Chapter 1: Equations and Inequalities

Section 1.1 Linear and Absolute Value Equations

Linear Equations

Solve.

1. $3x - 5 = x + 9$ (a) $\frac{1}{7}$ (b) -7 (c) $-\frac{1}{7}$ (d) 7

2. $-\frac{8}{7}x = 7$ (a) 0 (b) -8 (c) $-\frac{49}{8}$ (d) $\frac{1}{7}$

3. $x + \frac{2}{11} = \frac{5}{8}$ (a) $\frac{3}{88}$ (b) $\frac{39}{88}$ (c) $\frac{39}{8}$ (d) $\frac{39}{11}$

4. $1 = 3(x-1) + 2 - 2x$ (a) 0 (b) 6 (c) 2 (d) 4

Contradictions, Conditional Equations, and Identities

5. Which of the following equations is not an identity?

(a) $\frac{5x-15}{5} = x - 3$ (b) $5(2x-3) - x = 9x - 15$ (c) $5x + 2 = -3$ (d) All of the above are identities

6. Which of the following equations is an identity?

(a) $4(x-2) = 4x - 8$ (b) $4(x-2) = 8 - 4x$ (c) $4(x-2) = 4x - 2$ (d) $4(x-2) = x - 8$

7. Which of the following equations is not a conditional equation?

(a) $-3x + 8(x+5) = 5x + 5$ (b) $-15x + 5 = -3(x+8) + 8x$ (c) $-15x - 3 = 8(x+5)$

(d) $-3x + 5 = 5 + 5x$ (e) None of these

8. Find the values of a and c that make the equation an identity.
$9x - 12 = 3(ax + c) - 6x$

(a) $a = -5,\ c = -13$ (b) $a = 5,\ c = -4$ (c) $a = 12,\ c = -12$ (d) $a = 12,\ c = -4$ (e) None of these

Absolute Value Equations

Solve.

9. $|3x - 1| = 2$ (a) $\frac{4}{3}, \frac{2}{3}$ (b) $1, -\frac{1}{3}$ (c) $-\frac{4}{3}, \frac{2}{3}$ (d) $-1, -\frac{1}{3}$

10. $\left|\frac{5}{3}x + 7\right| + 3 = 13$ (a) $\frac{69}{5}, \frac{51}{5}$ (b) $\frac{9}{5}, -\frac{51}{5}$ (c) $\frac{51}{5}, -\frac{85}{3}$ (d) $5, -\frac{69}{5}$

11. $|4x + 4| = 3$ (a) $-\frac{7}{4}, -\frac{1}{4}$ (b) $-\frac{7}{4}, \frac{7}{4}$ (c) $\frac{3}{2}, \frac{7}{4}$ (d) $-\frac{7}{4}, \frac{1}{4}$

12. What is the solution to the equation $2|x|+1=10$?

(a) $x=\pm 6$ (b) $x=\pm 6\frac{1}{2}$ (c) $x=\pm 5\frac{1}{2}$ (d) $x=\pm 4\frac{1}{2}$

Applications

13. The formula

$$C=\frac{5}{9}(F-32)$$

is used to convert degrees Fahrenheit, F, to degrees Celsius, C. Convert $-1°C$ to degrees Fahrenheit.

(a) $55.8°F$ (b) $-37.0°F$ (c) $30.2°F$ (d) $-18.3°F$

14. Use the formula $d=rt$, where d is the distance, r is the rate of speed, and t is the time, to find how long it would take to travel a distance of 200 miles at a speed of 50 miles per hour.

(a) 4 hr (b) 7 hr (c) 5 hr (d) 16 hr

15. The sum of the angles in a convex polygon can be determined by the formula

$$D=180(n-2)$$

where D is the total number of degrees in the angles of a convex polygon with n sides. If a convex polygon's angles have a sum of 720°, find the number of sides in the polygon.

(a) 7 (b) 4 (c) 6 (d) 8 (e) None of these

16. The charge for mailing a fourth-class package through the U.S. Postal Service is

$$C=0.05x+2.57$$

where C is the charge in dollars and x is the weight of the package in pounds.
(a) Find the charge to mail a package that weighs 10 pounds.
(b) How many pounds can be mailed for $2.97?

