

## Ch. 1 Equations and Inequalities

### 1.1 Linear Equations

#### 1 Solve a Linear Equation

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the equation.**

1)  $5x = -5$

A)  $\{-1\}$

B)  $\{1\}$

C)  $\{5\}$

D)  $\{-5\}$

2)  $3x = 10$

A)  $\left\{\frac{10}{3}\right\}$

B)  $\left\{-\frac{10}{3}\right\}$

C)  $\left\{\frac{3}{10}\right\}$

D)  $\left\{-\frac{3}{10}\right\}$

3)  $2x + 8 = 0$

A)  $\{-4\}$

B)  $\{4\}$

C)  $\{2\}$

D)  $\{-2\}$

4)  $3x - 5 = 0$

A)  $\left\{\frac{5}{3}\right\}$

B)  $\left\{-\frac{5}{3}\right\}$

C)  $\left\{\frac{3}{5}\right\}$

D)  $\left\{-\frac{3}{5}\right\}$

5)  $10x + 8 = 0$

A)  $\left\{-\frac{4}{5}\right\}$

B)  $\left\{\frac{4}{5}\right\}$

C)  $\left\{\frac{5}{4}\right\}$

D)  $\left\{-\frac{5}{4}\right\}$

6)  $\frac{5}{6}x = \frac{1}{4}$

A)  $\left\{\frac{3}{10}\right\}$

B)  $\left\{\frac{10}{3}\right\}$

C)  $\left\{-\frac{3}{10}\right\}$

D)  $\left\{-\frac{3}{2}\right\}$

7)  $16x = -3 + 15x$

A)  $\{-3\}$

B)  $\{3\}$

C)  $\{-2\}$

D)  $\{12\}$

8)  $7x - 12 = 3x - 48$

A)  $\{-9\}$

B)  $\{9\}$

C)  $\{-12\}$

D)  $\{12\}$

9)  $-7x + 72 = 2x + 18$

A)  $\{6\}$

B)  $\{-6\}$

C)  $\{8\}$

D)  $\{-8\}$

10)  $-4 - 8x = 4 - 4x$

A)  $\{-2\}$

B)  $\{2\}$

C)  $\{-1\}$

D)  $\{1\}$

11)  $7x - (2x - 1) = 2$

A)  $\left\{\frac{1}{5}\right\}$

B)  $\left\{\frac{1}{9}\right\}$

C)  $\left\{-\frac{1}{5}\right\}$

D)  $\left\{-\frac{1}{9}\right\}$

12)  $4(3x - 1) = 16$

A)  $\left\{\frac{5}{3}\right\}$

B)  $\{1\}$

C)  $\left\{\frac{17}{12}\right\}$

D)  $\left\{\frac{5}{4}\right\}$

13)  $14(4x - 4) = 5x - 5$

A)  $\{1\}$

B)  $\left\{\frac{61}{51}\right\}$

C)  $\{-1\}$

D)  $\left\{\frac{51}{61}\right\}$

14)  $6(x + 5) = 7[x - (3 - x)]$

A)  $\left\{\frac{51}{8}\right\}$

B)  $\left\{-\frac{15}{4}\right\}$

C)  $\left\{\frac{15}{4}\right\}$

D)  $\left\{-\frac{51}{8}\right\}$

15)  $5(x + 5) = 6(x - 6)$

A)  $\{61\}$

B)  $\{-61\}$

C)  $\{-11\}$

D)  $\{6\}$

16)  $3(2x - 2) = 5(x + 2)$

A)  $\{16\}$

B)  $\{-4\}$

C)  $\{-16\}$

D)  $\{7\}$

17)  $7(x + 5) = (7x + 35)$

A) all real numbers

B)  $\{70\}$

C)  $\{0\}$

D) no solution

18)  $3x + 7 + 4(x + 1) = 4x + 5$

A)  $\{-2\}$

B)  $\left\{\frac{11}{8}\right\}$

C)  $\left\{\frac{4}{5}\right\}$

D)  $\{4\}$

19)  $-9x + 6 + 7x = -2x + 11$

A) no solution

B)  $\{5\}$

C)  $\{-6\}$

D) all real numbers

20)  $\frac{x}{4} - 4 = 1$

A)  $\{20\}$

B)  $\{-20\}$

C)  $\{12\}$

D)  $\{-12\}$

21)  $\frac{x}{5} - \frac{1}{5} = -2$

A)  $\{-9\}$

B)  $\{9\}$

C)  $\{-11\}$

D)  $\{11\}$

22)  $\frac{2x}{5} = 4 + \frac{x}{3}$

A)  $\{60\}$

B)  $\{-60\}$

C)  $\{120\}$

D)  $\{-120\}$

23)  $\frac{x}{3} - 1 = \frac{x}{2} + 7$

A)  $\{-48\}$

B)  $\{48\}$

C)  $\left\{-\frac{4}{3}\right\}$

D)  $\left\{\frac{4}{3}\right\}$

24)  $\frac{1}{2} + \frac{x}{4} = \frac{11}{8}$

A)  $\left\{\frac{7}{2}\right\}$

B)  $\left\{-\frac{7}{2}\right\}$

C)  $\left\{\frac{7}{4}\right\}$

D)  $\left\{-\frac{7}{4}\right\}$

25)  $-10.4x + 1.7 = -15.7 - 1.7x$

A)  $\{2\}$

B)  $\{-26\}$

C)  $\{1.7\}$

D)  $\{1.8\}$

$$26) \frac{5x+3}{2} + \frac{9}{2} = -\frac{7x}{3}$$

$$A) \left\{ -\frac{36}{29} \right\}$$

$$B) \left\{ \frac{18}{29} \right\}$$

$$C) \left\{ -\frac{18}{29} \right\}$$

$$D) \{-36\}$$

## 2 Solve Equations That Lead to Linear Equations

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the equation.**

$$1) 1 - \frac{4}{3x} = \frac{9}{10}$$

$$A) \left\{ \frac{40}{3} \right\}$$

$$B) \left\{ -\frac{40}{3} \right\}$$

$$C) \{-5\}$$

$$D) \{8\}$$

$$2) \frac{5}{x} + \frac{2}{5} = \frac{7}{x}$$

$$A) \{5\}$$

$$B) \{-5\}$$

$$C) \{2\}$$

$$D) \{-2\}$$

$$3) (x+9)(x-1) = (x+1)^2$$

$$A) \left\{ \frac{5}{3} \right\}$$

$$B) \left\{ \frac{3}{2} \right\}$$

$$C) \left\{ \frac{10}{9} \right\}$$

$$D) \{10\}$$

$$4) x(2x-1) = (2x+1)(x-2)$$

$$A) \{-1\}$$

$$B) \left\{ -\frac{2}{3} \right\}$$

$$C) \{-2\}$$

$$D) \{2\}$$

$$5) x(1+3x) = (3x-1)(x-3)$$

$$A) \left\{ \frac{3}{11} \right\}$$

$$B) \left\{ -\frac{3}{11} \right\}$$

$$C) \left\{ \frac{3}{121} \right\}$$

$$D) \left\{ -\frac{3}{121} \right\}$$

$$6) x(x^2+4) = 9+x^3$$

$$A) \left\{ \frac{9}{4} \right\}$$

$$B) \{4\}$$

$$C) \{9\}$$

$$D) \left\{ \frac{4}{9} \right\}$$

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

$$A) \left\{ -\frac{46}{47} \right\}$$

$$B) \left\{ \frac{46}{47} \right\}$$

$$C) \left\{ -\frac{47}{46} \right\}$$

$$D) \left\{ \frac{47}{46} \right\}$$

$$8) \frac{2x}{x^2-4} = \frac{3}{x^2-4} - \frac{4}{x+2}$$

$$A) \left\{ \frac{11}{6} \right\}$$

$$B) \left\{ -\frac{5}{6} \right\}$$

$$C) \left\{ \frac{5}{2} \right\}$$

$$D) \left\{ -\frac{1}{8} \right\}$$

$$9) \frac{5-x}{x} + \frac{3}{4} = \frac{7}{x}$$

$$A) \{-8\}$$

$$B) \left\{ -\frac{8}{7} \right\}$$

$$C) \{8\}$$

$$D) \{-4\}$$

$$10) \frac{1}{x} + \frac{1}{x+4} = \frac{x+5}{x+4}$$

A) {1}

B) {-4}

C) {-1}

D) {4}

$$11) \frac{6}{2x-3} = \frac{4}{2x+5}$$

A)  $\left\{-\frac{21}{2}\right\}$

B)  $\left\{\frac{21}{2}\right\}$

C)  $\left\{-\frac{2}{21}\right\}$

D)  $\left\{\frac{2}{21}\right\}$

$$12) \frac{x-2}{x-5} = \frac{x+6}{x-7}$$

A)  $\left\{\frac{22}{5}\right\}$

B)  $\left\{-\frac{15}{7}\right\}$

C) {-4}

D)  $\left\{\frac{8}{5}\right\}$

$$13) \frac{8x+7}{2x-8} = \frac{20x+9}{5x-2}$$

A)  $\left\{-\frac{58}{161}\right\}$

B)  $\left\{\frac{58}{123}\right\}$

C)  $\left\{-\frac{86}{161}\right\}$

D)  $\left\{\frac{86}{123}\right\}$

$$14) \frac{6}{5x} - \frac{1}{x+1} = \frac{3}{x(2x+2)}$$

A)  $\left\{\frac{3}{2}\right\}$

B) {3}

C)  $\left\{\frac{3}{10}\right\}$

D) no solution

$$15) \frac{2}{x+5} - \frac{4}{x-5} = \frac{6}{x^2-25}$$

A) {-18}

B) {18}

C)  $\{3\sqrt{3}\}$

D) {36}

$$16) \frac{4x-9}{2x-7} = \frac{10x+8}{5x-4}$$

A)  $\left\{\frac{92}{7}\right\}$

B)  $\left\{\frac{4}{5}\right\}$

C)  $\left\{\frac{20}{7}\right\}$

D)  $\left\{\frac{4}{23}\right\}$

$$17) \frac{8}{x} + \frac{7}{x} = -4$$

A)  $\left\{-\frac{15}{4}\right\}$

B)  $\left\{-\frac{4}{15}\right\}$

C)  $\left\{\frac{15}{4}\right\}$

D)  $\left\{\frac{4}{15}\right\}$

### 3 Solve Problems That Can Be Modeled by Linear Equations

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the equation. The letters a, b, and c are constants.**

