\frac{n}{2} + 3$
7. $4(n - 1)$
8. $2(n + 4)$
9. $\frac{1}{2}(n + 6)$
10. $\frac{3}{4}(n - 3)$
11. $\frac{1}{3}n - 4$
12. $\frac{1}{2}n + 7$

13. Today Harvey ran 2 km more than twice as far as he ran yesterday. Let y = the number of kilometers he ran yesterday. Write an expression for the number of kilometers he ran today.

14. Darrell sold 3 fewer subscriptions than 4 times the number Brenda sold. Let B = the number Brenda sold. Write an expression for the number Darrell sold.

15. Lyle still has \$2 more than half of his allowance. Let a = the amount of his allowance. Write an expression for the amount he has.

16. Last year Chu found 3 more customers than Ralph found. This year Chu found 2 times as many customers as he found last year. Let r = the number of customers Ralph found last year. Write an expression for the number of customers Chu found this year.

17. ***Critical Thinking*** Large drinks cost 15¢ more than small drinks.
   a. Let s = the cost of a small drink. Write an expression for the cost of the large drink.
   b. Let L = the cost of a large drink. Write an expression for the cost of a small drink.

18. ***Critical Thinking*** The cost of a small television set is \$25 more than half the cost of a large TV.
   a. Let C = the cost of a large television set. Write an expression for the cost of the small television.
   b. Let c = the cost of a small television set. Write an expression for the cost of the large television.

19. Elena has ridden 20 mi on her bike so far. She travels at an average rate of 10 mi/h. How many more hours will she have to ride to go a total of 55 mi?

   Let h = number of additional hours of travel needed.

   $10h$ = distance traveled in h hours

   a. Draw a diagram that shows this situation.
   b. Write an expression using h that represents 55 miles.
   c. What are you asked to find in this problem?
   d. Write an equation using the information you know.
   e. Solve the equation and answer the problem.

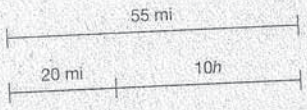
20. One hundred twenty-two vans were supposed to be shipped by railroad, but 2 vans could not fit on the railroad cars. There were 8 railroad cars, each holding the same number of vans. How many vans were on each car?

   Let v = the number of vans on each railroad car.

   a. What does the expression $8v$ represent?
   b. Write an expression using v that represents the 122 vans.
   c. Write an equation using the information you know.
   d. Solve the equation and answer the problem.

Exercises

13. $2y + 2$
14. $4B - 3$
15. $\frac{1}{2}a + 2$
16. $2(r + 3)$
17. a. $s + 15$
    b. $L - 15$
18. a. $\frac{1}{2}C + 25$
    b. $2(c - 25)$
19. a.



    b. $10h + 20$
    c. the number of additional hours that Elena must ride
    d. $10h + 20 = 55$
    e. $h = 3\frac{1}{2}$

    Elena must ride $3\frac{1}{2}$ hours more.

20. a. the total number of vans in the railroad cars
    b. $8v + 2$
    c. $8v + 2 = 122$
    d. $v = 15$

    There are 15 vans in each railroad car.

21. **TEST PREP** Let c = the number of cows in a herd. Then $2(c + 4)$ represents which quantity?

A. 4 more than twice the number of cows in the herd

B. twice the number of cows in a herd that has 4 more cows

C. the number of cows in a herd that has 6 more cows

D. the number of cows in a herd that has 8 more cows

B

22. The number of boys in the tennis club is 10 more than half the number of girls. There are 30 boys in the tennis club. Altogether, how many boys and girls are in the club?

23. A salesman rented a car that got 35 miles per gallon. He paid \$19.50 a day for the car plus \$0.26 per mile. He rented the car for 1 day and paid \$39. How many miles did he travel?

24. Bowling at Sunset Lanes cost Danny and Zorina \$9. This included shoe rental of \$0.75 a pair. How much did each game cost if Danny bowled 3 games and Zorina bowled 2 games?

25. Popcorn costs \$0.75 a box. Carl and Diane each bought 1 box of popcorn at the ball game. Carl bought 3 cans of juice and Diane bought 2 cans of juice during the game. Each can cost the same. They spent a total of \$5.25. What did they pay for each can of juice?

26. ***Critical Thinking*** If you add 2 to a certain number, multiply the result by 3, subtract 1 from the product, and divide the difference by 2, you get 10. Find the number.

Challenge

27. Ronald can do a job alone in 3 days. His assistant can do the same job alone in 6 days. How long would it take Ronald and his assistant to do the same job together? (Hint: Determine what part of the job each can do in one day.)

28. One cashier works at a rate of 3 minutes per customer and a second cashier works at a rate of 2 customers per minute. How many customers can they serve in 1 hour?

29. Ruth has some money in a savings account. After the bank adds 5% interest to her account, she has \$126. How much was in her account before the interest was added?

Mixed Review

Solve. **30.** $3x + 2x = 15$ **31.** $-\frac{1}{2}x + 3 = 1$ **32.** $3(4y - 2) = 18$ *3-3*

Write using exponential notation. **33.** $4 \cdot n \cdot n \cdot m \cdot 3 \cdot m \cdot n$

34. $y \cdot y \cdot y \cdot x$ **35.** $5 \cdot t \cdot 3 \cdot t \cdot 2 \cdot t$ **36.** $2 \cdot 6 \cdot r \cdot r$ *1-3*

Solve. **37.** $\frac{w}{-5} = -4$ **38.** $\frac{1}{2} = -\frac{1}{8}c$ **39.** $\frac{5}{7} = \frac{2}{3}x$ **40.** $\frac{4}{9}y = 2$ *3-2*

21. B
22. 70
23. 75
24. \$1.50
25. \$0.75
26. 5
27. 2 days
28. 140 customers
29. \$120

Mixed Review

30. 3
31. 4
32. 2
33. $12n^3m^2$
34. y^3x
35. $30t^3$
36. $12r^2$
37. 20
38. -4
39. $\frac{15}{14}$
40. $\frac{9}{2}$

Try This Solve.

a. $7y + 5 = 2y + 10$

b. $5 - 2p = 3p - 5$

c. $7x - 17 + 2x = 2 - 8x + 15$

d. $3n - 15 = 5n + 3 - 4n$

PART 2 Equations Containing Parentheses

Objective: Solve equations that contain parentheses.

Some equations containing parentheses can be solved by first using the distributive property.

EXAMPLE 3 Solve.

$$\begin{aligned}
3(n-2) - 1 &= 2 - 5(n+5) && \\
3n - 6 - 1 &= 2 - 5n - 25 && \text{Using the distributive property} \\
3n - 7 &= -5n - 23 && \text{Simplifying} \\
3n + 5n - 7 &= -5n + 5n - 23 && \text{Using the addition property} \\
8n - 7 &= -23 && \\
8n - 7 + 7 &= -23 + 7 && \text{Using the addition property} \\
8n &= -16 && \\
\tfrac{1}{8} \cdot 8n &= \tfrac{1}{8} \cdot -16 && \text{Using the multiplication property} \\
n &= -2 &&
\end{aligned}$$

Substitution will show that -2 checks.
The solution is -2.

Try This Solve.

e. $3(7 + 2x) = 30 + 7(x - 1)$

f. $4(3 + 5y) - 4 = 3 + 2(y - 2)$

3-5 Exercises

A

Solve.

1. $4x - 7 = 3x$
2. $9x - 6 = 3x$
3. $8x - 1 = 23 - 4x$
4. $5y - 2 = 28 - y$
5. $2x - 1 = 4 + x$
6. $5x - 2 = 6 + x$
7. $6x + 3 = 2x + 11$
8. $5y + 3 = 2y + 15$
9. $5 - 2x = 3x - 7x + 25$
10. $10 - 3x = 2x - 8x + 40$
11. $4 + 3x - 6 = 3x + 2 - x$
12. $5 + 4x - 7 = 4x + 3 - x$
13. 2 less than 3 times a number is the same as 3 more than 2 times the number. Find the number.
14. 3 less than 2 times a number is the same as 2 more than 3 times the number. Find the number.

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

Try This

a. 1
b. 2
c. 2
d. 9
e. -2
f. $-\frac{1}{2}$

Exercises

1. 7
2. 1
3. 2
4. 5
5. 5
6. 2
7. 2
8. 4
9. 10
10. 10
11. 4
12. 5
13. 5
14. -5

2 Equations Containing Parentheses

Remind students that their first obje is to simplify the equation, using the distributive property to remove parentheses and collect like terms a using the addition property to move variables to the same side of the equation. Once the equation is in th form $ax + b = c$, it can be solved as before.

Key Questions

- Does $3 - (x - 4) = 3 - x - 4$? No
- Does $3 + (x - 4) = 3 + x - 4$? Yes

Chalkboard Examples

1. $3(4x - 2) = 5x$
$12x - 6 = 5x$
$12x - 6 + 6 = 5x + 6$
$12x = 5x + 6$
$12x - 5x = 5x - 5x + 6$
$7x = 6$
$x = \frac{6}{7}$

2. $7x + 2(5x + 1) = 14x$
$7x + 10x + 2 = 14x$
$17x + 2 = 14x$
$17x + 2 - 2 = 14x - 2$
$17x = 14x - 2$
$17x - 14x = 14x - 14x - 2$
$3x = -2$
$x = -\frac{2}{3}$

3. PRACTICE/ASSESS

LESSON QUIZ

Solve.