(a) (a) \$0.40 (b) 10 lb (b) (a) \$2.92 (b) 7 lb (c) (a) \$3.07 (b) 8 lb (d) (a) \$3.07 (b) 9 lb

Section 1.2 Formulas and Applications

Formulas

Solve the formula for the given variable.

17. $V=\pi r^2 h$ for h (a) $\pi h=Vr^2$ (b) $h=\frac{V}{\pi r^2}$ (c) $h=V-\pi r^2$ (d) none of these

18. $W=p(V_2-V_1)$ for p (a) $p=\frac{W}{V_2-V_1}$ (b) $pW=V_2-V_1$ (c) $p=\frac{W}{V_2}+V_1$ (d) $p=W(V_2-V_1)$

19. $M=\frac{mRT}{PV}$ for R (a) $R=MPV-mT$ (b) $R=\frac{MPV}{mT}$ (c) $R=\frac{mT}{MPV}$ (d) $R=\frac{MmT}{PV}$

20. Solve the equation $A=\frac{1}{2}h(b+c)$ for c.

(a) $c=\frac{A}{b+c}$ (b) $c=\frac{h}{2}A-c$ (c) $c=\frac{2}{A}h+b$ (d) $c=\frac{2}{h}A-b$

Applications

21. The perimeter of a triangle is 60 centimeters. One side is 6 centimeters shorter than the second side. The third side is 6 centimeters shorter than triple the length of the first side. Find the length of each side.

(a) 12 cm, 12 cm, 12 cm (b) 6 cm, 12 cm, 35 cm (c) 12 cm, 18 cm, 30 cm (d) 6 cm, 12 cm, 42 cm

22. Jacob has \$6.00 in dimes and quarters. He has twice as many quarters as dimes. How many of each coin does he have?

(a) 10 dimes and 20 quarters (b) 8 dimes and 56 quarters

(c) 8 dimes and 16 quarters (d) 20 dimes and 10 quarters

23. The daily cost of renting a car is \$30 plus \$0.40 per mile. If Jane paid \$115.60 for a 1-day rental, how many miles did Jane travel?

(a) 364 (b) 289 (c) 86 (d) 214

24. The sum of three consecutive odd integers is 399. What is the largest of the three integers?

(a) 133 (b) 134 (c) 135 (d) None of these

Section 1.3 Quadratic Equations

Solve Quadratic Equations by Factoring

Solve by factoring.

25. $x^2 - x = 20$ (a) $-5,\ 4$ (b) $5,\ 4$ (c) $-5,\ -4$ (d) $5,\ -4$

26. $2x^2 + 13x + 15 = 0$ (a) $\frac{3}{2},\ -5$ (b) $-\frac{3}{2},\ 5$ (c) $\frac{3}{2},\ 5$ (d) $-\frac{3}{2},\ -5$

27. $x^2 - 5x - 6 = 0$ (a) $1, -6$ (b) $6, -1$ (c) $2, -3$ (d) $3, -2$

28. Solve. $\frac{x^2}{2} + \frac{x}{4} = \frac{3}{2}$ (a) $-\frac{3}{2},\ 2$ (b) $-\frac{2}{3},\ \frac{1}{2}$ (c) $\frac{2}{3},\ -\frac{1}{2}$ (d) $\frac{3}{2},\ -2$

Solve Quadratic Equations by Taking Square Roots

29. Solve. $x^2 - 50 = 0$ (a) $5\sqrt{2}$ (b) $-5\sqrt{2},\ 5\sqrt{2}$ (c) $-25,\ 25$ (d) $-2\sqrt{5},\ 2\sqrt{5}$

30. Solve by taking the square root. $9x^2 = 900$ (a) $\pm\sqrt{8100}$ (b) ± 90 (c) ± 10 (d) $\pm\sqrt{891}$

31. Solve. $5x^2 = 64$ (a) $-\frac{5\sqrt{8}}{8},\ \frac{5\sqrt{8}}{8}$ (b) $\frac{8\sqrt{5}}{5}$ (c) $-\frac{8\sqrt{5}}{5},\ \frac{8\sqrt{5}}{5}$ (d) $\frac{8}{5}$