1)  $ax - b = c, a \neq 0$

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

B)  $x = \frac{b-c}{a}$

C)  $x = \frac{c-b}{a}$

D)  $x = -\frac{b+c}{a}$

$$2) \frac{x}{a} + \frac{x}{b} = c, a \neq 0, b \neq 0, a \neq -b$$

$$A) x = \frac{abc}{a+b}$$

$$B) x = abc$$

$$C) x = \frac{c}{ab}$$

$$D) x = \frac{a+b}{abc}$$

$$3) \frac{a}{x} + \frac{b}{x} = c, c \neq 0$$

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

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

$$C) x = \frac{ab}{c}$$

$$D) x = \frac{c}{ab}$$

**Solve the formula for the indicated variable.**

$$4) PV = nRT \text{ for } T$$

$$A) T = \frac{PV}{nR}$$

$$B) T = \frac{PV}{R}$$

$$C) T = \frac{nPV}{R}$$

$$D) T = \frac{PVR}{n}$$

$$5) S = 2\pi rh + 2\pi r^2 \text{ for } h$$

$$A) h = \frac{S - 2\pi r^2}{2\pi r}$$

$$B) h = S - r$$

$$C) h = \frac{S}{2\pi r} - 1$$

$$D) h = 2\pi(S - r)$$

$$6) F = \frac{9}{5}C + 32 \text{ for } C$$

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

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

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

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

$$7) A = P(1 + rt) \text{ for } r$$

$$A) r = \frac{A - P}{tP}$$

$$B) r = \frac{A + P}{tP}$$

$$C) r = -\frac{A + P}{tP}$$

$$D) r = \frac{P - A}{tP}$$

$$8) P - \frac{7Q}{5} = \frac{P + 3}{2} + 1 \text{ for } P$$

$$A) P = \frac{25 + 14Q}{5}$$

$$B) P = \frac{25 - 14Q}{5}$$

$$C) P = \frac{5 - 14Q}{5}$$

$$D) P = \frac{5 + 14Q}{5}$$

**Solve the problem.**

9) Mary and her brother John collect foreign coins. Mary has twice the number of coins that John has. Together they have 120 foreign coins. Find how many coins Mary has.

A) 80 coins

B) 40 coins

C) 16 coins

D) 72 coins

10) Center City East Parking Garage has a capacity of 256 cars more than Center City West Parking Garage. If the combined capacity for the two garages is 1230 cars, find the capacity for each garage.

A) Center City East: 743 cars  
Center City West: 487 cars

B) Center City East: 487 cars  
Center City West: 743 cars

C) Center City East: 753 cars  
Center City West: 477 cars

D) Center City East: 477 cars  
Center City West: 753 cars

11) During an intramural basketball game, Team A scored 16 fewer points than Team B. Together, both teams scored a total of 144 points. How many points did Team A score during the game?

A) 64 points

B) 80 points

C) 65 points

D) 72 points

- 12) An auto repair shop charged a customer \$527 to repair a car. The bill listed \$87 for parts and the remainder for labor. If the cost of labor is \$55 per hour, how many hours of labor did it take to repair the car?  
 A) 8 hr                                      B) 7 hr                                      C) 9 hr                                      D) 8.5 hr
- 13) Going into the final exam, which will count as three tests, Jerome has test scores of 61, 72, 59, 75, and 77. What score does Jerome need on the final in order to earn a C, which requires an average of 70?  
 A) 72                                      B) 75                                      C) 70                                      D) 79
- 14) After a 13% price reduction, a boat sold for \$21,750. What was the boat's price before the reduction? (Round to the nearest cent, if necessary.)  
 A) \$25,000                                      B) \$2827.50                                      C) \$167,307.69                                      D) \$24,577.50
- 15) Inclusive of a 6.7% sales tax, a diamond ring sold for \$1707.20. Find the price of the ring before the tax was added. (Round to the nearest cent, if necessary.)  
 A) \$1600                                      B) \$1821.58                                      C) \$1592.82                                      D) \$114.38
- 16) It costs \$40 per hour plus a flat fee of \$25 for a plumber to make a house call. After writing an equation for this situation, suppose the total cost to have a plumber come to a house is \$425. How many hours did the plumber work?  
 A) 10 hr                                      B) 8 hr                                      C) 20 hr                                      D) 18 hr
- 17) A rectangular carpet has a perimeter of 234 inches. The length of the carpet is 83 inches more than the width. What are the dimensions of the carpet?  
 A) 100 in. by 17 in.                                      B) 100 in. by 117 in.                                      C) 67 in. by 84 in.                                      D) 108.5 in. by 117 in.
- 18) The perimeter of a triangle is 65 centimeters. Find the lengths of its sides, if the longest side is 7 centimeters longer than the shorter side, and the remaining side is 4 centimeters longer than the shorter side.  
 A) 18 cm, 22 cm, 25 cm                                      B) 16 cm, 20 cm, 29 cm  
 C) 20 cm, 22 cm, 23 cm                                      D) 17 cm, 20 cm, 28 cm
- 19)  $x$  represents the number of textbooks purchased at \$56 per book, and  $y$  represents the total amount of money spent on textbooks. What is an equation of the form  $y = ax$  for this situation?  
 A)  $y = 56x$                                       B)  $y = 112x$                                       C)  $y = 28x$                                       D)  $y = 168x$
- 20) It costs \$38 per hour plus a flat fee of \$32 for a plumber to make a house call. What is an equation of the form  $y = ax + b$  for this situation?  
 A)  $y = 38x + 32$                                       B)  $y = 32x + 38$                                       C)  $y = 38x$                                       D)  $y = 32x$
- 21) Using a phone card to make a long distance call costs a flat fee of \$0.81 plus \$0.21 per minute starting with the first minute. What is an equation of the form  $y = ax + b$  for this situation?  
 A)  $y = 0.21x + 0.81$                                       B)  $y = 0.81x + 0.21$                                       C)  $y = 0.81x$                                       D)  $y = 0.21x$
- 22)  $x$  represents the number of textbooks purchased at \$54 per book, and  $y$  represents the total amount of money spent on textbooks. After writing an equation for this situation, what is the cost of 3 textbooks?  
 A) \$162                                      B) \$324                                      C) \$81.00                                      D) \$18.00
- 23)  $x$  represents the number of cassette tapes sold at \$6.50 per tape, and  $y$  represents the total cost of the cassette tapes. After writing an equation for this situation, what is the total cost of 18 cassettes?  
 A) \$117                                      B) \$234                                      C) \$58.50                                      D) \$0.36
- 24) It costs \$34 per hour plus a flat fee of \$31 for a plumber to make a house call. After writing an equation for this situation, what is the total cost to have a plumber come to a house for 4 hours?  
 A) \$167                                      B) \$158                                      C) \$136                                      D) \$1058

## 1.2 Quadratic Equations

### 1 Solve a Quadratic Equation by Factoring

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the equation by factoring.**