1. $7x - 2 = 4x$ $x = \frac{2}{3}$
2. $4y + 3 = 6y + 8$ $y = -\frac{5}{2}$
3. $5(2z + 1) = 4z + 12$ $z = \frac{7}{6}$
4. $8u + 3(u + 2) = 7(2u - 1)$
$u = \frac{-13}{-3} = \frac{13}{3}$

Assignment Guide

To provide flexible scheduling, lesson can be split into parts.

- Core 1–14, 29–31, 34
  Extension 38
- Core 15–28, 32, 33,
  Extension 35–37

Use Mixed Review to maintain

Solve.

15. $5r - (2r + 8) = 16$

16. $6b - (3b + 8) = 16$

17. $3g - 3 = 3(7 - g)$

18. $3d - 10 = 5(d - 4)$

19. $5(d + 4) = 7(d - 2)$

20. $9(t + 2) = 3(t - 2)$

21. $8(3t - 2) = 4(7t - 1)$

22. $7(5x - 2) = 6(6x - 1)$

23. $3(r - 6) + 2 = 4(r + 2) - 21$

24. $5(t + 3) + 9 = 3(t - 2) + 6$

25. $19 - (2x + 3) = 2(x + 3) + x$

26. $13 - (2c + 2) = 2(c + 2) + 3c$

27. $\frac{1}{4}(8y + 4) - 17 = \frac{-1}{2}(4y - 8)$

28. $\frac{1}{3}(6x + 24) - 20 = \frac{-1}{4}(12x - 72)$

29. Placing planks of equal length end to end, Jules found that 3 planks were one foot short of the porch length, while 4 planks were two feet too long. How long was each plank?

B

Solve.

30. $\frac{2x + 4}{4} = 3x - 4$

31. $\frac{3x - 14}{-2} = 3x - 2$

32. $5(x - 1) = \frac{2(x + 4)}{-2}$

33. $-4(2x + 2) = \frac{-4(x + 1)}{4}$

Solve.

34. Terry has walked 3 miles. He averages 4 miles an hour. In how many more hours will he have traveled 13 miles?

35. ***Critical Thinking*** An **identity** is an equation that is true for all acceptable replacements. Is each equation an identity? Explain.

a. $2x + 4 + x = 4 + 3x$

b. $2(x - 3) + 5 = 3(x - 2) + 5$

Challenge

Solve for x. Assume that all variables represent positive numbers.

36. $a - b(x + c) = d$

37. $a(bx - c) = d - (x + e)$

38. How many equations having different solutions can you find by using parentheses to group the terms below? What are the solutions?

$4 - 2x - 3 = 2 - x + 1$

Mixed Review

Collect like terms. **39.** $\frac{2}{5}x + \frac{1}{7}y - \frac{3}{5}x + \frac{2}{7}y$

40. $\frac{3}{8}m - \frac{7}{8}n + \frac{1}{8}m + \frac{3}{8}n$

41. $\frac{2}{3}a - \frac{1}{3}a + \frac{4}{9} - \frac{1}{9}$ *2-7*

Write as an algebraic expression. *3-4*

42. 3 more than twice a number

43. 5 times the difference of a number and 2

44. 4 more than the quotient of a number and 2

Exercises

15. 8
16. 8
17. 4
18. 5
19. 17
20. −4
21. −3
22. −8
23. −3
24. −12
25. 2
26. 1
27. 5
28. 6
29. 3 ft
30. 2
31. 2
32. $\frac{1}{6}$
33. −1
34. $2\frac{1}{2}$ hours
35. a. Yes; true for all values of x.
    b. No; true only for $x = 0$.
36. $\frac{d - a + bc}{-b}$
37. $\frac{d - e + ac}{ab + 1}$
38. 4 equations; −2, 0, 4, 6

Mixed Review

39. $-\frac{1}{5}x + \frac{3}{7}y$
40. $\frac{1}{2}m - \frac{1}{2}n$
41. $\frac{1}{3}a + \frac{1}{3}$
42. $3 + 2n$
43. $5(n - 2)$
44. $\frac{n}{2} + 4$

CE/ASSESS

ıctions first, if necessary.
$x + \frac{7}{3}$
/ 3 to clear the fractions.

$\frac{4}{5}z + \frac{2}{10}$
y 10 to clear the fractions.

$2 = 0.4a + 0.7$
by 10 to clear the decimals.

ent Guide
–30
sion 31–33

ed Review to maintain skills.

Try This Solve.

a. $\frac{7}{8}x + \frac{3}{4} = \frac{1}{2}x + \frac{3}{2}$ **b.** $\frac{5}{6}x + \frac{1}{2} = \frac{2}{3}x + 4$

c. $26.45 = 4.2x + 1.25$ **d.** $41.68 = 4.7 - 8.6y$

The following summarizes the steps for solving an equation.

Quick Review

Step 1: This lesson
Step 2: Lesson 3-3
Step 3: Lessons 3-5, 3-1
Step 4: Lesson 3-3
Step 5: Lesson 3-2

Solving Equations

1. Multiply both sides to clear fractions or decimals, if necessary.
2. Collect like terms on each side, if necessary.
3. Use the addition property to move the variable to one side and all other terms to the other side of the equation.
4. Collect like terms again, if necessary.
5. Use the multiplication property to solve for the variable.

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

3-6 Exercises

A

Mental Math By what number would you multiply to clear the fractions?

1. $\frac{1}{4}x + 2 = \frac{3}{4}x$ **2.** $5d - \frac{2}{3} = \frac{1}{3}d$ **3.** $\frac{3}{4}k + 1 = \frac{3}{8} - 2k$

4. $2 - \frac{4}{5}w = \frac{7}{15}w + \frac{1}{5}$ **5.** $\frac{1}{3}g + \frac{1}{2} = \frac{5}{6}g$ **6.** $\frac{3}{4} - \frac{1}{6}m = \frac{2}{3}m$

Solve. Clear the fractions first, if necessary.

7. $\frac{7}{2}x + \frac{1}{2}x = 3x + \frac{3}{2} + \frac{5}{2}x$ **8.** $\frac{1}{2} + 4m = 3m - \frac{5}{2}$

9. $\frac{5}{3} + \frac{2}{3}x = \frac{25}{12} + \frac{5}{4}x + \frac{3}{4}$ **10.** $1 - \frac{2}{3}y = \frac{9}{5} - \frac{y}{5} + \frac{3}{5}$

11. $\frac{4}{5}x - \frac{3}{4}x = \frac{3}{10}x - 1$ **12.** $\frac{8}{5}y - \frac{2}{3}y = 23 - \frac{1}{15}y$

13. $\frac{7}{8}x - \frac{1}{4} + \frac{3}{4}x = \frac{1}{16} + x$ **14.** $\frac{2}{3} + \frac{1}{4}t = \frac{1}{3}$

15. $-\frac{3}{2} + x = -\frac{5}{6} - \frac{4}{3}$ **16.** $\frac{2}{3} + 3y = 5y - \frac{2}{15}$

17. $\frac{2}{7}x + \frac{1}{2}x = \frac{3}{4}x + 1$ **18.** $\frac{5}{16}y + \frac{3}{8}y = 2 + \frac{1}{4}y$

19. $2.1x + 45.2 = 3.2 - 8.4x$ **20.** $0.96y - 0.79 = 0.21y + 0.46$

21. $1.03 - 0.62x = 0.71 - 0.22x$ **22.** $0.42 - 0.03y = 3.33 - y$

23. $1.7t + 8 - 1.62t = 0.4t - 0.32 + 8$

24. $0.7n - 15 + n = 2n - 8 - 0.4n$

Try This

a. 2
b. 21
c. 6
d. −4.3

Exercises

1. 4
2. 3
3. 8
4. 15
5. 6
6. 12
7. −1
8. −3
9. −2
10. −3
11. 4
12. 23
13. $\frac{1}{2}$
14. $-\frac{4}{3}$
15. $-\frac{2}{3}$
16. $\frac{2}{5}$
17. 28
18. $\frac{32}{7}$
19. −4
20. $\frac{5}{3}$
21. 0.8
22. 3
23. 1
24. 70

B

Solve.

25. $7\frac{1}{2}x - \frac{1}{2}x = 3\frac{3}{4}x + 39$

26. $\frac{1}{5}t - 0.4 + \frac{2}{5}t = 0.6 - \frac{1}{10}t$

27. $\frac{1}{4}(8y + 4) - 17 = -\frac{1}{2}(4y - 8)$

28. $\frac{1}{3}(6x + 24) - 20 = -\frac{1}{4}(12x - 72)$

29. $30{,}000 + 20{,}000x = 55{,}000$

30. $25{,}000(4 + 3x) = 125{,}000$

31. ***Critical Thinking*** After the death (about 290 A.D.) of Diophantus, a famous Greek mathematician, someone described his life as a puzzle.

He was a boy for $\frac{1}{6}$ of his life.
After $\frac{1}{12}$ more, he acquired a beard.
After another $\frac{1}{7}$, he married.
In the fifth year after his marriage his son was born.
The son lived half as many years as his father.
Diophantus died 4 years after his son.

How old was Diophantus when he died?

Challenge

32. Apples are collected in a basket for six people. One third, one fourth, one eighth, and one fifth of the apples are given to four people, respectively. The fifth person gets ten apples with one apple remaining for the sixth person. Find the original number of apples in the basket.