32. Solve by extracting square roots.

$4(x+4)^2 - 108 = 0$

(a) $-4 \pm 3\sqrt{3}$ (b) $-4 \pm 9\sqrt{27}$ (c) $-4 \pm 9\sqrt{3}$ (d) $4 \pm 3\sqrt{3}$

Solve Quadratic Equations by Completing the Square

33. Solve by completing the square. $-9x = 5x^2 - 1$

(a) $\frac{-9 \pm \sqrt{101}}{10}$ (b) $\frac{9 \pm \sqrt{101}}{10}$ (c) $\frac{-9 \pm \sqrt{61}}{10}$ (d) $\frac{9 \pm \sqrt{61}}{10}$

Solve by completing the square.

34. $4x^2 - 6x - 6 = 0$

(a) $\frac{3+2\sqrt{33}}{4}, \frac{3-2\sqrt{33}}{4}$ (b) $\frac{3+\sqrt{33}}{4}, \frac{3-\sqrt{33}}{4}$

(c) $\frac{-3+2\sqrt{33}}{4}, \frac{-3-2\sqrt{33}}{4}$ (d) $\frac{-3+\sqrt{33}}{4}, \frac{-3-\sqrt{33}}{4}$

35. $-9x^2 - 90x = 18$

(a) $5+\sqrt{23}, 5-\sqrt{23}$ (b) $5+3\sqrt{3}, 5-3\sqrt{3}$ (c) $-5+3\sqrt{3}, -5-3\sqrt{3}$ (d) $-5+\sqrt{23}, -5-\sqrt{23}$

36. Solve by completing the square. $x^2 + 8x - 20 = 0$

(a) –8, 20 (b) 10, –2 (c) 8, –20 (d) –10, 2

Solve Quadratic Equations by Using the Quadratic Formula

Solve using the quadratic formula.

37. $2x^2 + 1 = 5x$

(a) $\frac{5+\sqrt{33}}{4}, \frac{5-\sqrt{33}}{4}$ (b) $\frac{5+\sqrt{17}}{4}, \frac{5-\sqrt{17}}{4}$ (c) $\frac{-5+\sqrt{33}}{4}, \frac{-5-\sqrt{33}}{4}$ (d) $\frac{-5+\sqrt{17}}{4}, \frac{-5-\sqrt{17}}{4}$

38. $4x^2 - 4x - 5 = 0$

(a) $\frac{-1+2\sqrt{6}}{2}, \frac{-1-2\sqrt{6}}{2}$ (b) $\frac{-1+\sqrt{6}}{2}, \frac{-1-\sqrt{6}}{2}$ (c) $\frac{1+\sqrt{6}}{2}, \frac{1-\sqrt{6}}{2}$ (d) $\frac{1+2\sqrt{6}}{2}, \frac{1-2\sqrt{6}}{2}$

39. Use the Quadratic Formula to solve. $2x^2 - 1 = 7x$

(a) $\frac{-7 \pm \sqrt{41}}{4}$ (b) $\frac{7 \pm \sqrt{57}}{4}$ (c) $\frac{-7 \pm \sqrt{57}}{4}$ (d) $\frac{7 \pm \sqrt{41}}{4}$

40. Solve using the Quadratic Formula. $5x^2 + 9x = -11$

(a) $\frac{9 \pm \sqrt{139}i}{10}$ (b) $\frac{-9 \pm \sqrt{301}i}{10}$ (c) $\frac{9 \pm \sqrt{301}i}{10}$ (d) $\frac{-9 \pm \sqrt{139}i}{10}$

The Discriminant of a Quadratic Equation

41. Determine the nature of the roots: $2x^2 + 4x - 5 = 0$.

(a) Two equal real roots (b) No real roots (c) Two distinct real roots (d) Cannot be determined

42. Determine the number of real solutions of the equation. $3x^2 + 6x + 3 = 0$

(a) 3 (b) 0 (c) 1 (d) 2

43. Which of the following is the discriminant and the nature of the roots for $2x^2 + 4x + 2 = 0$?

(a) The discriminant is 0 and there are no real roots.
(b) The discriminant is 32 and there are two real roots.
(c) The discriminant is 0 and there is one real root.
(d) The discriminant is 32 and there is one real root.