1)  $7x^2 - 9x = 0$

A)  $\{\frac{9}{7}, 0\}$

B)  $\{\frac{9}{7}, -\frac{9}{7}\}$

C)  $\{0\}$

D)  $\{-\frac{9}{7}, 0\}$

2)  $60x^2 + 44x = 0$

A)  $\{-\frac{11}{15}, 0\}$

B)  $\{\frac{11}{15}, -\frac{11}{15}\}$

C)  $\{0\}$

D)  $\{\frac{11}{15}, 0\}$

3)  $x^2 - 25 = 0$

A)  $\{5, -5\}$

B)  $\{5\}$

C)  $\{-5\}$

D)  $\{25\}$

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

4)  $x^2 - x = 72$

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

5)  $x^2 - 11x + 30 = 0$

A)  $\{5, 6\}$

B)  $\{5, -6\}$

C)  $\{-5, 6\}$

D)  $\{-5, -6\}$

6)  $x^2 - 2x - 24 = 0$

A)  $\{-4, 6\}$

B)  $\{-4, -6\}$

C)  $\{4, -6\}$

D)  $\{4, 6\}$

7)  $5x^2 + 8x - 4 = 0$

A)  $\{\frac{2}{5}, -2\}$

B)  $\{\frac{2}{5}, 2\}$

C)  $\{-\frac{2}{5}, -2\}$

D)  $\{-\frac{2}{5}, 2\}$

8)  $2x^2 - 22 = 0$

A)  $\{-\sqrt{11}, \sqrt{11}\}$

B)  $\{12\}$

C)  $\{-11, 11\}$

D)  $\{11\}$

9)  $x(x - 3) + 2 = 0$

A)  $\{1, 2\}$

B)  $\{1, -2\}$

C)  $\{-1, 2\}$

D)  $\{-1, -2\}$

10)  $25x^2 - 90x + 81 = 0$

A)  $\{\frac{9}{5}\}$

B)  $\{\frac{5}{9}\}$

C)  $\{-\frac{9}{5}\}$

D)  $\{-\frac{5}{9}\}$

11)  $12x^2 - 5x - 25 = 0$

A)  $\{\frac{5}{4}, \frac{5}{3}\}$

B)  $\{\frac{5}{4}, -\frac{5}{3}\}$

C)  $\{-\frac{5}{4}, \frac{5}{3}\}$

D)  $\{-\frac{5}{4}, -\frac{5}{3}\}$

$$12) 9x - 17 = \frac{2}{x}$$

A)  $\{-\frac{1}{9}, 2\}$

B)  $\{-\frac{1}{9}, 9\}$

C)  $\{\frac{1}{17}, -\frac{1}{9}\}$

D)  $\{-9, 2\}$

$$13) 10x + \frac{16}{x} = -28$$

A)  $\{-\frac{4}{5}, -2\}$

B)  $\{\frac{4}{5}, 2\}$

C)  $\{-\frac{5}{4}, 2\}$

D)  $\{10, \frac{1}{2}\}$

$$14) \frac{x-4}{x} = \frac{15}{x+4}$$

A)  $\{16, -1\}$

B)  $\{16, 1\}$

C)  $\{4, -1\}$

D)  $\{4, 1\}$

**Solve the equation by the Square Root Method.**

$$15) x^2 = 196$$

A)  $\{14, -14\}$

B)  $\{14\}$

C)  $\{15, -15\}$

D)  $\{98\}$

$$16) (x-5)^2 = 4$$

A)  $\{7, 3\}$

B)  $\{9\}$

C)  $\{2, -2\}$

D)  $\{3, -7\}$

$$17) (2x-1)^2 = 81$$

A)  $\{5, -4\}$

B)  $\{4, -5\}$

C)  $\{10, -8\}$

D)  $\{8, -10\}$

$$18) x^2 = 6$$

A)  $\{\sqrt{6}, -\sqrt{6}\}$

B)  $\{6, -6\}$

C)  $\{\sqrt{6}\}$

D) no real solution

$$19) (x+5)^2 = 14$$

A)  $\{-5 + \sqrt{14}, -5 - \sqrt{14}\}$

B)  $\{5 + \sqrt{14}, 5 - \sqrt{14}\}$

C)  $\{\sqrt{14}, -\sqrt{14}\}$

D)  $\{9\}$

## 2 Solve a Quadratic Equation by Completing the Square

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

**Solve the equation by completing the square.**

$$1) x^2 - 4x + 1 = 0$$

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

$$2) x^2 + 4x = 3$$

A)  $\{-2 - \sqrt{7}, -2 + \sqrt{7}\}$

B)  $\{2 + \sqrt{7}\}$

C)  $\{-1 - \sqrt{7}, -1 + \sqrt{7}\}$

D)  $\{-2 - 2\sqrt{7}, -2 + 2\sqrt{7}\}$

$$3) x^2 + 6x + 8 = 0$$

A)  $\{-2, -4\}$

B)  $\{2, 4\}$

C)  $\{1, -1\}$

D)  $\{12, -4\}$

$$4) x^2 + 12x + 21 = 0$$

A)  $\{-6 - \sqrt{15}, -6 + \sqrt{15}\}$

B)  $\{6 + \sqrt{15}\}$

C)  $\{6 - \sqrt{21}, 6 + \sqrt{21}\}$

D)  $\{-12 + \sqrt{21}\}$



$$5) x^2 + 5x - 5 = 0$$

$$A) \left\{ \frac{-5 - 3\sqrt{5}}{2}, \frac{-5 + 3\sqrt{5}}{2} \right\}$$

$$C) \left\{ \frac{-5 - 3\sqrt{5}}{2} \right\}$$

$$B) \left\{ \frac{5 + 3\sqrt{5}}{2} \right\}$$

$$D) \{-5 - 3\sqrt{5}, -5 + 3\sqrt{5}\}$$

$$6) x^2 + 8x - 7 = 0$$

$$A) \{-4 - \sqrt{23}, -4 + \sqrt{23}\}$$

$$C) \{-1 - \sqrt{23}, -1 + \sqrt{23}\}$$

$$B) \{4 + \sqrt{23}\}$$

$$D) \{-4 - 2\sqrt{23}, -4 + 2\sqrt{23}\}$$

$$7) x^2 - 8x - 3 = 0$$

$$A) \{4 - \sqrt{19}, 4 + \sqrt{19}\}$$

$$C) \{-4 - \sqrt{19}, -4 + \sqrt{19}\}$$

$$B) \{4 - \sqrt{3}, 4 + \sqrt{3}\}$$

$$D) \{8 - \sqrt{67}, 8 + \sqrt{67}\}$$

$$8) \frac{1}{3}x^2 + \frac{1}{12}x - \frac{1}{6} = 0$$

$$A) \left\{ \frac{\sqrt{33} - 1}{8}, -\frac{\sqrt{33} + 1}{8} \right\}$$

$$C) \left\{ \frac{1}{8}, -\frac{1}{8} \right\}$$

$$B) \left\{ \frac{\sqrt{33}}{8}, -\frac{\sqrt{33}}{8} \right\}$$

$$D) \left\{ \frac{\sqrt{33} - 1}{8}, \frac{\sqrt{33} + 1}{8} \right\}$$

$$9) 3x^2 - 2x - 4 = 0$$

$$A) \left\{ \frac{1 - \sqrt{13}}{3}, \frac{1 + \sqrt{13}}{3} \right\}$$

$$C) \left\{ -4, \frac{14}{3} \right\}$$

$$B) \left\{ \frac{3 - \sqrt{13}}{9}, \frac{3 + \sqrt{13}}{9} \right\}$$

$$D) \left\{ \frac{-1 - \sqrt{13}}{3}, \frac{-1 + \sqrt{13}}{3} \right\}$$

$$10) 4x^2 + 24x + 35 = 0$$

$$A) \left\{ -\frac{5}{2}, -\frac{7}{2} \right\}$$

$$B) \left\{ -\frac{5}{4}, -\frac{7}{4} \right\}$$

$$C) \left\{ \frac{5}{2}, \frac{7}{2} \right\}$$

$$D) \left\{ -\frac{7}{2}, \frac{21}{2} \right\}$$

$$11) x^2 - \frac{4}{7}x - \frac{5}{49} = 0$$

$$A) \left\{ -\frac{1}{7}, \frac{5}{7} \right\}$$

$$B) \left\{ \frac{1}{7}, \frac{5}{7} \right\}$$

$$C) \left\{ -\frac{1}{7}, -\frac{5}{7} \right\}$$

$$D) \left\{ \frac{1}{7}, -\frac{5}{7} \right\}$$

### 3 Solve a Quadratic Equation Using the Quadratic Formula

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

Find the real solutions, if any, of the equation. Use the quadratic formula.