33. Carol shared a package of graph paper with 3 of her friends. She gave $\frac{1}{4}$ of the pack to Willy. Sara got $\frac{1}{3}$ of what was left. Then Marcy took $\frac{1}{6}$ of what was left in the package. Carol kept the remaining 30 sheets. How many sheets were in the package to start?

Mixed Review

Write a true sentence using $<$ or $>$. **34.** $7.301 \square 7.310$

35. $5.4 \square |-5|$ **36.** $-0.783 \square -0.781$ **37.** $|6| \square |-7|$ *2-1, 2-2*

Write as an algebraic expression. **38.** 7 more than half a number

39. 5 less than twice a number **40.** twice the sum of a number and 3 *3-4*

Solve. **41.** $-4(2t + 7) = -4$ **42.** $3a + 2(2a + 5) = 3$

43. $x + \frac{1}{3}x = 8$ **44.** $x + \frac{1}{4}x = 10$ **45.** $\frac{3}{8}y + \frac{3}{4}y = 3$ *3-2, 3-5*

Evaluate each expression for $x = -2$. **46.** $9x^2 - 4$ **47.** $\frac{1}{2}x^3 + 32$ *1-3*

25. 12
26. $\frac{10}{7}$
27. 5
28. 6
29. $\frac{5}{4}$
30. $\frac{1}{3}$
31. 84 yr
32. 120
33. 72

Mixed Review

34. $<$
35. $>$
36. $<$
37. $<$
38. $\frac{n}{2} + 7$
39. $2n - 5$
40. $2(n + 3)$
41. -3
42. -1
43. 6
44. 8
45. $\frac{8}{3}$
46. 32
47. 28

EXAMPLE 3

A formula for computing the earned-run average A of a pitcher who has given up R earned runs in I innings of pitching is

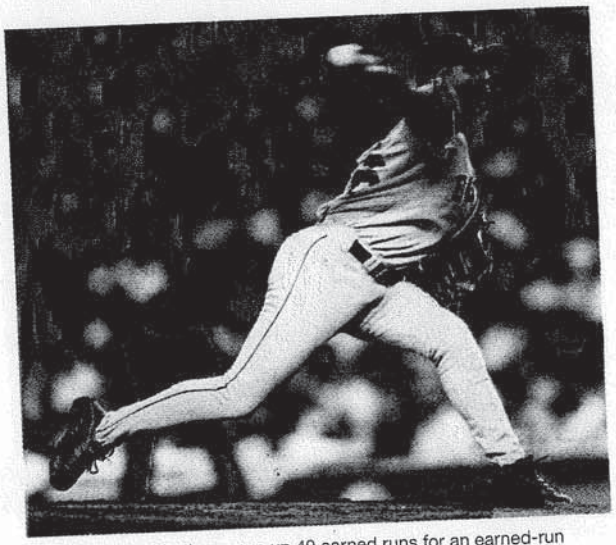
$$A = \frac{9R}{I}$$

Solve for I.

$$A = \frac{9R}{I}$$
$$AI = 9R \quad \text{Multplying both sides by } I$$
$$I = \frac{9R}{A} \quad \text{Multiplying both sides by } \frac{1}{A}$$

Try This

d. A formula for a football player's rushing average r with a total of y yards rushed in n carries of the ball is $r = \frac{y}{n}$. Solve for n.



In 1999, Pedro Martinez gave up 49 earned runs for an earned-run average of 2.067. How many innings did he pitch that year?

3-7 Exercises

A

Solve.

1. $A = bh$, for b (an area formula)
2. $A = bh$, for h
3. $d = rt$, for r (a distance formula)
4. $d = rt$, for t
5. $I = Prt$, for P (an interest formula)
6. $I = Prt$, for t
7. $F = ma$, for a (a physics formula)
8. $F = ma$, for m
9. $P = 2l + 2w$, for w (a perimeter formula)
10. $P = 2l + 2w$, for l
11. $A = \pi r^2$, for r^2 (an area formula)
12. $A = \pi r^2$, for π
13. $A = \frac{1}{2}bh$, for b (an area formula)
14. $A = \frac{1}{2}bh$, for h
15. $E = mc^2$, for m (a relativity formula)
16. $E = mc^2$, for c^2
17. $A = \frac{a+b+c}{3}$, for b
18. $A = \frac{a+b+c}{3}$, for c
19. $v = \frac{3k}{t}$, for t
20. $P = \frac{ab}{c}$, for c

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

Writing Math

Mathematicians may solve Exercise 17 in much the same way that you do. Then, however, they will quickly give the answer to Exercise 18, writing "by symmetry" to justify it. Can you solve Exercise 18 by using the "symmetry" of Exercises 17 and 18?

3. PRACTICE/ASSESS

LESSON QUIZ

Solve.

1. $I = Prt$, for r
   $\frac{I}{Pt} = r$
2. $Q = \frac{2s}{t}$, for s
   $Qt = 2s$
   $\frac{Qt}{2} = s$
3. $A = \frac{a+b}{2}$, for b
   $2A = a + b$
   $2A - a = b$
4. $e = 3f + 2g$, for g
   $e - 3f = 2g$
   $\frac{1}{2}(e - 3f) = g$

Assignment Guide

Core 1–33, 35, 42
Extension 34, 36–41

Use Mixed Review to maintain s

Photo Caption

$213\frac{1}{3}$

Try This

d. $n = \frac{y}{r}$

Exercises

1. $\frac{A}{h}$
2. $\frac{A}{b}$
3. $\frac{d}{t}$
4. $\frac{d}{r}$
5. $\frac{I}{rt}$
6. $\frac{I}{Pr}$
7. $\frac{F}{m}$
8. $\frac{F}{a}$
9. $\frac{P-2l}{2}$
10. $\frac{P-2w}{2}$
11. $\frac{A}{\pi}$
12. $\frac{A}{r^2}$
13. $\frac{2A}{h}$
14. $\frac{2A}{b}$
15. $\frac{E}{c^2}$
16. $\frac{E}{m}$
17. $3A - a - c$
18. $3A - a - b$
19. $\frac{3k}{v}$
20. $\frac{ab}{P}$

Practice Multiple Choice

Choose the best answer.

1. Solve:
$3(3x + 2) + 5 = 5(3x - 8) + 9$

A $x = 1$
B $x = 2\frac{2}{3}$
C $x = 7$
D $x = 3\frac{2}{3}$

2. Solve for b in this formula:
$A = \frac{bh}{2}$

F $b = \frac{Ah}{2}$
G $b = 2Ah$
H $b = \frac{A}{2h}$
J $b = \frac{2A}{h}$

A formula for the area of a sector of a circle is $A = \frac{\pi r^2 S}{360}$ where r is the radius and S is the central angle measure of the sector.

21. Solve for S.

22. Solve for r^2.

A formula to find the horsepower H of an N-cylinder engine is $H = \frac{D^2N}{2.5}$

23. Solve for D^2.

24. Solve for N.

B

In Exercises 25–33, solve. Justify each step.

25. $A = \frac{1}{R}$, for R

26. $g = 40n + 20k$, for k

27. $r = 2h - \frac{1}{4}f$, for f

28. $\frac{s}{t} = \frac{t}{v}$, for s

29. $a^2 = b^2 + 2xc$, for x

30. $m = ax^2 + bx + c$, for b

31. $\frac{a}{b} = \frac{c}{d}$, for $\frac{a}{c}$

32. $d = \frac{1}{e + f}$, for f

33. $l = a + (n - 1)d$, for n

34. If $a^2 = b^2$, does $a = b$?

35. The formula $R = -0.00625t + 3.85$ can be used to estimate the world record in the 1500 m run t years after 1930. Solve for t.

36. ***Critical Thinking*** In Exercise 23, you solved for D^2. How might you solve for D?

Challenge

Solve.

37. $y = a - ab$, for a

38. $ax + b = cb$, for b

39. $x = a + b - 2ab$, for a

40. $x - a = a(y - b)$, for a

41. ***Mathematical Reasoning*** Solve $2p - q = 2r - s$ for $4p + 2s$.

42. **TEST PREP** If $\frac{a}{b - c} = d$, then $b = ?$

A. $\frac{a + c}{d}$ **B.** $\frac{a + cd}{d}$ **C.** $\frac{a}{d - c}$ **D.** $\frac{d + c}{a}$

Self-Test On the Web
Check your progress. Look for a self-test at the Prentice Hall Web site.
www.phschool.com

Mixed Review

Factor. **43.** $4x + 12$ **44.** $3c + 12d - 9$ *2-7*

Collect like terms. **45.** $2x + 3y - 4x$ **46.** $8a - 3c + 4 - 2a$ *1-5*

Solve. **47.** $16 - 2c = 4c - 2$ **48.** $1.7m + 16.8 = 25.8 - 0.55m$

49. $\frac{1}{2}(8m + 4) + 2 = \frac{1}{3}(18m - 18)$ **50.** $\frac{2}{5} + 3y = 10y - 1$

51. $15.4 - 9.1t = 2.4t - 19.1$ **52.** $27 - 3(t + 4) = 9(t - 2) - 15$ *3-5, 3-6*

1. C; Algebra 4.0
2. J; Algebra 10.0

Exercises

21. $\frac{360A}{\pi r^2}$

22. $\frac{360A}{\pi S}$

23. $\frac{2.5H}{N}$

24. $\frac{2.5H}{D^2}$

25. $\frac{1}{A}$

26. $\frac{g - 40n}{20}$

27. $8h - 4r$

28. $\frac{t^2}{v}$

29. $\frac{a^2 - b^2}{2c}$

30. $\frac{m - ax^2 - c}{x}$

31. $\frac{b}{d}$

32. $\frac{1}{d} - e$

33. $\frac{d - a + l}{d}$

34. No, a may be $-b$.

35. $t = \frac{R - 3.85}{-0.00625}$ or $-160R + 616$

36. by taking the square root of D^2;
$D = \sqrt{\frac{2.5H}{N}}$

37. $\frac{y}{1 - b}$

38. $\frac{ax}{c - 1}$

39. $\frac{x - b}{1 - 2b}$

40. $\frac{x}{y - b + 1}$

41. $4r + 2q$

42. B

Mixed Review

43. $4(x + 3)$
44. $3(c + 4d - 3)$
45. $3y - 2x$
46. $6a - 3c + 4$
47. 3
48. 4
49. 5
50. $\frac{1}{5}$
51. 3
52. 4

PRACTICE/ASSESS

SON QUIZ

e.