44. Determine the number and nature of the roots of the equation. $4x^2 - 3x + 1 = 0$

(a) one real root and one imaginary root (b) one real root (c) two imaginary roots (d) two real roots

Applications of Quadratic Equations

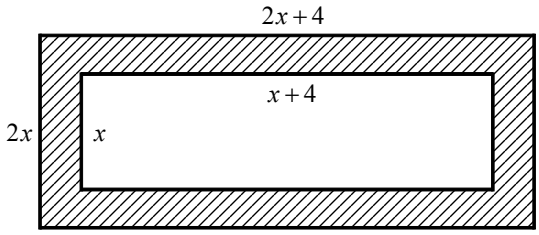
45. The width of a rectangular carpet is 3 feet less than its length. If the area of the carpet is 70 square feet, find its width.

(a) 7 ft (b) 18 ft (c) 10 ft (d) 6 ft

46. One integer is eight more than three times another. If the product of the integers is 35, find the two integers.

(a) –5 and –7 (b) 5 and –7 (c) –5 and 7 (d) 5 and 7

47. A sidewalk was built around a rectangular garden. If the area of the sidewalk is 224 m^2, find x. (Note: Figure not drawn to scale.)



(a) 7 m (b) 8 m (c) 4 m (d) 6 m

48. The length of a rectangle is 7 cm less than three times its width. If the area is 40 cm^2, find the dimensions of the rectangle.

(a) $8 \text{ cm} \times 5 \text{ cm}$ (b) $8 \text{ cm} \times 6 \text{ cm}$ (c) $47 \text{ cm} \times 33 \text{ cm}$ (d) $280 \text{ cm} \times 6 \text{ cm}$

Section 1.4 Other Types of Equations

Polynomial Equations

49. Solve. $x^3 + x^2 - 16x - 16 = 0$ (a) $\pm 4, 1$ (b) $-1, 16$ (c) $\pm 4, -1$ (d) $1, 4$

50. Solve by factoring. $4x(3x^2 + 11x + 8) = 0$ (a) $-\frac{8}{3}$ (b) $-1, -\frac{8}{3}$ (c) 0 (d) $0, -1, -\frac{8}{3}$

51. Solve the polynomial equation by factoring.
$5x^3 - 10x^2 = 75x$

(a) $-4, 0, 2$ (b) $-5, 0, 3$ (c) $-3, 0, 5$ (d) $-2, 0, 4$

52. Solve: $6x^4 - 216x^2 = 0$ (a) $0, \pm 36$ (b) $\pm\sqrt{1296}$ (c) $0, \pm 6$ (d) $\pm\sqrt{210}$

Rational Equations

Solve the equation.

53. $-\frac{1}{k}-3=-\frac{2}{3}$ (a) $\frac{2}{5}$ (b) $-\frac{3}{7}$ (c) $2\frac{1}{2}$ (d) $-2\frac{1}{3}$

54. $\frac{x-5}{x+3}=\frac{x-4}{x-8}$ (a) $-\frac{7}{3}$ (b) 7 (c) $-\frac{3}{10}$ (d) $\frac{13}{3}$

55. $\frac{-3x}{x-4}+10=\frac{5x}{x-4}$ (a) $\frac{1}{20}$ (b) 20 (c) -20 (d) $-\frac{1}{20}$

56. $\frac{x}{x^2-81}+\frac{9}{x-9}=\frac{1}{x+9}$ (a) 10 (b) -10 (c) -8 (d) 8

Radical Equations

Solve.