$$1) x^2 + 8x - 7 = 0$$

$$A) \{-4 - \sqrt{23}, -4 + \sqrt{23}\}$$

$$C) \{-1 - \sqrt{23}, -1 + \sqrt{23}\}$$

$$B) \{4 + \sqrt{23}\}$$

$$D) \{-4 - 2\sqrt{23}, -4 + 2\sqrt{23}\}$$

$$2) x^2 - 12x - 7 = 0$$

$$A) \{6 + \sqrt{43}, 6 - \sqrt{43}\}$$

$$C) \{-6 + \sqrt{43}, -6 - \sqrt{43}\}$$

$$B) \{6 + \sqrt{7}, 6 - \sqrt{7}\}$$

$$D) \{12 + \sqrt{43}, 12 - \sqrt{43}\}$$

3)  $2x^2 + 2x - 12 = 0$

A)  $\{2, -3\}$

B)  $\{2, 3\}$

C)  $\{-2, -3\}$

D)  $\{-2, 3\}$

4)  $8x^2 - x + 1 = 0$

A)  $\left\{\frac{-1 - \sqrt{33}}{16}, \frac{-1 + \sqrt{33}}{16}\right\}$

B)  $\left\{\frac{-1 + \sqrt{33}}{16}, \frac{1 + \sqrt{33}}{16}\right\}$

C)  $\left\{\frac{-1 - \sqrt{33}}{16}, \frac{1 + \sqrt{33}}{16}\right\}$

D) no real solution

5)  $x^2 + 5x + 2 = 0$

A)  $\left\{\frac{-5 - \sqrt{17}}{2}, \frac{-5 + \sqrt{17}}{2}\right\}$

B)  $\left\{\frac{5 - \sqrt{17}}{2}, \frac{5 + \sqrt{17}}{2}\right\}$

C)  $\left\{\frac{-5 - \sqrt{17}}{10}, \frac{-5 + \sqrt{17}}{10}\right\}$

D)  $\left\{\frac{-5 - \sqrt{33}}{2}, \frac{-5 + \sqrt{33}}{2}\right\}$

6)  $5x^2 + x - 1 = 0$

A)  $\left\{\frac{-1 - \sqrt{21}}{10}, \frac{-1 + \sqrt{21}}{10}\right\}$

B)  $\left\{\frac{-1 - \sqrt{21}}{2}, \frac{-1 + \sqrt{21}}{2}\right\}$

C)  $\left\{\frac{1 - \sqrt{21}}{10}, \frac{1 + \sqrt{21}}{10}\right\}$

D) no real solution

7)  $4x^2 + 10x + 3 = 0$

A)  $\left\{\frac{-5 - \sqrt{13}}{4}, \frac{-5 + \sqrt{13}}{4}\right\}$

B)  $\left\{\frac{-5 - \sqrt{13}}{8}, \frac{-5 + \sqrt{13}}{8}\right\}$

C)  $\left\{\frac{-10 - \sqrt{13}}{4}, \frac{-10 + \sqrt{13}}{4}\right\}$

D)  $\left\{\frac{-5 - \sqrt{37}}{4}, \frac{-5 + \sqrt{37}}{4}\right\}$

8)  $5x = 11x^2$

A)  $\{0, \frac{5}{11}\}$

B)  $\{\frac{5}{11}, -\frac{5}{11}\}$

C)  $\{0\}$

D)  $\{0, -\frac{5}{11}\}$

9)  $36x^2 + 60x + 25 = 0$

A)  $\{-\frac{5}{6}\}$

B)  $\{\frac{5}{6}\}$

C)  $\{-\frac{5}{6}, 30\}$

D) no real solution

10)  $49x^2 + 24 = -70x$

A)  $\{-\frac{4}{7}, -\frac{6}{7}\}$

B)  $\{-\frac{4}{49}, -\frac{6}{49}\}$

C)  $\{\frac{4}{7}, \frac{6}{7}\}$

D)  $\{-\frac{6}{49}, \frac{30}{49}\}$

11)  $2x^2 + 10x = -4$

A)  $\left\{\frac{-5 - \sqrt{17}}{2}, \frac{-5 + \sqrt{17}}{2}\right\}$

B)  $\left\{\frac{-5 - \sqrt{17}}{4}, \frac{-5 + \sqrt{17}}{4}\right\}$

C)  $\left\{\frac{-10 - \sqrt{17}}{2}, \frac{-10 + \sqrt{17}}{2}\right\}$

D)  $\left\{\frac{-5 - \sqrt{33}}{2}, \frac{-5 + \sqrt{33}}{2}\right\}$

12)  $2x^2 = -6x - 3$

A)  $\left\{\frac{-3 - \sqrt{3}}{2}, \frac{-3 + \sqrt{3}}{2}\right\}$

B)  $\left\{\frac{-3 - \sqrt{3}}{4}, \frac{-3 + \sqrt{3}}{4}\right\}$

C)  $\left\{\frac{-6 - \sqrt{3}}{2}, \frac{-6 + \sqrt{3}}{2}\right\}$

D)  $\left\{\frac{-3 - \sqrt{15}}{2}, \frac{-3 + \sqrt{15}}{2}\right\}$

13)  $4x = 1 + \frac{-1}{x}$

A)  $\left\{\frac{1 - \sqrt{17}}{8}, \frac{1 + \sqrt{17}}{8}\right\}$

B)  $\left\{-\frac{1 + \sqrt{17}}{8}, \frac{1 - \sqrt{17}}{8}\right\}$

C)  $\left\{\frac{1 - \sqrt{17}}{8}\right\}$

D) no real solution

Find the real solutions, if any, of the equation. Use the quadratic formula and a calculator. Express any solutions rounded to two decimal places.

14)  $x^2 + \sqrt{11}x - 11 = 0$

A)  $\{-5.37, 2.05\}$

B)  $\{-2.05, 5.37\}$

C)  $\{-5.37, -2.05\}$

D)  $\{-5.37, 5.37\}$

Find the real solutions, if any, of the equation. Use the quadratic formula and a calculator. Express any solutions rounded to two decimal places. Use 3.14 to approximate  $\pi$ .

15)  $\pi x^2 + \pi x - 5 = 0$

A)  $\{-1.86, 0.86\}$

B)  $\{0.86, 1.86\}$

C)  $\{-0.86, 1.86\}$

D)  $\{-1.86, -0.86\}$

Use the discriminant to determine whether the quadratic equation has two unequal real solutions, a repeated real solution, or no real solution without solving the equation.

16)  $x^2 - 3x - 4 = 0$

A) repeated real solution

B) two unequal real solutions

C) no real solution

17)  $x^2 - 12x + 36 = 0$

A) repeated real solution

B) two unequal real solutions

C) no real solution

18)  $x^2 + 4x + 5 = 0$

A) repeated real solution

B) two unequal real solutions

C) no real solution

Solve using the quadratic formula. Round any answers to two decimal places.

19)  $\frac{1}{4}x^2 - 2\sqrt{3}x = 3$

A)  $\{-0.82, 14.67\}$

B)  $\{0.82, -14.67\}$

C)  $\{-0.21, 14.67\}$

D)  $\{0.21, -14.67\}$

#### 4 Solve Problems That Can Be Modeled by Quadratic Equations

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the problem.**

- 1) The length of a vegetable garden is 6 feet longer than its width. If the area of the garden is 112 square feet, find its dimensions.

A) 8 ft by 14 ft

B) 7 ft by 15 ft

C) 9 ft by 15 ft

D) 7 ft by 13 ft

- 2) The area of a circle is found by the equation  $A = \pi r^2$ . If the area  $A$  of a certain circle is  $64\pi$  square centimeters, find its radius  $r$ .
- A) 8 cm                      B)  $8\pi$  cm                      C)  $8\sqrt{\pi}$  cm                      D) {8 cm,  $-8$  cm}
- 3) A 33-inch-square TV is on sale at the local electronics store. If 33 inches is the measure of the diagonal of the screen, use the Pythagorean theorem to find the length of the side of the screen.
- A)  $\frac{33\sqrt{2}}{2}$  in.                      B)  $\sqrt{33}$  in.                      C)  $\frac{\sqrt{33}}{2}$  in.                      D)  $\frac{1089}{2}$  in.

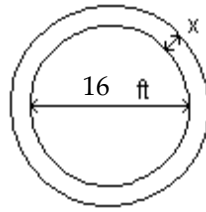
**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 4) The surface area  $A$  of a right circular cylinder is  $A = 2\pi r^2 + 2\pi rh$ , where  $r$  is the radius and  $h$  is the height. Find the radius of a right circular cylinder whose surface area is  $95.36\pi$  square inches and whose height is 11.7 inches.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 5) An open box is to be constructed from a square sheet of plastic by removing a square of side 3 inches from each corner, and then turning up the sides. If the box must have a volume of 675 cubic inches, find the length of one side of the open box.
- A) 15 in.                      B) 18 in.                      C) 21 in.                      D) 14 in.
- 6) A ball is thrown vertically upward from the top of a building 144 feet tall with an initial velocity of 128 feet per second. The distance  $s$  (in feet) of the ball from the ground after  $t$  seconds is  $s = 144 + 128t - 16t^2$ . After how many seconds will the ball pass the top of the building on its way down?
- A) 8 sec                      B) 144 sec                      C) 7 sec                      D) 10 sec
- 7) As part of a physics experiment, Ming drops a baseball from the top of a 330-foot building. To the nearest tenth of a second, for how many seconds will the baseball fall? (Hint: Use the formula  $h = 16t^2$ , which gives the distance  $h$ , in feet, that a free-falling object travels in  $t$  seconds.)
- A) 4.5 sec                      B) 82.5 sec                      C) 20.6 sec                      D) 1.1 sec
- 8) The net income  $y$  (in millions of dollars) of Pet Products Unlimited from 1997 to 1999 is given by the equation  $y = 9x^2 + 15x + 52$ , where  $x$  represents the number of years after 1997. Assume this trend continues and predict the year in which Pet Products Unlimited's net income will be \$352 million.
- A) 2002                      B) 2004                      C) 2001                      D) 2003
- 9) The formula  $A = P(1 + r)^2$  is used to find the amount of money,  $A$ , in an account after  $P$  dollars have been invested in the account paying an annual interest rate,  $r$ , for 2 years. Find the interest rate  $r$  if \$500 grows to \$980 in 2 years.
- A) 40%                      B) 96%                      C) 4%                      D) 240%

- 10) A circular pool measures 16 feet across. One cubic yard of concrete is to be used to create a circular border of uniform width around the pool. If the border is to have a depth of 1 inch, how wide will the border be? Use 3.14 to approximate  $\pi$ . Express your solution rounded to two decimal places. (1 cubic yard = 27 cubic feet)



- A) 4.93 ft                      B) 15.48 ft                      C) 5.69 ft                      D) 10.78 ft
- 11) If a polygon, of  $n$  sides has  $\frac{1}{2}n(n - 3)$  diagonals, how many sides will a polygon with 152 diagonals have?
- A) 19 sides                      B) 20 sides                      C) 18 sides                      D) 21 sides

### 1.3 Complex Numbers; Quadratic Equations in the Complex Number System

#### 1 Add, Subtract, Multiply, and Divide Complex Numbers

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Write the expression in the standard form  $a + bi$ .**