$|x| = 2$

$x = 2$ or $x = -2$

$|a| = |-4|$

$|a| = 4$

$a = 4$ or $a = -4$

$|y| + 5 = 9$

$|y| = 9 - 5$

$|y| = 4$

$y = 4$ or $y = -4$

$3|x| + 7 = 13$

$3|x| = 13 - 7$

$3|x| = 6$

$|x| = \frac{6}{3} = 2$

$x = 2$ or $x = -2$

$\frac{2}{5}|b| + |-2| = 5$

$\frac{2}{5}|b| + 2 = 5$

$\frac{2}{5}|b| = 5 - 2$

$\frac{2}{5}|b| = 3$

$\frac{5}{2} \cdot \frac{2}{5}|b| = \frac{5}{2} \cdot 3$

$|b| = \frac{15}{2}$

$b = \frac{15}{2}$ or $b = -\frac{15}{2}$

Assignment Guide

Core 1–33, 40–53, 67–70
Extension 34–39, 54–66

Use Mixed Review to maintain skills.

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

3-8 Exercises

A

Mental Math Solve.

1. $|x| = 19$
2. $|y| = 9$
3. $4 = |m|$
4. $|n| = 7$
5. $|h| = 0$
6. $3 = |a|$
7. $|b| = 12$
8. $|x| = 15$
9. $|a| = |-2|$
10. $|-20| = |-x|$
11. $|y| = 12 - 5$
12. $|y| + 5 = 16$
13. $|a| - 7 = 21$
14. $4 + |m| = 9$
15. $-2 + |n| = 0$
16. $|x| + 3 + 9 = 15$
17. $5 + |x| - 9 = 2$
18. $|x| - 23 = 34$
19. $|-4| + |-6| + |m| = 10$
20. $|-8| + |x| = |-8| + |-3|$
21. $5|x| = 35$
22. $3|y| = 27$

Solve.

23. $2|x| + 6 = 12$
24. $4|r| - 2 = 18$
25. $\frac{|m|}{4} = 5$
26. $\frac{|t|}{-2} = -9$
27. $-4|x| = -5$
28. $4|x| + |-4| = |-6|$
29. $-3|a| - 5 = -17$
30. $-2|b| + 4 = 2$
31. $\frac{|x|}{5} + 7 = 42$
32. $\frac{1}{4} + \frac{1}{2}|x| = \frac{5}{8}$
33. ***Write a Convincing Argument*** $|x| = -5$ has no solutions. Why?

Mathematical Reasoning Show that the statement is sometimes true. Then give a counterexample to show that the statement is not always true.

34. $|x| = x$
35. $|x| = -x$
36. $|-x| = x$
37. $|-x| = -x$
38. $|x + y| = |x| + |y|$
39. $|x + y| < |x| + |y|$

B

Solve.

40. $-|x| = -4$
41. $-12 = -|y|$
42. $-2|a| + 3 = 1$
43. $2|x| + 3|x| + 4 = 24$
44. $-3|m| + 5|m| - 3 = 1$
45. $|n| - 3 + 5|n| = 15$
46. $|x| + 12 = 5|x| - 4$
47. $6 - 3|a| = 2|a| + 1$
48. $-\frac{2}{3}|m| - \frac{4}{5} = -4$
49. $-\frac{1}{3}|y| + \frac{5}{6} = \frac{1}{6}$
50. $|3m| = 6$
51. $|2a| = 8$
52. $|-m| = 5$
53. $|-x| = 7$

Exercises

1. 19, −19
2. 9, −9
3. 4, −4
4. 7, −7
5. 0
6. 3, −3
7. 12, −12
8. 15, −15
9. 2, −2
10. 20, −20
11. 7, −7
12. 11, −11
13. 28, −28
14. 5, −5
15. 2, −2
16. 3, −3
17. 6, −6
18. 57, −57
19. 0
20. 3, −3
21. 7, −7
22. 9, −9
23. 3, −3
24. 5, −5
25. 20, −20
26. 18, −18
27. $\frac{5}{4}, -\frac{5}{4}$
28. $\frac{1}{2}, -\frac{1}{2}$
29. 4, −4
30. 1, −1
31. 175, −175
32. $\frac{3}{4}, -\frac{3}{4}$
33. The absolute value of a number cannot be negative.
34. true for $x = 2$; false for $x = -2$
35. true for $x = -2$; false for $x = 2$
36. true for $x = 2$; false for $x = -2$
37. true for $x = -2$; false for $x = 2$
38. true for $x = 2$, $y = 3$; false for $x = -2$, $y = 3$
39. true for $x = -2$, $y = 3$; false for $x = 2$, $y = 3$
40. 4, −4
41. 12, −12
42. 2, −2
43. 4, −4
44. 2, −2
45. 3, −3
46. 4, −4
47. 1, −1
48. $\frac{24}{5}, -\frac{24}{5}$
49. 2, −2
50. $m = 2, -2$
51. $a = 4, -4$
52. $m = 5, -5$
53. $x = 7, -7$

Critical Thinking Complete.

54. If $x > 0, |x| = ?$ **55.** If $x < 0, |x| = ?$ **56.** If $x = 0, |x| = ?$

Challenge

Solve.

57. $|x + 2| = 7$ **58.** $|m - 4| = 1$ **59.** $|2a + 1| = 5$

Mathematical Reasoning Is the statement sometimes true, always true, or never true? Explain.

60. $|x| > x$ **61.** $|x| = |-x|$ **62.** $|x^2| = x^2$

63. $|x| + |y| > 0$ **64.** $|xy| = |x||y|$ **65.** $|x - y| = |x| - |y|$

66. If $|x| > |y|$, what is the most you know about x and y?

Error Analysis The solution of each equation has an error commonly made by algebra students. Find and correct the error.

67. $4 - 3x = 5$

$3x = 9$

$x = 3$

68. Solve $ax - b = c$ for b.

$ax = b + c$

$x = \frac{b + c}{a}$

69. $4|c| - 3 = 1$

$4|c| - 3 = 1$ or $4|c| - 3 = -1$

$4|c| = 4$ or $4|c| = 2$

$|c| = 1$ or $|c| = \frac{1}{2}$

$c = 1$ or $c = -1$ $c = \frac{1}{2}$ or $c = -\frac{1}{2}$

70. $|x| = -3$

$x = 3$ or $x = -3$

Mixed Review

Solve. **71.** $-12t - 4 = 32$ **72.** $3m + 2m + 15 = 35$

73. $x + 0.75x = 21$ **74.** $\frac{1}{2}n + \frac{2}{5}n = -\frac{9}{10}$ **75.** $\frac{2}{5}(m - 4) = 4$ *3-3*

Collect like terms. **76.** $2x - \frac{1}{2}x + \frac{3}{4}x - 4x$

77. $3a - \frac{2}{5}b - \frac{1}{2}a - 6b$ **78.** $5x + \frac{2}{3}y - \frac{1}{4}x + y$ *2-7*

Translate to an equation and solve.

79. The sum of two consecutive even integers is 94. What are the integers?

80. The sum of three consecutive odd integers is 123. What are the integers?

81. One angle of a triangle is 3 times as large as another. The third angle is 60° less than the sum of the other two angles. Find the measure of each angle.

82. The length of a rectangle is twice the width. The perimeter is 24 m. Find the length and the width. *3-4*

54. x
55. $-x$
56. 0
57. 5, −9
58. 5, 3
59. 2, −3
60. Sometimes; true for $x = -2$; false for $x = 2$.
61. Always; a number and its opposite are the same distance from 0.
62. Always; $x^2 \geq 0$, so $|x^2| = x^2$.
63. Sometimes; false only for $x = y = 0$.
64. Always; the factors on the right are the same as the factors inside the absolute value symbol on the left, except possibly for a factor of −1 inside the absolute value symbol. The absolute value symbol eliminates the factor of −1.
65. Sometimes; true for $x = 3$, $y = 2$; false for $x = 3$, $y = -2$.
66. $x \neq y$, $x \neq 0$
67. The correct solution is $x = -\frac{1}{3}$.
68. The correct solution is $b = ax - c$.
69. The correct solution is $c = 1$ or $c = -1$.
70. There is no solution.