57. $\sqrt{x+9}-3=x$ (a) -5 (b) 7 (c) $-5, 7$ (d) 0

58. $\sqrt{6x-3}=\sqrt{5x+4}$ (a) 7 (b) 6 (c) 3 (d) No solution

59. Solve. $\sqrt{x^2+8x+21}=3$ (a) $2, -6$ (b) $2, 6$ (c) $-2, -6$ (d) -2

60. Solve. $\sqrt{x-2}=x-4$ (a) 3 (b) 6, 3 (c) 6 (d) no solution

Equations that are Quadratic in Form

Solve:

61. $6x^{-2}+x^{-1}+1=0$ (a) $x=3, x=-2$ (b) $x=3, x=\frac{1}{2}$ (c) $x=-\frac{1}{3}, x=-\frac{1}{2}$ (d) no solution

62. $5\sqrt{x}-2x-2=0$ (a) $\frac{1}{4}, 5$ (b) $\frac{1}{4}, 4$ (c) $-\frac{1}{4}, -4$ (d) $\frac{1}{6}, 4$

63. $15x^{-2}-2x^{-1}+1=0$ (a) $x=3, x=-5$ (b) $x=-\frac{1}{3}, x=-\frac{1}{5}$ (c) $x=3, x=\frac{1}{5}$ (d) no solution

64. $x^{2/3}-4x^{1/3}-32=0$

(a) $x=512$ or $x=16$ (b) $x=512$ or $x=-64$ (c) $x=64$ or $x=64$ (d) $x=8$ or $x=-4$

Section 1.5 Inequalities

Properties of Inequalities

Solve:

65. $-19+w<-2$ (a) $\{w \mid w>-21\}$ (b) $\{w \mid w<-21\}$ (c) $\{w \mid w>17\}$ (d) $\{w \mid w<17\}$

Solve:

66. $20b - 4 \le 21b + 6$ (a) $\{b \mid b \le 10\}$ (b) $\{b \mid b \ge -10\}$ (c) $\{b \mid b \ge 24\}$ (d) $\left\{b \,\middle|\, b = -\frac{10}{41}\right\}$

67. $12x - 9x + 18 > 2x - (10 - 2x)$

(a) $\{x \mid x > 28\}$ (b) $\{x \mid x < 28\}$ (c) $\{x \mid x < -4\}$ (d) $\{x \mid x > -4\}$

68. $\frac{9}{8} - \frac{1}{2}x + \frac{7}{8} \le 9x - \frac{3}{2}$ (a) $\left\{x \,\middle|\, x \ge \frac{7}{19}\right\}$ (b) $\left\{x \,\middle|\, x \ge \frac{7}{17}\right\}$ (c) $\left\{x \,\middle|\, x \le \frac{7}{19}\right\}$ (d) none of these

Compound Inequalities

69. Solve. (a) $x \le 4$ or $x > 7$ (b) $4 \le x < 7$ (c) $4 < x \le 7$ (d) $x < 4$ or $x \ge 7$
$x - 4 \le 0$ or $x > 7$

70. Solve. $3x - 1 > -13$ or $2x + 3 < 1$ (a) $x > -4$ (b) $x < -1$ (c) all real numbers (d) no solution

71. Solve. (a) $x \le -4$ or $x > 7$ (b) $x < -4$ or $x \ge 7$ (c) $-4 < x \le 7$ (d) $-4 \le x < 7$
$x + 2 \ge -2$ and $x < 7$

72. Solve the inequality and give the solution in interval notation.
$2x - 1 > -9$ or $3x - 3 < -9$

(a) $(-4, \infty)$ (b) $(-\infty, -2)$ (c) $(-\infty, \infty)$ (d) $\varnothing$

Absolute Value Inequalities

73. Solve. $|3x + 3| > 3$

(a) $\{x \mid -2 < x < 0\}$ (b) $\{x \mid x \le -2 \text{ or } x \ge 0\}$ (c) $\{x \mid x < -2 \text{ or } x > 0\}$ (d) none of these

74. Solve:
$|2x - 3| \ge 2$

(a) $\left\{x \mid \frac{1}{2} < x < \frac{5}{2}\right\}$ (b) $\left\{x \mid x < \frac{1}{2} \text{ or } x > \frac{5}{2}\right\}$ (c) $\left\{x \mid x \le \frac{1}{2} \text{ or } x \ge \frac{5}{2}\right\}$ (d) $\left\{x \mid \frac{1}{2} \le x \le \frac{5}{2}\right\}$

75. Solve. $|x - 2| \ge 2$

(a) $\{x \mid x \le 0 \text{ or } x \ge 4\}$ (b) $\{x \mid 0 \le x \le 4\}$ (c) $\{x \mid 0 < x < 4\}$ (d) $\{x \mid x < 0 \text{ or } x > 4\}$

76. Solve the inequality. (a) $x \le 4,\ x \ge 8$ (b) $4 \le x \le 8$ (c) $4 < x < 8$ (d) $x < 4,\ x > 8$
$|x - 6| < 2$

The Critical Value Method

Solve.