- 1)  $(2 - 3i) + (6 + 7i)$   
 A)  $8 + 4i$                       B)  $8 - 4i$                       C)  $-4 + 10i$                       D)  $-8 - 4i$
- 2)  $(8 + 3i) - (-6 + i)$   
 A)  $14 + 2i$                       B)  $14 - 2i$                       C)  $2 + 4i$                       D)  $-14 - 2i$
- 3)  $3(3 - 3i)$   
 A)  $9 - 9i$                       B)  $9 + 9i$                       C)  $9i - 3i$                       D)  $3 - 9i$
- 4)  $8i(9 - 2i)$   
 A)  $16 + 72i$                       B)  $72i - 16$                       C)  $72i - 16i^2$                       D)  $72i + 16i^2$
- 5)  $-2i(-5 + 5i)$   
 A)  $10 + 10i$                       B)  $-10 + 10i$                       C)  $10i - 10i^2$                       D)  $10i + 10i^2$
- 6)  $(-9 + 2i)(3 + i)$   
 A)  $-29 - 3i$                       B)  $-25 - 3i$                       C)  $-29 - 15i$                       D)  $-25 - 15i$
- 7)  $(3 + 8i)(8 + 8i)$   
 A)  $-40 + 88i$                       B)  $-40 - 88i$                       C)  $88 + 40i$                       D)  $64i^2 + 88i + 24$
- 8)  $(8 + 7i)(2 - 6i)$   
 A)  $58 - 34i$                       B)  $58 + 34i$                       C)  $-26 + 62i$                       D)  $-42i^2 - 34i + 16$
- 9)  $(9 + 8i)(9 - 8i)$   
 A) 145                      B)  $81 - 64i^2$                       C) 17                      D)  $81 - 64i$

- 10)  $(-6 + i)(-6 - i)$   
 A) 37                      B) -6                      C) 36                      D) -35
- 11)  $(7 + 5i)(7 - 5i)$   
 A) 74                      B)  $49 - 25i^2$                       C) 24                      D)  $49 - 25i$
- 12)  $\frac{2}{5 + i}$   
 A)  $\frac{5}{13} - \frac{1}{13}i$                       B)  $\frac{5}{13} + \frac{1}{13}i$                       C)  $\frac{5}{12} + \frac{1}{12}i$                       D)  $\frac{5}{12} - \frac{1}{12}i$
- 13)  $\frac{9}{7 - i}$   
 A)  $\frac{63}{50} + \frac{9}{50}i$                       B)  $\frac{63}{50} - \frac{9}{50}i$                       C)  $\frac{21}{16} + \frac{3}{16}i$                       D)  $\frac{21}{16} - \frac{3}{16}i$
- 14)  $\frac{9}{4 - 5i}$   
 A)  $\frac{36}{41} + \frac{45}{41}i$                       B)  $\frac{36}{41} - \frac{45}{41}i$                       C)  $-4 + 5i$                       D)  $-4 - 5i$
- 15)  $\frac{5i}{2 + i}$   
 A)  $1 + 2i$                       B)  $-1 + 2i$                       C)  $1 + 5i$                       D)  $1 - 2i$
- 16)  $\frac{3 + 2i}{2 - 3i}$   
 A)  $i$                       B)  $-i$                       C)  $1$                       D)  $-1$
- 17)  $\frac{31 - 8i}{3 - 4i}$   
 A)  $5 + 4i$                       B)  $5 - 4i$                       C)  $4 + 5i$                       D)  $4 - 5i$
- 18)  $\frac{7 + 7i}{9 - 8i}$   
 A)  $\frac{7}{145} + \frac{119}{145}i$                       B)  $\frac{7}{17} - 7i$                       C)  $\frac{119}{145} - \frac{7}{145}i$                       D)  $7 - 7i$
- 19)  $(1 - 6i)^2$   
 A)  $-35 - 12i$                       B)  $37 - 12i$                       C)  $-35$                       D)  $1 - 12i + 36i^2$
- 20)  $\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i\right)^2$   
 A)  $i$                       B)  $-i$                       C)  $\frac{i}{2}$                       D)  $-\frac{i}{2}$
- 21)  $i^8$   
 A)  $1$                       B)  $-1$                       C)  $i$                       D)  $-i$

- 22)  $i^{15}$   
 A)  $-i$                                       B)  $i$                                       C)  $1$                                       D)  $-1$
- 23)  $i^9$   
 A)  $i$                                       B)  $-i$                                       C)  $1$                                       D)  $-1$
- 24)  $i^{18}$   
 A)  $-1$                                       B)  $1$                                       C)  $i$                                       D)  $-i$
- 25)  $2i^{15} - i^7$   
 A)  $-i$                                       B)  $i$                                       C)  $-1$                                       D)  $1$
- 26)  $5i^5(1 + i^3)$   
 A)  $5 + 5i$                                       B)  $5 - 5i$                                       C)  $-5 - 5i$                                       D)  $-5 + 5i$
- 27)  $(1 + i)^3$   
 A)  $-2 + 2i$                                       B)  $2 + 2i$                                       C)  $-2 - 2i$                                       D)  $-2 + i$
- 28)  $i^{10} + i^8 + i^6 + 1$   
 A)  $0$                                       B)  $1$                                       C)  $i$                                       D)  $-1$

**Perform the indicated operations and express your answer in the form  $a + bi$ .**

- 29)  $\sqrt{-4}$   
 A)  $2i$                                       B)  $-i\sqrt{2}$                                       C)  $-2i$                                       D)  $\pm 2$
- 30)  $\sqrt{-36}$   
 A)  $6i$                                       B)  $i\sqrt{6}$                                       C)  $-6i$                                       D)  $\pm 6$
- 31)  $\sqrt{(5 + 12i)(12i - 5)}$   
 A)  $13i$                                       B)  $-13i$                                       C)  $-13$                                       D)  $13$

**Write the expression in the standard form  $a + bi$ .**

- 32) If  $z = 8 - 2i$ , evaluate  $z + \bar{z}$ .  
 A)  $16$                                       B)  $16 - 4i$                                       C)  $-4i$                                       D)  $16 + 4i$
- 33) If  $w = 8 + 3i$ , evaluate  $w - \bar{w}$ .  
 A)  $6i$                                       B)  $-16 + 6i$                                       C)  $16$                                       D)  $0$
- 34) If  $z = 3 - 8i$ , evaluate  $z\bar{z}$ .  
 A)  $73$                                       B)  $9 - 64i^2$                                       C)  $-55$                                       D)  $9 - 64i$
- 35) If  $z = 4 + 5i$  and  $w = -7 + i$ , evaluate  $\overline{z - w}$ .  
 A)  $11 - 4i$                                       B)  $11 + 4i$                                       C)  $-3 + 6i$                                       D)  $-11 - 4i$
- 36) If  $z = 8 - 6i$  and  $w = 5 + 8i$ , evaluate  $\overline{\overline{z + w}}$ .  
 A)  $13 + 2i$                                       B)  $13 - 2i$                                       C)  $3 + 14i$                                       D)  $-13 - 2i$

## 2 Solve Quadratic Equations in the Complex Number System

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the equation in the complex number system.**

1)  $x^2 + 36 = 0$

A)  $\{-6i, 6i\}$

B)  $\{6i\}$

C)  $\{6\}$

D)  $\{-6, 6\}$

2)  $x^2 + 8x + 41 = 0$

A)  $\{-4 - 5i, -4 + 5i\}$

B)  $\{-4 - 25i, -4 + 25i\}$

C)  $\{-4 + 5i\}$

D)  $\{-9, 1\}$

3)  $x^2 + x + 7 = 0$

A)  $\{-\frac{1}{2} - \frac{3\sqrt{3}}{2}i, -\frac{1}{2} + \frac{3\sqrt{3}}{2}i\}$

B)  $\{\frac{1 - 3\sqrt{3}}{2}, \frac{1 + 3\sqrt{3}}{2}\}$

C)  $\{\frac{1}{2} - \frac{3\sqrt{3}}{2}i, \frac{1}{2} + \frac{3\sqrt{3}}{2}i\}$

D)  $\{\frac{-1 - 3\sqrt{3}}{2}, \frac{-1 + 3\sqrt{3}}{2}\}$

4)  $16x^2 + 1 = 5x$

A)  $\{\frac{5}{32} - \frac{\sqrt{39}}{32}i, \frac{5}{32} + \frac{\sqrt{39}}{32}i\}$

B)  $\{-\frac{5}{32} - \frac{\sqrt{39}}{32}i, \frac{5}{32} + \frac{\sqrt{39}}{32}i\}$

C)  $\{\frac{5}{32} - \frac{\sqrt{39}}{32}i, -\frac{5}{32} + \frac{\sqrt{39}}{32}i\}$

D)  $\{-\frac{5}{32} - \frac{\sqrt{39}}{32}i, -\frac{5}{32} + \frac{\sqrt{39}}{32}i\}$

5)  $x^3 - 27 = 0$

A)  $\{3, -\frac{3}{2} - \frac{3\sqrt{3}}{2}i, -\frac{3}{2} + \frac{3\sqrt{3}}{2}i\}$

B)  $\{3, -\frac{3}{2} - \frac{3\sqrt{3}}{2}i, -\frac{3}{2} + \frac{3\sqrt{3}}{2}i\}$

C)  $\{3, -3i, 3i\}$

D)  $\{3\}$

6)  $x^4 = 1$

A)  $\{-1, 1, -i, i\}$

B)  $\{-1, 1\}$

C)  $\{1\}$

D)  $\{-1, 1, i\}$

7)  $x^4 - 6x^2 - 7 = 0$

A)  $\{-\sqrt{7}, \sqrt{7}, i, -i\}$

B)  $\{\sqrt{7}i, i\}$

C)  $\{-\sqrt{7}i, -i\}$

D)  $\{\sqrt{7}, 7\}$

**Without solving, determine the character of the solutions of the equation in the complex number system.**

8)  $x^2 - 4x + 3 = 0$

A) two unequal real solutions

B) a repeated real solution

C) two complex solutions that are conjugates of each other

9)  $x^2 - 8x + 16 = 0$

A) a repeated real solution

B) two unequal real solutions

C) two complex solutions that are conjugates of each other

10)  $x^2 + 4x + 5 = 0$

A) two complex solutions that are conjugates of each other

B) two unequal real solutions

C) a repeated real solution



- 11)  $x^2 + 8x + 6 = 0$   
 A) two unequal real solutions  
 B) a repeated real solution  
 C) two complex solutions that are conjugates of each other

**Solve the problem.**

- 12)  $4 - i$  is a solution of a quadratic equation with real coefficients. Find the other solution.  
 A)  $4 + i$                                       B)  $4 - i$                                       C)  $-4 + i$                                       D)  $-4 - i$

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Write the expression in the standard form  $a + bi$ .**

- 13) If  $z = 3 - 6i$  and  $w = 1 + 5i$ , evaluate  $\overline{z + w}$ .