Mixed Review

71. −3
72. 4
73. 12
74. −1
75. 14
76. $-\frac{7}{4}x$
77. $\frac{5}{2}a - \frac{32}{5}b$
78. $\frac{19}{4}x + \frac{5}{3}y$
79. 46, 48
80. 39, 41, 43
81. 30°, 60°, 90°
82. 8 m, 4 m

TICE/ASSESS

IZ

proportions.

$= \frac{7}{3}$

rtain map, 2 inches represent
9 inches represent how many

e the number of miles. Since
le proportion remains constant,
le is equal to $\frac{2}{5}$ and to $\frac{9}{x}$, hence

ly by $5x$.
$= 5x \cdot \frac{9}{x}$
$= 45$
$= \frac{45}{2}$

es represent $22\frac{1}{2}$ miles.

ıment Guide
ıvide flexible scheduling, this
can be split into parts.
e 1–24
ension 39
e 25–37, 43
ension 38, 40–42

lixed Review to maintain skills.

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

Practice Multiple Choice

Choose the best answer.

1. Solve.
$8 + |y| - 11 = 3$
A $y = -6$ or $y = 6$
B $y = 6$
C $y = 22$
D $y = 22$ or $y = -22$

2. Norman received $60 for working 8 hours. At this rate, how much would he receive for working 35 hours?
F $262.50
G $7.50
H $2100
J $480

1. A; Algebra 3.0
2. F; Algebra 5.0

3-9 Exercises

A

Solve these proportions.

1. $\frac{y}{3} = \frac{9}{27}$
2. $\frac{7}{8} = \frac{m}{4}$
3. $\frac{9}{x} = \frac{2}{3}$
4. $\frac{25}{75} = \frac{1}{x}$
5. $\frac{2}{y} = \frac{5}{9}$
6. $\frac{16}{m} = \frac{1}{4}$
7. $\frac{8}{5} = \frac{40}{y}$
8. $\frac{12}{15} = \frac{t}{5}$
9. $\frac{y}{4} = \frac{5}{8}$
10. $\frac{3}{8} = \frac{12}{x}$
11. $\frac{5}{x} = \frac{9}{11}$
12. $\frac{2}{7} = \frac{5}{y}$
13. $\frac{x}{40} = \frac{3}{5}$
14. $\frac{n}{20} = \frac{3}{4}$
15. $\frac{18}{c} = \frac{2}{7}$
16. $\frac{24}{x} = \frac{4}{3}$
17. $\frac{15}{y} = \frac{10}{8}$
18. $\frac{63}{144} = \frac{u}{16}$
19. $\frac{12}{30} = \frac{10}{k}$
20. $\frac{5}{3} = \frac{y}{42}$
21. $\frac{7}{b} = \frac{4}{9}$
22. $\frac{100}{a} = \frac{90}{45}$
23. $\frac{4}{5} = \frac{28}{h}$
24. $\frac{y}{18} = \frac{150}{126}$

Solve.

25. A car travels 150 km on 12 L of gasoline. How many liters of gasoline are needed to travel 500 km?
26. A baseball pitcher strikes out an average of 3.6 batters per 9 innings. At this rate, how many batters would the pitcher strike out in 315 innings?
27. A watch loses 2 minutes every 15 hours. How much time will it lose in 2 hours?
28. A school has a policy that 2 adults must accompany every group of 15 students on school trips. How many adults are needed to take 180 students on a trip?
29. Four shovels of sand are used for every 5 shovels of gravel in making concrete. How much gravel is needed for 64 shovels of sand?
30. The ratio of international students to U.S. students at a college is 2 to 35. How many international students are there if there are 1575 U.S. students?
31. A loading crew estimates that it can load 8 boxes in 20 minutes. At this rate, how many boxes could it load in 1 hour?
32. On a map, 1 cm represents 3.27 km. It is 24.5 cm between two cities on this map. What is the actual distance between the two cities?
33. A television station found that 145 out of the 350 people surveyed watched a special program on education on Monday night. If this survey is representative of the total viewing population (12,250 people), about how many people watched the television special?
34. A survey of 250 people in a city found that Channel 5 is the favorite station of 52 people. If this survey is representative of the city's population of 35,000, about how many people in this city favor Channel 5?

Exercises

1. 1
2. $\frac{7}{2}$
3. $\frac{27}{2}$
4. 3
5. $\frac{18}{5}$
6. 64
7. 25
8. 4
9. $\frac{5}{2}$
10. 32
11. $\frac{55}{9}$
12. $\frac{35}{2}$
13. 24
14. 15
15. 63
16. 18
17. 12
18. 7
19. 25
20. 70
21. $\frac{63}{4}$
22. 50
23. 35
24. $\frac{150}{7}$
25. 40
26. 126
27. $\frac{4}{15}$ minute
28. 24
29. 80
30. 90
31. 24
32. 80.115 km
33. 5075
34. 7280

35. If two out of five people wear red to support the Ohio State football team, then how many in a full Ohio Stadium (capacity 89,841) are wearing red?

In this sample, about 67 of 200 people are wearing red. If there were 85,000 people at this Ohio State game, estimate how many wore red.

B

Solve.

36. An automobile engine crankshaft revolves 3000 times per minute. How long does it take to revolve 50 times?

37. A refrigerator goes on a defrost cycle for 1 hour out of every 14 hours. How many hours is this each week?

38. The ratio of full seats to empty seats in an auditorium is 5 to 2. If there are 120 empty seats, what is the seating capacity of this auditorium?

39. ***Critical Thinking*** $9m = 5n$. Find the ratio $m:n$.

Challenge

40. ***Mathematical Reasoning*** The boy : girl ratio in a school is 4 : 5.
   a. If there are 225 girls, how many students are in the school?
   b. If there are 225 students, how many girls are in the school?

41. ***Mathematical Reasoning*** Alena wants to guess the number of marbles in an 8-gal jar in order to win a moped. She knows there are 128 oz in a gallon, and she finds that 46 marbles fill an 8-oz jar. What should be her guess?

42. ***Critical Thinking*** It takes 12 minutes to cut a log into 4 pieces. How long would it take to cut a log into 8 pieces?

43. A scale model of an experimental airplane measures 2.5 m from wingtip to wingtip. The actual plane will measure 60 m from wingtip to wingtip. If the highest point on the model will just fit under a $\frac{1}{2}$ m workbench, how tall does the airplane hangar doorway have to be?

Mixed Review

Divide. **44.** $\frac{-32}{-8}$ **45.** $-\frac{7}{8} \div \frac{1}{4}$ **46.** $\frac{1}{6} \div -\frac{2}{3}$ *2-6*

Solve. **47.** $9a - 6 = 30 - 3a$ **48.** $17 - 5c = 2c + 3$

49. $-11w = -132$ **50.** $|x| = 15$ **51.** $|c| + 9 = 12$

52. $6|m| = 24$ **53.** $|n| = 0$ **54.** $4(3x - 12) = 12$

55. $\frac{x}{3} + 5 = \frac{3x}{5} - \frac{7}{3}$ **56.** $0.3r - 2.8 = 3.2 - 0.2r$ *3-2, 3-5, 3-6, 3-8*

Solve for the given variable. **57.** $y = mx + b$ for m

58. $PV = nRT$ for T **59.** $I = Prt$ for r *3-7*

Simplify. **60.** $2w - (3w - 1)$ **61.** $2[3x - 2(3x + 4)]$ *2-8*

35. 35,936
Photo caption: 28,475
36. 1 second
37. 12
38. 420
39. 5:9
40. a. 405
    b. 125
41. 5888 marbles
42. 28 minutes
43. 12 meters

Mixed Review

44. 4
45. $-\frac{7}{2}$ or $-3\frac{1}{2}$
46. $-\frac{1}{4}$
47. 3
48. 2
49. 12
50. ± 15
51. ± 3
52. ± 4
53. 0
54. 5
55. $x = \frac{55}{2}$
56. $r = 12$
57. $m = \frac{y - b}{x} = \frac{y}{x} - \frac{b}{x}$
58. $T = \frac{PV}{nR}$
59. $r = \frac{I}{Pt}$
60. $-w + 1$
61. $-6x - 16$

PRACTICE/ASSESS

SSON QUIZ

ite as a decimal.
. 54% 0.54
. 4% 0.04
. 104% 1.04
. 0.3% 0.003

press as a percent.
. $\frac{7}{5}$
$\frac{7}{5} = 1.4 = \frac{140}{100} = 140\%$

lve.
. What number is 40% of 120?
$0.40 \cdot 120 = 48$
. 18 is what percent of 20?
$18 = \frac{p}{100} \cdot 20$
$p = 90$; 90%

Assignment Guide

To provide flexible scheduling, this lesson can be split into parts.

1 Core 1–20
Extension Connections 1, 2 (p.154)

2 Core 21–36
Extension 44, 51

3 Core 37–43, 45–50
Extension 52–54

Use Mixed Review to maintain skills.

Extra Help On the Web

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www.phschool.com

3-10 Exercises

A

Write as a decimal.

1. 41% **2.** 60% **3.** 7% **4.** 1% **5.** 125%
6. 180% **7.** 0.8% **8.** 0.6% **9.** 1.5% **10.** 2.8%

Express as a percent. Round to the nearest tenth of a percent if necessary.

11. $\frac{3}{4}$ **12.** $\frac{1}{25}$ **13.** $\frac{24}{25}$ **14.** $\frac{3}{8}$ **15.** $\frac{1}{3}$

16. $\frac{3}{25}$ **17.** $\frac{5}{8}$ **18.** $\frac{5}{6}$ **19.** $\frac{3}{16}$ **20.** $\frac{1}{20}$

Solve.