77. $(x-7)(7x+1) \ge 0$

(a) $\left\{x \middle| -\frac{1}{7} \le x \le 7\right\}$ (b) $\left\{x \middle| -7 \le x \le \frac{1}{7}\right\}$ (c) $\left\{x \middle| x \le -\frac{1}{7} \text{ or } x \ge 7\right\}$ (d) $\left\{x \middle| x \le -7 \text{ or } x \ge \frac{1}{7}\right\}$

78. $x^2 + 5x \ge 14$

(a) $\{x \mid x \le -7 \text{ or } x \ge 2\}$ (b) $\{x \mid -2 \le x \le 7\}$ (c) $\{x \mid x \le -2 \text{ or } x \ge 7\}$ (d) $\{x \mid -7 \le x \le 2\}$

79. $x^2 + 11x + 18 > 0$

(a) $\{x \mid 2 < x < 9\}$ (b) $\{x \mid x < -9 \text{ or } x > -2\}$ (c) $\{x \mid x < 2 \text{ or } x > 9\}$ (d) $\{x \mid -9 < x < -2\}$

80. Solve the inequality and give the solution in interval notation.

$x^2 - 12x - 5 > 0$

(a) $\left(-\infty,\ 6-\sqrt{41}\right] \cup \left[6+\sqrt{41},\ \infty\right)$ (b) $\left(-\infty,\ 6-\sqrt{41}\right) \cup \left(6+\sqrt{41},\ \infty\right)$

(c) $\left(6-\sqrt{41},\ 6+\sqrt{41}\right)$ (d) $\left[6-\sqrt{41},\ 6+\sqrt{41}\right]$

Rational Inequalities

81. Solve the inequality: $\frac{x+23}{x+3} \ge 5$

(a) $-3 < x \le 2$ (b) $x < -3,\ x \ge 2$ (c) $x < -3,\ x \ge 23$ (d) $-3 < x \le 23$

82. Solve:

$\frac{(x-5)(x+3)}{x-3} \ge 0$

(a) $3 \le x \le -5$ (b) $x \ge 5$ or $-3 \le x < 3$ (c) $x \le -3$ or $3 < x \le 5$ (d) $x \le -3$ or $x \ge -5$

83. Identify the solution set of the inequality: $\frac{5x+1}{x-1} \ge 7$

(a) $1 < x \le 4$ (b) $1 \le x \le 4$ (c) $x \le 4$ (d) $x < 1$ or $x \ge 4$

84. Solve the equation or inequality.

$\frac{2x-3}{x^2-36} \le \frac{1}{x+6}$

(a) $x < -6$ or $x \ge 3$; undefined at $x = 6$ (b) $-3 \le x < 6$; $x < -6$

(c) $-6 < x \le -3$ or $x > 6$; undefined at $x = -6$ (d) $-6 < x \le 3$

Applications

85. The daily cost of renting a car is \$30 plus \$0.20 per mile. Joan's budget allows her to spend a maximum of \$42 for a 1-day rental. How many miles may Joan drive the rental car in one day without exceeding her budget of \$42?

(a) ≤ 60 mi (b) ≥ 60 mi (c) ≤ 12 mi (d) ≥ 12 mi

86. During a physics lab, students found that the minimum force F needed to pull a block up an incline was given by $F = 2.06x$. If the mass of the block x is 32.56 kilograms, what is the force needed to pull the block?

(a) ≥ 30.50 N (b) ≥ 67.07 N (c) ≥ 15.81 N (d) ≥ 34.62 N

87. A garden is to have a perimeter of 80 feet and its area must be at least 399 square feet. Within what bounds must the length of the rectangle lie?