## 1.4 Radical Equations; Equations Quadratic in Form; Factorable Equations

### 1 Solve Radical Equations

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Find the real solutions of the equation.**

- 1)  $\sqrt{x + 5} = 5$   
 A) {20}                                      B) {25}                                      C) {30}                                      D) {100}
- 2)  $\sqrt{3x - 2} = 2$   
 A) {2}                                      B) {4}                                      C)  $\{\frac{2}{3}\}$                                       D)  $\{\frac{4}{3}\}$
- 3)  $\sqrt{4x + 5} = 5$   
 A) {5}                                      B) {25}                                      C)  $\{\frac{15}{2}\}$                                       D)  $\{\frac{25}{4}\}$

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

4)  $\sqrt[3]{4x - 5} + 7 = 8$

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 5)  $\sqrt[3]{2x + 4} = 5$   
 A)  $\{\frac{121}{2}\}$                                       B)  $\{\frac{21}{2}\}$                                       C)  $\{\frac{125}{2}\}$                                       D)  $\{\frac{123}{2}\}$
- 6)  $\sqrt[5]{1 - x} = -2$   
 A) {33}                                      B) {-32}                                      C) {-33}                                      D) {32}
- 7)  $\sqrt[3]{1 + x} = -1$   
 A) {-2}                                      B) {2}                                      C) {-1}                                      D) {1}
- 8)  $x = 12\sqrt{x}$   
 A) {0, 144}                                      B) {0, 12}                                      C) {-144, 144}                                      D) {-12, 12}

$$9) \sqrt{6x + 27} = x$$

A) {9}

B) {-3, 9}

C)  $\{-\frac{27}{5}\}$

D) no real solution

$$10) \sqrt{16x - 16} = x + 3$$

A) {5}

B) {-4}

C) {-5}

D) {7}

$$11) \sqrt{x + 7} + \sqrt{x} = 3$$

A)  $\{\frac{1}{9}\}$

B) {4}

C) {1}

D) no real solution

$$12) \sqrt{x^2 - 3x + 16} = x + 1$$

A) {3}

B) {-3}

C)  $\{-\frac{3}{2}\}$

D) {4}

$$13) \sqrt{x^2 - 2x + 66} = x + 4$$

A) {5}

B) {-5}

C) {9}

D) {1}

$$14) \sqrt{x^2 + 2} - \sqrt{2x + 5} = 0$$

A) {3, -1}

B) {-3, 1}

C) {3}

D) no real solution

$$15) \sqrt{2x + 3} - \sqrt{x + 1} = 1$$

A) {3, -1}

B) {3}

C) {-3, -1}

D) no real solution

$$16) \sqrt{2x + 5} - \sqrt{x - 2} = 3$$

A) {2, 38}

B) {3, 8}

C) {2}

D) {-2}

$$17) \sqrt{3x + 10} - \sqrt{x + 2} = 2$$

A) {-2, 2}

B) {2}

C) {-3}

D) {-2}

$$18) \sqrt{2 - 3\sqrt{x}} = 6$$

A)  $\{\sqrt{\frac{34}{3}}\}$

B)  $\{\sqrt{-\frac{34}{3}}\}$

C)  $\{\sqrt{\frac{2}{3}}\}$

D) no real solution

$$19) (3x - 7)^{1/2} = 4$$

A)  $\{\frac{23}{3}\}$

B)  $\{\frac{22}{3}\}$

C)  $\{\frac{11}{3}\}$

D) no real solution

$$20) (3x + 2)^{1/2} = 3$$

A)  $\{\frac{7}{3}\}$

B) {3}

C)  $\{-\frac{2}{3}\}$

D) {6}

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

$$21) \sqrt[3]{4x - 5} + 7 = 8$$

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

22)  $(4x + 5)^{1/3} = -4$

A)  $\{-\frac{69}{4}\}$

B)  $\{\frac{11}{4}\}$

C)  $\{-16\}$

D)  $\{-\frac{68}{5}\}$

23)  $(x + 3)^{1/3} = -2$

A)  $\{-11\}$

B)  $\{1\}$

C)  $\{-9\}$

D) no real solution

24)  $(x^2 + 4)^{1/2} = 7$

A)  $\{3\sqrt{5}, -3\sqrt{5}\}$

B)  $\{45, -45\}$

C)  $\{\sqrt{3}\}$

D)  $\{3\}$

25)  $x^{3/2} - 4x^{1/2} = 0$

A)  $\{0, 4\}$

B)  $\{0, 16\}$

C)  $\{2\}$

D)  $\{\sqrt{2}\}$

26)  $x^{5/4} - 4x^{1/4} = 0$

A)  $\{0, 4\}$

B)  $\{-4, 0, 4\}$

C)  $\{0, 2\}$

D)  $\{0\}$

## 2 Solve Equations Quadratic in Form

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Find the real solutions of the equation.**

1)  $x^4 - 10x^2 + 9 = 0$

A)  $\{-1, 1, -3, 3\}$

B)  $\{-3, 3\}$

C)  $\{-9, 9\}$

D)  $\{-10, 10\}$

2)  $5x^4 + 13x^2 - 6 = 0$

A)  $\{-\sqrt{\frac{2}{5}}, \sqrt{\frac{2}{5}}\}$

B)  $\{-\frac{2}{5}, \frac{2}{5}\}$

C)  $\{-\sqrt{\frac{3}{5}}, \sqrt{\frac{3}{5}}\}$

D)  $\{-\sqrt{3}, \sqrt{3}\}$

3)  $x^6 - 26x^3 - 27 = 0$

A)  $\{3, -1\}$

B)  $\{27\}$

C)  $\{3\}$

D)  $\{-3, 1\}$

4)  $2(x + 1)^2 + 9(x + 1) + 9 = 0$

A)  $\{-\frac{5}{2}, -4\}$

B)  $\{1, 2\}$

C)  $\{-\frac{3}{2}, -4\}$

D)  $\{-\frac{5}{2}, -3\}$

5)  $(3x - 3)^2 - 6(3x - 3) + 8 = 0$

A)  $\{\frac{7}{3}, \frac{5}{3}\}$

B)  $\{-\frac{7}{3}, -\frac{5}{3}\}$

C)  $\{\frac{1}{3}, -\frac{1}{3}\}$

D)  $\{-\frac{1}{3}, \frac{1}{3}\}$

6)  $(x - 4)^2 + 3(x - 4) - 18 = 0$

A)  $\{-2, 7\}$

B)  $\{-7, 2\}$

C)  $\{-6, 1\}$

D)  $\{-1, 6\}$

7)  $x + \sqrt{x} = 90$

A)  $\{81\}$

B)  $\{9\}$

C)  $\{10\}$

D)  $\{100\}$

8)  $x + 8x^{1/2} + 7 = 0$

A)  $\{196, 484\}$

B)  $\{14, -22\}$

C)  $\{324\}$

D) no real solution

9)  $x^{1/2} - 7x^{1/4} + 12 = 0$

A) {81, 256}

B) {9, 16}

C) {3, 4}

D) {-3, -4}

10)  $x^2 + 5x - \sqrt{x^2 + 5x} = 6$

A)  $\left\{\frac{-5 + \sqrt{61}}{2}, \frac{-5 - \sqrt{61}}{2}\right\}$

B) {25, -25}

C) {2}

D) {5}

11)  $\frac{1}{(x-2)^2} - \frac{2}{x-2} = 3$

A)  $\left\{1, \frac{7}{3}\right\}$

B)  $\left\{-1, \frac{1}{3}\right\}$

C)  $\left\{1, \frac{1}{3}\right\}$

D)  $\left\{-1, \frac{7}{3}\right\}$

12)  $2 + \frac{5}{7x-1} = \frac{-2}{(7x-1)^2}$

A)  $\left\{-\frac{1}{7}, \frac{1}{14}\right\}$

B)  $\left\{-2, -\frac{1}{2}\right\}$

C)  $\left\{-\frac{1}{7}, 0\right\}$

D)  $\left\{-\frac{1}{7}, -\frac{1}{14}\right\}$

13)  $5x^{-2} - 14x^{-1} - 3 = 0$

A)  $\left\{-5, \frac{1}{3}\right\}$

B)  $\left\{5, \frac{1}{3}\right\}$

C)  $\left\{-\frac{1}{5}, -3\right\}$

D)  $\left\{-\frac{1}{5}, 3\right\}$

14)  $x^{2/3} - 5x^{1/3} + 6 = 0$

A) {8, 27}

B) {2, 3}

C) {-3, -2}

D) {-27, -8}

15)  $x^{2/3} - 7x^{1/3} + 12 = 0$

A) {27, 64}

B) {3, 4}

C) {-4, -3}

D) {-64, -27}

**Find the real solutions of the equation. Use a calculator to express the solutions rounded to two decimal places.**

16)  $\pi(1+x)^2 - 5 = 2(1+x)$

A) {0.62, -1.98}

B) {-0.62, 0.82}

C) {-1.62, -0.62}

D) {-0.62, -0.18}

17)  $x^{2/5} - 3x^{1/5} - 4 = 0$

A) {-1, 1024}

B) {-1, 4}

C) {-1, 1.32}

D) {-1}

**Solve the problem.**

18) If  $k = \frac{x+3}{x-3}$  and  $k^2 - 4k = 21$ , find x.