21. What percent of 68 is 17?
22. What percent of 75 is 36?
23. What percent of 125 is 30?
24. What percent of 300 is 57?
25. 45 is 30% of what number?
26. 20.4 is 24% of what number?
27. 0.3 is 12% of what number?
28. 7 is 175% of what number?
29. What percent of 80 is 100?
30. What percent of 10 is 205?
31. What is 2% of 40?
32. What is 40% of 2?
33. 2 is what percent of 40?
34. 40 is 2% of what number?
35. 2 is 40% of what number?
36. 40 is what percent of 2?

37. On a test of 88 items, a student got 76 correct. What percent were correct?

38. A softball player had 13 hits in 25 times at bat. What percent of her times at bat resulted in hits?

39. A family spent \$408 one month for food. This was 26% of its income. What was its monthly income?

40. The sales-tax rate in New York City is $8\frac{1}{4}$%. How much city sales tax would be charged on a purchase of \$428.86? What will be the total cost of the purchase?

41. Water volume increases 9% when it freezes. If 400 cm^3 of water are frozen, how much will the volume increase? What will be the volume of the ice?

42. Sales tax in Freeberg is 5%. What would be the sales tax on a motorbike that costs \$775? What would be the total cost for the motorbike, including tax?

43. A salesperson's quota was set at \$7500 for one month. During this month the salesperson sold \$10,000. What percent of the quota is this?

44. ***Write a Convincing Argument*** Which is greater,
a. 50% of 40 or 40% of 50?
b. 20% of 90 or 90% of 20?
c. a% of b or b% of a?

ercises
. 0.41
. 0.6
. 0.07
. 0.01
. 1.25
. 1.8
. 0.008
. 0.006
. 0.015
. 0.028
. 75%
. 4%
. 96%

14. 37.5%
15. 33.3%
16. 12%
17. 62.5%
18. 83.3%
19. 18.8%
20. 5%
21. 25%
22. 48%
23. 24%
24. 19%
25. 150
26. 85
27. 2.5
28. 4
29. 125%
30. 2050%
31. 0.8
32. 0.8
33. 5%
34. 2000
35. 5
36. 2000%
37. 86.4%
38. 52%
39. \$1569.23
40. \$35.38; \$464.24
41. 36 cm^3; 436 cm^3
42. \$38.75; \$813.75
43. 133.3%
44. a. They are equal.
$\frac{50}{100} \cdot 40 = \frac{40}{100} \cdot 50$
b. They are equal.
$\frac{20}{100} \cdot 90 = \frac{90}{100} \cdot 20$
c. They are equal.
$\frac{a}{100} \cdot b = \frac{b}{100} \cdot a$

B

45. A meal came to \$16.41 without tax. Calculate a 6% sales tax, and then calculate a 15% tip based on the sum of the meal and the tax. What is the total cost of the meal?

46. Debby's Discs charges \$12.99 for a CD. DISCount, Inc., charges \$14.95, but you have a \$2.00 DISCount coupon. A sales tax of 7% is charged on the *regular* prices. How much does the CD cost at each store?

To find the **percent of increase** (or **decrease**), divide the amount of increase (or decrease) by the original amount.

47. Wendi worked for \$6 an hour for the first month she was on the job. She was then given a raise to \$6.24 an hour. What was the percent of her wage increase?

48. A car stereo that originally cost \$175 was on sale for \$150. What was the percent of decrease for the car stereo?

49. The dimensions of a rectangular design are 7.5 cm by 12.5 cm. Each is $37\frac{1}{2}\%$ of the original design. What were the original dimensions?

50. The new price of a car is 25% higher than the old price of \$8800. The old price is less than the new price by what percent?

51. ***Critical Thinking*** If x is 160% of y, y is what percent of x?

Challenge

52. A store has a 30% discount on every item in stock. By how much is the 5% sales tax reduced on an item that regularly sells for \$10?

53. A bank offered two plans for a two-year investment. One was 5% the first year and 10% the second year. The other was 10% the first year and 5% the second year. Which investment plan was better?

54. ***Write a Convincing Argument*** Here are seven different discount plans. List them in order from best to worst. Justify your listing.

successive discounts of 10%, 10%, 10%, 10%; of 10%, 10%, 20%
of 20%, 10%, 10%; of 10%, 30%;
of 30%, 10%; of 20%, 20%;
of 40% (one discount only)

Mixed Review

Give the additive inverse. **55.** 4.1 **56.** -9 **57.** 16 *2-3*

Simplify. **58.** $-4 - (-2x) + 6x + x + 9$ **59.** $8c + 8 - (-2c)$

60. $-6 + 5x - (-2x) - 4x$ **61.** $2t - (-13) - 3t - (-6t) - 19$ *2-8*

Calculate. **62.** $-6(3.4)(-1)$ **63.** $-3.2(0)$ **64.** $-2(-8)(-2)$

65. $99 \div (-3)$ **66.** $-72 \div 3$ **67.** $45 \div (-15)$ *2-5, 2-6*

45. \$20
46. \$13.90, \$14.00
47. 4%
48. 14.3%
49. 20 cm by 33.3 cm
50. 20%
51. 62.5%
52. \$0.15
53. Equal. Both earn \$15.50 interest on \$100 over two years.
54.

Plan	Of original price
40%;	pay 60%
30%, 10%;	pay 63%
10%, 30%;	pay 63%
20%, 20%;	pay 64%
20%, 10%, 10%;	pay 64.8%
10%, 10%, 20%;	pay 64.8%
10%, 10%, 10%, 10%;	pay 65.6%

Mixed Review

55. -4.1
56. 9
57. -16
58. $9x + 5$
59. $10c + 8$
60. $3x - 6$
61. $5t - 6$
62. 20.4
63. 0
64. -32
65. -33
66. -24
67. -3

RACTICE/ASSESS

ON QUIZ

ıe height of a table is 1.5 times the eight of the seat of a chair. Write an pression for the difference between ıe height of the table and the height the chair.
t c be the height of the chair.
$1.5c - c$ or $0.5c$

rite an expression for the sum of an teger plus twice the next integer.
t n be the integer.
$n + 2(n + 1)$ or $3n + 2$

you add one fifth of a number to ıat number you get 42. What is the ımber?
t n be the number.
$n + n = 42$
$\frac{6}{5}n = 42$
$n = \frac{5}{6} \cdot 42 = 35$

ssignment Guide

o provide flexible scheduling, this sson can be split into parts.
Core 1–11
Extension 12–14
Core 15–20, 22–37, 40
Extension 21, 38, 39, 41, 42

se Mixed Review to maintain skills.

Try This Solve.

c. The perimeter of a rectangle is 150 cm. The length is 15 cm greater than the width. Find the dimensions.

d. The sum of an integer and twice the next consecutive integer is 29. What are the integers?

e. Mrs. Lee deposited a sum of money in a savings account that pays 4% interest per year. At the end of one year, Mrs. Lee had a total of $9620 in the account. How much did she invest originally?

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

3-11 Exercises

A

1. A CD costs $3.50 more than a tape. Write an expression for the total cost of 1 CD and 1 tape.

2. The second math test was worth half as many points as the first test. Write an expression for the total number of points on the 2 tests.

3. There are 9 fewer math books than English books. Write an expression for the total number of books.

4. There are 12 more history books than science books. Write an expression for the total number of books.

5. A hardback book cost $7 more than a paperback book. Write an expression for the total cost of 1 paperback book and 3 hardback books.

6. A large drink costs 50¢ more than a small drink. Write an expression for the total cost of 3 small drinks and 2 large drinks.

Write an expression for each of the following.

7. the sum of an even integer and the next even integer

8. the sum of an odd integer and the next odd integer

9. the sum of an even integer and two times the next even integer

10. the sum of an integer and three times the next integer

11. the sum of an even integer and the next two even integers

12. the sum of $\frac{1}{4}$ of an integer, $\frac{1}{5}$ of the next integer, and $\frac{1}{2}$ of the following integer

13. the sum of an even integer, $\frac{1}{2}$ of the next even integer, and $\frac{1}{4}$ of the following even integer

14. the sum of an odd integer, $\frac{3}{4}$ of the next odd integer, and two times the following odd integer

Solve.

15. The sum of a number and $\frac{2}{5}$ of itself is 56. What is the number?

16. If you add one third of a number to the number itself, you get 48. What is the number?

Try This

c. Width is 30 cm; length is 45 cm
d. 9, 10
e. $9250

Exercises

Answers may vary depending on which quantity the variable represents.