(a) $16 \text{ ft} \leq l \leq 19 \text{ ft}$ (b) $18 \text{ ft} \leq l \leq 22 \text{ ft}$ (c) $19 \text{ ft} \leq l \leq 21 \text{ ft}$ (d) $16 \text{ ft} \leq l \leq 24 \text{ ft}$

88. The area of the cross section of a round bolt must be greater than 169 mm^2 and less than 289 mm^2. Remember that the formula for the area of a circle is $A = \pi r^2$, where r is the radius. Write an inequality to describe the requirements for the radius of the bolt. Round to the nearest hundredth of a millimeter.

(a) $7.33 \text{ mm} \leq r \leq 9.59 \text{ mm}$ (b) $13 \text{ mm} \leq r \leq 17 \text{ mm}$

(c) $530.93 \text{ mm} \leq r \leq 907.92 \text{ mm}$ (d) $53.79 \text{ mm} \leq r \leq 91.99 \text{ mm}$

Section 1.6 Variation and Applications

Direct Variation

89. The total cost of gasoline varies directly with the number of gallons purchased. Mariko pays $24.22 for 14 gallons of gasoline. Write a direct variation equation that shows the relationship between the total cost of gasoline c and the number of gallons purchased n.

(a) $n = 1.73c$ (b) $n = 24.22c$ (c) $c = 24.22n$ (d) $c = 1.73n$

90. The distance an object falls varies directly with the square of the time of the fall. On planet X, an object falls 29 feet in 4 seconds.
a. Find a mathematical model that relates the distance the object falls to time.
b. How long does it take an object to fall 95 feet? Round your answer to three decimal places.

(a) a. $d = \dfrac{464}{t^2}$ b. 2.210 s (b) a. $d = \dfrac{29}{16}t^2$ b. 7.240 s (c) a. $d = \sqrt{\dfrac{29t^2}{4}}$ b. 35.282 s (d) a. $d = \dfrac{1}{16}t^2$ b. 38.987 s

91. The amount of a person's paycheck P varies directly with the number of hours worked t. For 8 hours of work, the paycheck is $46.00. Find the pay for 20 hours of work.

(a) $120.75 (b) $120.00 (c) $115.00 (d) none of these

92. An enclosed gas exerts a pressure P, on the walls of a container. This pressure is directly proportional to the temperature T, of the gas. If the pressure is 5 lb per square inch when the temperature is $350° \text{ F}$, find the constant of variation.

(a) $\dfrac{1}{70}$ (b) 70 (c) $\dfrac{1}{25}$ (d) 25

Inverse Variation

93. The intensity I of light received from a source varies inversely as the square of the distance d from the source. If the light intensity is 5 foot-candles at 12 feet, find the light intensity at 14 feet.

(a) 0.73 foot-candles (b) 3.67 foot-candles (c) 51.43 foot-candles (d) 0.31 foot-candles

94. The price per person of renting a bus varies inversely with the number of people renting the bus. It costs \$22 per person if 27 people rent the bus.
a. Write a mathematical model representing the price *p,* to the number of people renting the bus *n*.
b. How much will it cost per person if 84 people rent the bus?

(a) a. $p = \dfrac{594}{n}$ b. \$7.07 (b) a. $p = \dfrac{22}{27}n$ b. \$68.44 (c) a. $p = \dfrac{1}{594}n$ b. \$3.98 (d) a. $p = \dfrac{27}{22}n$ b. \$103.09

95. Yellows vary inversely as oranges squared. When there are 64 yellows, there are 3 oranges. How many yellows are present when there are 12 oranges?

(a) 16 (b) 4 (c) 3 (d) 8

96. Under certain conditions, the pressure of a perfect gas varies inversely as the volume. When the pressure of a quantity of gas is 6 pascals, the volume is 60 liters. What would be the volume if the pressure is increased to 20 pascals?

(a) 42 L (b) 120 L (c) 12 L (d) 18 L

Joint Variation and Combined Variation

97. Write the variation and find the quantity indicated when *a* varies jointly as *b* and the square of *c*. If *a* is 1575 when *b* is 1 and *c* is 5, find *a* when *b* is 3 and *c* is 3.