A)  $\left\{4, \frac{3}{2}\right\}$

B)  $\left\{\frac{21}{4}, \frac{3}{2}\right\}$

C)  $\left\{4, \frac{1}{4}\right\}$

D)  $\left\{\frac{24}{7}, \frac{3}{2}\right\}$

19) For a cone, the formula  $r = \sqrt{\frac{3V}{\pi h}}$  describes the relationship between the radius r of the base, the volume V, and the height h. Find the volume if the radius is 3 inches and the cone is 9 inches high. (Use 3.14 as an approximation for  $\pi$ , and round to the nearest tenth.)

A) 84.8 cubic in.

B) 28.3 cubic in.

C) 763.0 cubic in.

D) 9.4 cubic in.

- 20) The formula  $v = \sqrt{2.5r}$  can be used to estimate the maximum safe velocity  $v$ , in miles per hour, at which a car can travel along a curved road with a radius of curvature  $r$ , in feet. To the nearest whole number, find the radius of curvature if the maximum safe velocity is 15 miles per hour.
- A) 90 ft                                      B) 563 ft                                      C) 36 ft                                      D) 225 ft
- 21) The function  $f(x) = 6.75\sqrt{x} + 12$  models the amount,  $f(x)$ , in billions of dollars of new student loans  $x$  years after 1993. According to the model, in what year is the amount loaned expected to reach \$32.25 billion?
- A) 2002                                      B) 2005                                      C) 2007                                      D) 2006
- 22) When an object is dropped to the ground from a height of  $h$  meters, the time it takes for the object to reach the ground is given by the equation  $t = \sqrt{\frac{h}{4.9}}$ , where  $t$  is measured in seconds. Solve the equation for  $h$ .
- Use the result to determine the height from which an object was dropped if it hits the ground after falling for 4 seconds.
- A)  $h = 4.9t^2$ ; 78.4 meters                                      B)  $h = 24.01t$ ; 96 meters  
 C)  $h = 24.01t^2$ ; 384.2 meters                                      D)  $h = 4.9t$ ; 19.6 meters
- 23) The maximum number of volts,  $E$ , that can be placed across a resistor is given by the formula  $E = \sqrt{PR}$ , where  $P$  is the number of watts of power that the resistor can absorb and  $R$  is the resistance of the resistor in ohms. Solve this equation for  $R$ . Use the result to determine the resistance of a resistor if  $P$  is  $\frac{1}{8}$  watts and  $E$  is 20 volts.
- A)  $R = \frac{E^2}{P}$ ; 3200 ohms                                      B)  $R = \frac{E^2}{P^2}$ ; 25,600 ohms  
 C)  $R = E^2P$ ; 3200 ohms                                      D)  $R = E^2P^2$ ; 25,600 ohms
- 24) The number of centimeters,  $d$ , that a spring is compressed from its natural, uncompressed position is given by the formula  $d = \sqrt{\frac{2W}{k}}$ , where  $W$  is the number of joules of work done to move the spring and  $k$  is the spring constant. Solve this equation for  $W$ . Use the result to determine the work needed to move a spring 6 centimeters if it has a spring constant of 0.6.
- A)  $W = \frac{d^2k}{2}$ ; 10.8 joules                                      B)  $W = \frac{d^2k^2}{4}$ ; 3.2 joules  
 C)  $W = \frac{2d^2}{k}$ ; 120 joules                                      D)  $W = 2d^2k$ ; 43.2 joules

### 3 Solve Equations by Factoring

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Find the real solutions of the equation by factoring.**

- 1)  $x^3 - 49x = 0$
- A) {0, 7, -7}                                      B) {0, 7}                                      C) {0, -7}                                      D) {0, 49}
- 2)  $5x^5 = 45x^3$
- A) {-3, 0, 3}                                      B)  $\{-3\sqrt{5}, 0, 3\sqrt{5}\}$                                       C) {-3, 3}                                      D) {0}

3)  $x^3 + 5x^2 - 4x - 20 = 0$

A)  $\{-2, 2, -5\}$

B)  $\{4, -5\}$

C)  $\{2, -5\}$

D)  $\{-2, 2, 5\}$

4)  $x^3 + 4x^2 + 4x + 16 = 0$

A)  $\{-4\}$

B)  $\{4\}$

C)  $\{-2, 2, -4\}$

D) no real solution

5)  $5x^4 - 320x^2 = 0$

A)  $\{-8, 0, 8\}$

B)  $\{-8\sqrt{5}, 0, 8\sqrt{5}\}$

C)  $\{-8, 8\}$

D)  $\{0\}$

6)  $3x^4 = 24x$

A)  $\{0, 2\}$

B)  $\{-2, 0, 2\}$

C)  $\{0, 3, 2\}$

D)  $\{0\}$

7)  $x^3 + 4x^2 - 12x = 0$

A)  $\{0, 2, -6\}$

B)  $\{2, -6\}$

C)  $\{0, -2, 6\}$

D)  $\{-2, 6\}$

8)  $x^3 + 6x^2 - x - 6 = 0$

A)  $\{-1, 1, -6\}$

B)  $\{1, -6, 6\}$

C)  $\{-6, 6\}$

D)  $\{36\}$

9)  $10x^3 + 70x^2 + 120x = 0$

A)  $\{0, -4, -3\}$

B)  $\{-4, -3\}$

C)  $\{0, 4, 3\}$

D)  $\{-\frac{1}{4}, -3\}$

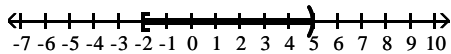
## 1.5 Solving Inequalities

### 1 Use Interval Notation

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

Express the graph shown using interval notation. Also express it as an inequality involving  $x$ .

1)



A)  $[-2, 5]$

$-2 \leq x < 5$

B)  $(-2, 5)$

$-2 < x < 5$

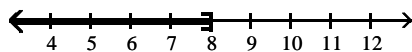
C)  $[-2, 5]$

$-2 \leq x \leq 5$

D)  $(-2, 5]$

$-2 < x \leq 5$

2)



A)  $(-\infty, 8]$

$x \leq 8$

B)  $(-\infty, 8)$

$x < 8$

C)  $[8, \infty)$

$x \geq 8$

D)  $(8, \infty)$

$x > 8$

3)



A)  $(2, \infty)$

$x > 2$

B)  $(-\infty, 2]$

$x \leq 2$

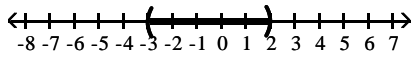
C)  $[2, \infty)$

$x \geq 2$

D)  $(-\infty, 2)$

$x < 2$

4)



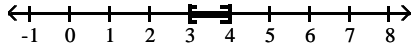
A)  $(-3, 2)$   
 $-3 < x < 2$

B)  $[-3, 2]$   
 $-3 \leq x \leq 2$

C)  $(-3, 2]$   
 $-3 < x \leq 2$

D)  $[-3, 2)$   
 $-3 \leq x < 2$

5)



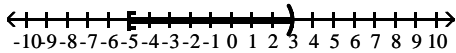
A)  $[3, 4]$   
 $3 \leq x \leq 4$

B)  $(3, 4)$   
 $3 < x < 4$

C)  $[3, 4)$   
 $3 \leq x < 4$

D)  $(3, 4]$   
 $3 < x \leq 4$

6)



A)  $[-5, 3)$   
 $-5 \leq x < 3$

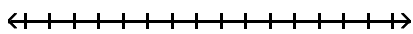
B)  $(-5, 3]$   
 $-5 < x \leq 3$

C)  $(-\infty, 3)$   
 $x < 3$

D)  $[-5, 3]$   
 $-5 \leq x \leq 3$

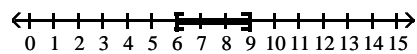
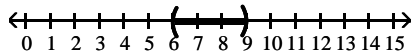
Write the inequality using interval notation, and illustrate the inequality using the real number line.