1. Let c = cost of one CD.
$c + (c - 3.50)$ or $2c - 3.50$
Let t = cost of one tape.
$t + (t + 3.50)$ or $2t + 3.50$

2. Let t = points on first test.
$t + \frac{1}{2}t$ or $\frac{3}{2}t$
Let s = points on second test.
$s + 2s$ or $3s$

3. Let e = number of English books.
$e + (e - 9)$ or $2e - 9$
Let m = number of math books.
$m + (m + 9)$ or $2m + 9$

4. Let s = number of science books.
$s + (s + 12)$ or $2s + 12$
Let h = number of history books.
$h + (h - 12)$ or $2h - 12$

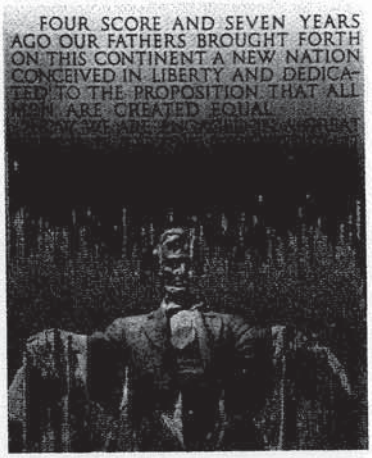
5. Let p = cost of paperback book.
$p + 3(p + 7)$ or $4p + 21$
Let h = cost of hardback book.
$3h + (h - 7)$ or $4h - 7$

6. Let s = cost of small drink.
$3s + 2(s + 50)$ or $5s + 100$
Let l = cost of large drink.
$2l + 3(l - 50)$ or $5l - 150$

7. $x + (x + 2) = 2x + 2$

8. $x + (x + 2) = 2x + 2$

17. The sum of two consecutive odd integers is 76. What are the integers?
18. The sum of two consecutive even integers is 106. What are the integers?
19. The sum of three consecutive integers is 126. What are the integers?
20. The sum of three consecutive odd integers is 189. What are the integers?
21. ***Critical Thinking*** Redo Exercise 19. Let x be the second of the three consecutive integers. Then redo Exercise 20 using a similar procedure.
22. The perimeter of a rectangle is 310 m. The length is 25 m greater than the width. What are the length and the width of this rectangle?
23. One angle of a triangle is 4 times as large as another. The third angle is equal to the sum of the other two angles. What is the measure of the smallest angle? (Hint: The sum of the measures of the angles of a triangle is 180°.)
24. ***Critical Thinking*** Abraham Lincoln's 1863 Gettysburg Address refers to the year 1776 as "four score and seven years ago." Write an equation and solve for a score.
25. The combined lengths of the Nile and Amazon rivers is 13,108 km. If the Amazon were 234 km longer, it would be as long as the Nile. What is the length of each river?
26. In 1999, tennis-playing sisters Venus and Serena Williams earned a total of $4,921,107. If Venus had earned $289,097 more, she would have earned the same as Serena. How much did each earn?
27. A 48-ft wire is cut into three pieces. The second piece is three times as long as the first piece. The third piece is four times as long as the second piece. How long is each piece?
28. Mrs. Gutierrez borrowed some money. At the end of the year, she repaid the loan plus 10.5% of the original amount for interest. She paid back a total of $8287.50. How much money did she borrow originally?
29. Mr. Horvath put some money into a savings account and deposited no more into this account for one year. At the end of the year, there was $6272 in the account, including 6% of the original amount for interest. How much did he deposit originally?
30. After a 20% discount, an item was sold for $9600. What was the original price of the item?
31. The population of the United States in 1998 was estimated to be 270 million. This was a 79% increase over the population in 1950. What was the population in 1950, to the nearest million?
32. The number of students, ages 5 to 17 years, enrolled in school in 1970 was 45.6 million. The number enrolled in 1995 was 3.3% less than in 1970.
    a. How many students were enrolled in 1995?
    b. Can you tell which year had the greater percentage of students in this age group in school? Explain.



How many score years ago did Lincoln give his Gettysburg Address? (See Exercise 24.)

9. $x + 2(x + 2) = 3x + 4$
10. $x + 3(x + 1) = 4x + 3$
11. $x + (x + 2) + (x + 4) = 3x + 6$
12. $\frac{1}{4}x + \frac{1}{5}(x + 1) + \frac{1}{2}(x + 2) = \frac{19}{20}x + \frac{6}{5}$
13. $x + \frac{1}{2}(x + 2) + \frac{1}{4}(x + 4) = \frac{7}{4}x + 2$
14. $x + \frac{3}{4}(x + 2) + 2(x + 4) = \frac{15}{4}x + \frac{19}{2}$
15. 40
16. 36
17. 37, 39
18. 52, 54
19. 41, 42, 43
20. 61, 63, 65
21. 41, 42, 43; 61, 63, 65
22. 65 m, 90 m
23. 18°
24. $4s + 7 = 1863 - 1776$; $s = 20$

Photo caption: 7 score years in 2003

25. Amazon 6437 km, Nile 6671 km
26. Venus $2,316,005; Serena $2,605,102
27. 3 ft, 9 ft, 36 ft
28. $7500
29. $5916.98
30. $12,000
31. 151 million
32. a. 44.1 million
    b. No; you need to know the total number of students in this age group.

B

33. One number is 25% of another. The larger number is 12 more than the smaller. Both numbers are positive. What are the numbers?

34. If the daily rental for a car is \$38.90, and a person must drive 190 miles and stay within a \$100.00 budget, what is the highest price per mile the person can afford?

35. Jane scored 78 on a test that had 4 seven-point fill-ins and 24 three-point multiple-choice questions. She had one fill-in wrong. How many multiple-choice answers did she get right?

36. The width of a rectangle is $\frac{3}{4}$ the length. The perimeter of the rectangle becomes 50 cm when the length and width are each increased by 2 cm. Find the length and width.

37. Phone charges are \$13.72 per month plus 13¢ per call and 8¢ per minute. How much did it cost one month for 35 calls totaling 172 minutes?

Challenge

38. In a basketball league, the Falcons won 15 of their first 20 games. If they win only half the time from now on, how many more games will they have to play in order to win 60% of the total games?

39. ***Error Analysis*** In one city, a city sales tax of 9% was added to the gasoline price registered on the pump. What, if anything, is wrong with each scenario?

a. At one station, a driver asked for \$10 worth. The attendant filled the tank until the pump read \$9.10 and charged the driver \$10.00.

b. On Tuesdays, this gas station gives 9% off the total cost to the customer. On one Tuesday, the attendant simply collected the amount that registered on the pump.

40. The buyer of a piano priced at \$2000 is given the choice of paying cash at the time of purchase or \$2150 at the end of one year. What rate of interest is being charged if payment is made at the end of one year?

41. If you receive 7% interest on savings, but 20% tax is charged on the interest, how much do you have left from an initial \$1000 deposit?

42. A storekeeper goes to the bank to get \$10 worth of change. He requests twice as many quarters as half dollars, twice as many dimes as quarters, three times as many nickels as dimes, and no pennies or dollars. How many of each coin did the storekeeper get?

Mixed Review

Solve. **43.** $7x = 10$ **44.** $7a - 9a = 6$ **45.** $-8w + 13w = 45$

46. $8c + 6 = 6c + 10$ **47.** $15 - (5m - 6) = 1$ **48.** $\frac{3}{4}b = 9$ *3-2, 3-5*

Solve. **49.** $\frac{3}{4}a - 6 = 3 + \frac{1}{2}a$ **50.** $\frac{3}{5}y + 2 = \frac{1}{2}y$ *3-5, 3-6*

Exercises

33. 4, 16
34. 32¢
35. 19
36. 12 cm, 9 cm
37. \$32.03
38. 30
39. a. The driver owed only $9.10 + (0.09)(9.10) \approx \$9.92$.
    b. If the pump registered \$10, the driver owed $10 + (0.09)10 = \$10.90$, less the 9% discount, or $10.90 - (0.09)(10.90) = \$9.92$.
40. 7.5%
41. \$1056
42. 5 half dollars, 10 quarters, 20 dimes, 60 nickels

Mixed Review

43. $\frac{10}{7}$
44. -3
45. 9
46. 2
47. 4
48. 12
49. 36
50. -20

3 Chapter Wrap Up

3-1

To solve an equation using the **addition property of equality,** you add the same number to both sides of the equation.

Solve.

1. $x + 12 = -8$
2. $-7 = y - 11$
3. $x - 11 = 14$
4. $w + \frac{3}{7} = -\frac{5}{7}$

Translate to an equation and solve.

5. A color TV sold for \$629 in May. This was \$38 more than the price in January. Find the January price.
6. In La Ciudad Fría the average daily high temperature in the winter is −65°F. This is 150° less than the average daily high temperature in Ciudad Caliente. What is the average daily high temperature in Ciudad Caliente in the winter?

3-2

To solve an equation using the **multiplication property of equality,** you multiply both sides of the equation by the same nonzero number.

Solve.

7. $6x = 24$
8. $-\frac{x}{4} = 48$
9. $\frac{3}{5} = \frac{-2}{5}x$
10. $-11x = 121$

Translate to an equation and solve.

11. Rosita gets a \$4 commission for each small appliance that she sells. One week she got \$108 in commissions. How many small appliances did she sell?

3-3

To solve an equation, you may need to use both the addition and multiplication properties of equality. Collect like terms on each side of the equation before using the properties. You may need to use the distributive property to remove parentheses before collecting like terms.

Solve and check.

12. $2x + 5 = 13$
13. $-8x + 3 = 27$
14. $50 - 4x = 14$
15. $7x + 8x = 45$
16. $4(3y + 2) = 44$
17. $6(3a - 2) + 5a = 57$

Key Terms

addition property of equality (p. 114)
identity (p. 138)
multiplication property of equality (p. 119)
percent (p. 152)
percent of decrease (p. 157)
percent of increase (p. 157)
proportion (p. 148)
ratio (p. 148)

Chapter 3 Wrap Up

1. −20
2. 4
3. 25
4. $-\frac{8}{7}$
5. \$591
6. 85°
7. 4
8. −192
9. $-\frac{3}{2}$
10. −11
11. 27
12. 4
13. −3
14. 9
15. 3
16. 3
17. 3

Internet Activity On the Web

Look for extension problems for this chapter at the Prentice Hall Web site.
www.phschool.com

3-4

Use the Problem-Solving Guidelines to help you understand a problem, write an equation, and check your solution.