(a) $a = kbc$; 315 (b) $a = kbc^2$; 189 (c) $a = bc^2$; 1581 (d) $a = \dfrac{k}{bc^2}$; 63

98. The horsepower that a rotating shaft can safely generate varies jointly with the cube of its diameter and its speed in revolutions per minute. A shaft with a 2-inch diameter turning at a speed of 1700 revolutions per minute can safely transmit 10 horsepower. Find the horsepower that a shaft with a 3-inch diameter can safely transmit at a speed of 2300 revolutions per minute.

(a) 15 hp (b) 46 hp (c) 30 hp (d) 91 hp

99. If *m* varies directly as the square root of y , inversely as p^2 , and directly as n , what happens to *m* when y is quadrupled, p is tripled, and n is multiplied by 2?

(a) m is multiplied by $\dfrac{4}{9}$ (b) m is multiplied by $\dfrac{9}{4}$ (c) m is divided by $\dfrac{4}{9}$ (d) it stays the same

100. The Crystal Glass Company found that the number of windows sold, N, varies directly as their advertising budget, A, and inversely as the price of each window, P. When \$30,000 is spent on advertising and the price of a window is set at \$50, 10,200 windows are sold. Determine the number of windows sold when the amount spent on advertising is increased to \$60,000.

(a) 21,080 (b) 20,400 (c) 3468 (d) 1200

Chapter 1: Equations and Inequalities (Answer Key)

Section 1.1 Linear and Absolute Value Equations

Linear Equations

[1] (d)

[2] (c)

[3] (b)

[4] (c)

Contradictions, Conditional Equations, and Identities

[5] (c)

[6] (a)

[7] (e)

[8] (b)

Absolute Value Equations

[9] (b)

[10] (b)

[11] (a)

[12] (d)

Applications

[13] (c)

[14] (a)

[15] (c)

[16] (c)

Section 1.2 Formulas and Applications

Formulas

[17] (b)

[18] (a)

[19] (b)

[20] (d)

Applications

[21] (c)

[22] (a)

[23] (d)

[24] (c)

Section 1.3 Quadratic Equations

Solve Quadratic Equations by Factoring

[25] (d)

[26] (d)

[27] (b)

[28] (d)

Solve Quadratic Equations by Taking Square Roots

[29] (b)

[30] (c)

[31] (c)

[32] (a)

Solve Quadratic Equations by Completing the Square

[33] (a)

[34] (b)

[35] (d)

[36] (d)

Solve Quadratic Equations by Using the Quadratic Formula

[37] (b)

[38] (c)

[39] (b)

[40] (d)

The Discriminant of a Quadratic Equation

[41] (c)

[42] (c)

[43] (c)

[44] (c)

Applications of Quadratic Equations

[45] (a)

[46] (a)

[47] (b)

[48] (a)

Section 1.4 Other Types of Equations

Polynomial Equations

[49] (c)

[50] (d)

[51] (c)

[52] (c)

Rational Equations

[53] (b)

[54] (d)

[55] (b)

[56] (b)

Radical Equations

[57] (d)

[58] (a)

[59] (c)

[60] (c)

Equations that are Quadratic in Form

[61] (d)

[62] (b)

[63] (d)

[64] (b)

Section 1.5 Inequalities

Properties of Inequalities

[65] (d)

[66] (b)

[67] (b)

[68] (a)

Compound Inequalities

[69] (a)

[70] (c)

[71] (d)

[72] (c)

Absolute Value Inequalities

[73] (c)

[74] (c)

[75] (a)

[76] (c)

The Critical Value Method

[77] (c)

[78] (a)

[79] (b)

[80] (b)

Rational Inequalities

[81] (a)

[82] (b)

[83] (a)

[84] (b)

Applications

[85] (a)

[86] (b)

[87] (c)

[88] (a)

Section 1.6 Variation and Applications

Direct Variation

[89] (d)

[90] (b)

[91] (c)

[92] (a)

Inverse Variation

[93] (b)

[94] (a)

[95] (b)

[96] (d)

Joint Variation and Combined Variation

[97] (b)

[98] (b)

[99] (a)

[100] (b)