Write as an algebraic expression.

18. 6 more than twice a number

19. 18 less than the product of 5 and a number

20. 6 less than $\frac{1}{3}$ of the number

21. $\frac{1}{2}$ of the sum of a number and 10

22. Betsy swims every day. She swam 3 fewer laps today than twice the number of laps she swam yesterday. Write an expression for the number of laps she swam today.

23. After 8 weeks at the exercise club, Nadia could lift 10 pounds more than twice what she could lift before joining the club. Write an expression for the weight Nadia could lift after 8 weeks at the club.

24. The number of girls in the swim club is 5 less than twice the number of boys. There are 75 girls in the club. How many boys are in the club?

25. Chris has ridden her bike 10 miles. She averages 12 mi/h. How many more minutes must she ride before she has traveled 60 miles?

26. If the Menlo High football team scored 4 more points in Friday night's game, they would have tripled the score of Woodside High. Woodside scored 14 points. How many points did Menlo score?

3-5

To solve an equation, you must get all variable terms on the same side of the equation. If the equation contains parentheses, you may need to use the distributive property first. An **identity** is an equation that is true for all acceptable replacements of the variables.

Solve.

27. $6x - 5 = -2x + 11$

28. $3y - 6 - 7y = 12 - 2y + 6$

29. $4(x + 3) = 36$

30. $8(x - 2) = 5(x + 4)$

31. $x + 7 - 2 = 5 + x$

32. $2(x + 3) - 3x = 5 - x + 1$

3-6

To clear an equation of fractions, multiply both sides of the equation by the least common denominator. To clear an equation of decimals, multiply both sides of the equation by a power of 10.

Solve.

33. $\frac{3}{4}x + \frac{1}{2}x + \frac{1}{4} = 1 + 2x$

34. $12.21 - 4.3a = 24.25$

35. $\frac{4}{9}y - \frac{4}{3} = \frac{1}{6}y + \frac{11}{18}$

36. $0.83w + 0.29 = 0.5w - 0.7$

Chapter 3 Wrap Up

18. $2n + 6$
19. $5n - 18$
20. $\frac{1}{3}n - 6$
21. $\frac{1}{2}(n + 10)$
22. $2n - 3$
23. $2x + 10$
24. 40
25. 4 h 10 min or 250 min
26. 38
27. 2
28. -12
29. 6
30. 12
31. true for all values of x; an identity
32. true for all values of x; an identity
33. -1
34. -2.8
35. 7
36. -3

3-7

To solve a formula for a given variable, use the same rules you use to solve equations.

Solve.

37. $V = Bh$ for h

38. $b = \frac{3A}{r}$ for A

39. $P = 2x + 2w$ for x

40. $V = \frac{1}{3}Ar$ for A

3-8

To solve an equation involving absolute value, remember that the absolute value of a number is its distance from 0 on a number line. If $|a| = 3$, then $a = 3$ or -3.

Solve.

41. $|x| = 5$

42. $|x| - 4 = 6$

43. $-9 + 3|y| = 24$

3-9

An equation that states two **ratios** are equal is called a **proportion.** Some problems can be solved by writing and solving a proportion.

Solve.

44. $\frac{b}{42} = \frac{6}{7}$

45. $\frac{45}{15} = \frac{30}{x}$

Translate to a proportion and solve.

46. The winner of an election for class president won by a vote of 3 to 2, having received 324 votes. How many votes did the other candidates get?

47. A student traveled 234 km in 14 days. At this rate, how far would the student travel in 42 days?

3-10

The ratio of a number to 100 is called **percent.** When solving problems involving percent, the percent should be expressed as a fraction or a decimal. To find the **percent of increase** (or **decrease**), divide the amount of increase (or decrease) by the original amount.

Write as a decimal.

48. 48%

49. 7%

50. 150%

Express as a percent. Round to the nearest tenth if necessary.

51. $\frac{1}{3}$

52. $\frac{7}{8}$

53. 0.012

Solve.

54. 60 is what percent of 150?

55. 75% of what number is 187.5?

56. Sales tax in a certain city is 6.5% of the cost. What would the sales tax be on a motorcycle that costs $850?

57. A Shea CD player cost $80 last year and $112 this year. What was the percent of increase in its price?

37. $h = \frac{V}{B}$
38. $A = \frac{br}{3}$
39. $x = \frac{P - 2w}{2}$
40. $A = \frac{3V}{r}$
41. 5, −5
42. 10, −10
43. 11, −11
44. 36
45. 10
46. 216
47. 702 km
48. 0.48
49. 0.07
50. 1.5
51. 33.3%
52. 87.5%
53. 1.2%
54. 40%
55. 250
56. $55.25
57. 40%

nent Item Analysis

Lesson
3-1
3-2
3-3
3-5
3-6
3-8
3-4
3-7
3-9
3-10
3-11

3-11

To solve a problem with more than one unknown quantity, you may be able to represent all of the unknown quantities in terms of one variable. First decide which unknown quantity the variable will represent.

58. An adult's ticket to the movie theater costs twice as much as a child's ticket. Write an expression for the cost of admission for one child and one adult.

59. Write an expression for the sum of two consecutive even integers.

Translate to an equation and solve.

60. The sum of two consecutive odd integers is 116. Find the integers.

61. The perimeter of a rectangle is 56 cm. The width is 6 cm less than the length. Find the width and the length.

3 Chapter Assessment

Solve.

1. $x + 7 = 15$

2. $t - 9 = 17$

3. $3x = -18$

4. $-7x = -28$

5. $-\frac{x}{8} = 5$

6. $-\frac{2}{3}y = -\frac{4}{15}$

7. $8a + 11 = 35$

8. $-4y + 7 = -21$

9. $3(x + 2) = 27$

10. $45 - 3x = 30$

11. $3t + 7 = 2t - 5$

12. $-3x + 6(x + 4) = 9$

13. $0.51m + 0.03 = 0.4m - 0.74$

14. $\frac{1}{2}x - \frac{3}{5} = \frac{1}{10} + \frac{3}{10}$

15. $|x| + 3 = 8$

16. $2|y| - 4 = 8$

Write as an algebraic expression.

17. the number of days in x weeks

18. fifteen decreased by four times a number

19. the sum of two consecutive integers

20. two less than one fifth of a number

Solve the formulas for the given variable.

21. $A = 2\pi rh$ for r

22. $b = \frac{2A}{h}$ for A

23. $P = 2x + 2w$ for x

24. $V = \frac{1}{3}Ar$ for r

Chapter 3 Wrap Up

58. $2x + x = 3x$
59. $x + x + 2 = 2x + 2$
60. 57, 59
61. 11 cm, 17 cm

Chapter 3 Assessment

1. 8
2. 26
3. -6
4. 4
5. -40
6. $\frac{2}{5}$
7. 3
8. 7
9. 7
10. 5
11. -12
12. -5
13. -7
14. 2
15. 5, -5
16. 6, -6
17. $7x$
18. $15 - 4n$
19. $2x + 1$
20. $\frac{1}{5}x - 2$
21. $r = \frac{A}{2\pi h}$
22. $A = \frac{bh}{2}$
23. $x = \frac{P - 2w}{2}$
24. $r = \frac{3V}{A}$

Solve.

25. $\frac{16}{3} = \frac{c}{12}$ **26.** $\frac{21}{x} = \frac{105}{5}$

Translate to a proportion and solve.

27. A sample of 184 light bulbs contained 6 defective bulbs. At this rate, how many defective bulbs would you expect to find in a sample of 1288 light bulbs?

28. In traveling 350 miles, Raul used 21 gallons of gas. How many gallons of gas would Raul use on a trip of 525 miles if his car consumed gas at the same rate?

Write as a decimal.

29. 89% **30.** 3% **31.** 200%

Express as a percent. Round off to the nearest tenth of a percent if necessary.

32. $\frac{2}{5}$ **33.** $\frac{2}{3}$

Solve.

34. 96 is what percent of 150?

35. 90% of what number is 45?

36. 87.5% of 200 is what number?

37. A family spends \$660 a month for rent. This is 30% of the family's monthly income. What is their monthly income?

Translate to an equation and solve.

38. Jim scored 22 points in a basketball game. That was six points more than Frank scored. How many points did Frank score?

39. A carpenter worked on a job for 5 days and earned \$440. How much did he earn per day?

40. Marisa and Lisa earned a total of \$65 babysitting during the month of November. Marisa earned \$5 more than $\frac{1}{2}$ of what Lisa earned. How much did they each earn?

41. The perimeter of a rectangle is 36 cm. The length is 4 cm greater than the width. Find the width and length.

42. Money is invested in a "guaranteed fund" at 12% simple interest. After one year, there is \$840 in the account. How much was originally invested?

25. 64
26. 1
27. 42 defective bulbs
28. 31.5 gallons
29. 0.89
30. 0.03
31. 2.00 or 2
32. 40%
33. 66.7%
34. 64%
35. 50
36. 175
37. \$2200
38. 16
39. \$88
40. Lisa \$40, Marisa \$25
41. 7 cm, 11 cm
42. \$750