7)  $6 < x < 9$



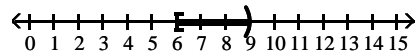
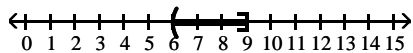
A)  $(6, 9)$

B)  $[6, 9]$

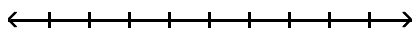


C)  $(6, 9]$

D)  $[6, 9)$

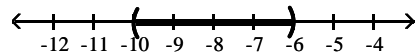
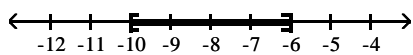


8)  $-10 \leq x \leq -6$



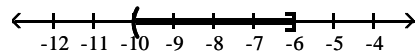
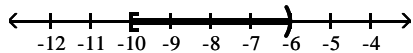
A)  $[-10, -6]$

B)  $(-10, -6)$

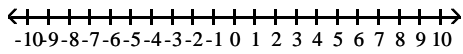


C)  $[-10, -6)$

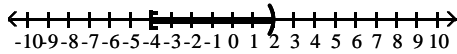
D)  $(-10, -6]$



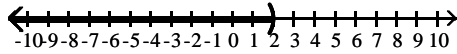
9)  $-4 \leq x < 2$



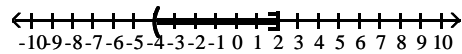
A)  $[-4, 2)$



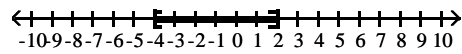
C)  $(-\infty, 2)$



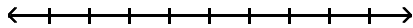
B)  $(-4, 2]$



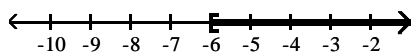
D)  $[-4, 2]$



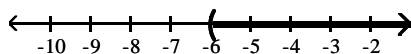
10)  $t \geq -6$



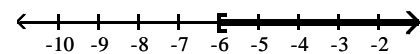
A)  $[-6, \infty)$



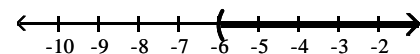
C)  $(-6, \infty)$



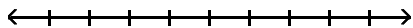
B)  $[-6, \infty]$



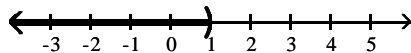
D)  $(-6, \infty]$



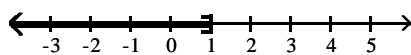
11)  $y < 1$



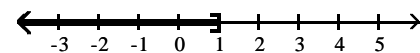
A)  $(-\infty, 1)$



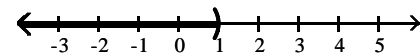
C)  $[-\infty, 1]$



B)  $(-\infty, 1]$

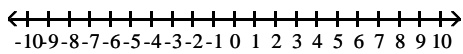


D)  $[-\infty, 1)$

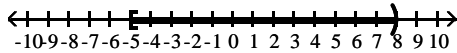


Write the interval as an inequality involving  $x$ , and illustrate the inequality using the real number line.

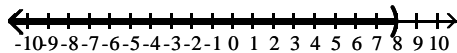
12)  $[-5, 8)$



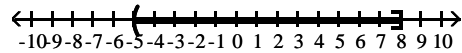
A)  $-5 \leq x < 8$



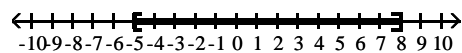
C)  $x < 8$



B)  $-5 < x \leq 8$

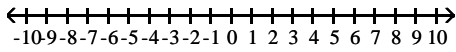


D)  $-5 \leq x < 8$

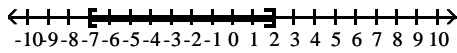




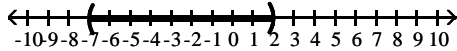
13)  $[-7, 2]$



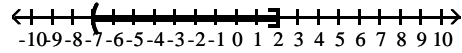
A)  $-7 \leq x \leq 2$



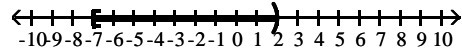
C)  $-7 < x < 2$



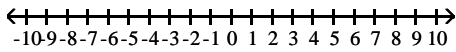
B)  $-7 < x \leq 2$



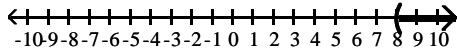
D)  $-7 \leq x < 2$



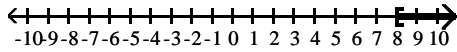
14)  $(8, \infty)$



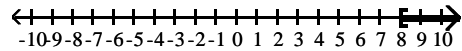
A)  $x > 8$



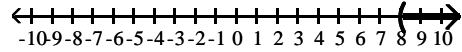
C)  $x > 8$



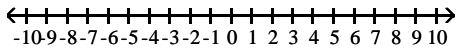
B)  $x \geq 8$



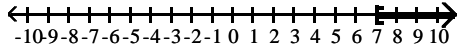
D)  $x \geq 8$



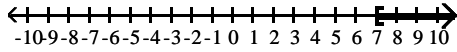
15)  $[7, \infty)$



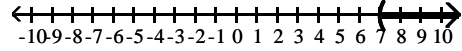
A)  $x \geq 7$



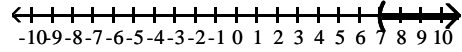
C)  $x > 7$



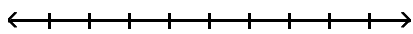
B)  $x > 7$



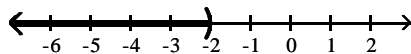
D)  $x \geq 7$



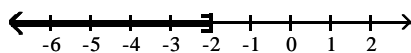
16)  $(-\infty, -2)$



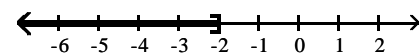
A)  $x < -2$



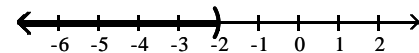
C)  $x < -2$



B)  $x \leq -2$



D)  $x \leq -2$



## 2 Use Properties of Inequalities

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Write the inequality obtained by performing the indicated operation on the given inequality.**

1) Subtract 4 from each side of the inequality  $5 - 3x \geq 1$ .

A)  $1 - 3x \geq -3$

B)  $1 - 3x \leq -3$

C)  $1 - 7x \geq -3$

D)  $1 - 7x \leq -3$

2) Multiply each side of the inequality  $4 + 5x > -3$  by 3.

A)  $12 + 15x > -9$

B)  $12 + 15x < -9$

C)  $12 + 5x > -9$

D)  $12 + 5x < -9$

**Fill in the blank with the correct inequality symbol.**

3) If  $x < 14$ , then  $x - 14$  \_\_\_\_\_ 0.

A)  $<$

B)  $>$

C)  $\leq$

D)  $\geq$

4) If  $x < -3$ , then  $x + 3$  \_\_\_\_\_ 0.

A)  $<$

B)  $>$

C)  $\leq$

D)  $\geq$

5) If  $x > -3$ , then  $4x$  \_\_\_\_\_  $-12$ .

A)  $>$

B)  $<$

C)  $\geq$

D)  $\leq$

6) If  $x < 5$ , then  $-3x$  \_\_\_\_\_  $-15$ .

A)  $>$

B)  $<$

C)  $\geq$

D)  $\leq$

7) If  $x > -3$ , then  $-6x$  \_\_\_\_\_  $18$ .

A)  $<$

B)  $>$

C)  $\geq$

D)  $\leq$

8) If  $-4x < -20$ , then  $x$  \_\_\_\_\_  $5$ .

A)  $>$

B)  $<$

C)  $\geq$

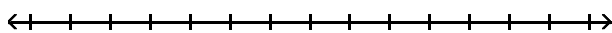
D)  $\leq$

## 3 Solve Inequalities

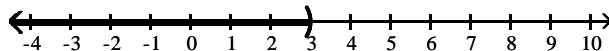
**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the inequality. Express your answer using interval notation.**

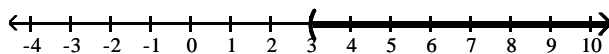
1)  $x + 3 < 6$



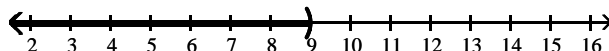
A)  $(-\infty, 3)$



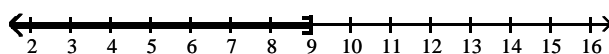
B)  $(3, \infty)$



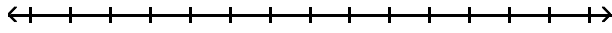
C)  $(-\infty, 9)$



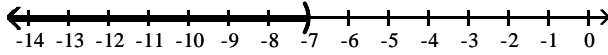
D)  $(-\infty, 9]$



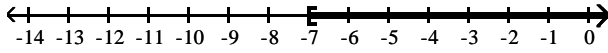
2)  $x + 2 < -5$



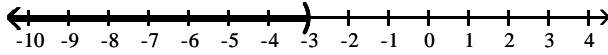
A)  $(-\infty, -7)$



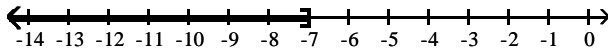
B)  $(-7, \infty)$



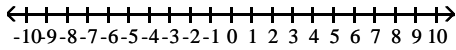
C)  $(-\infty, -3)$



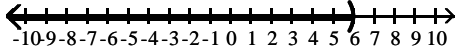
D)  $(-\infty, -7]$



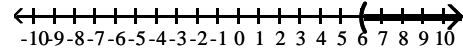
3)  $2x + 4 < 16$



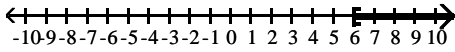
A)  $(-\infty, 6)$



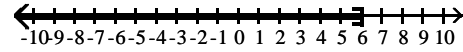
B)  $(6, \infty)$



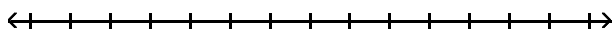
C)  $[6, \infty)$



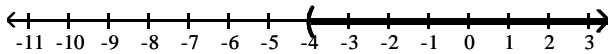
D)  $(-\infty, 6]$



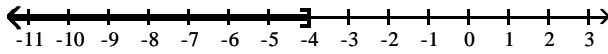
4)  $6x + 1 > 5x - 3$



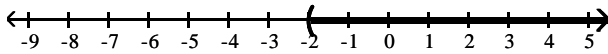
A)  $(-4, \infty)$



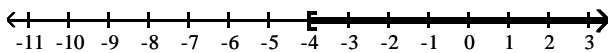
B)  $(-\infty, -4]$



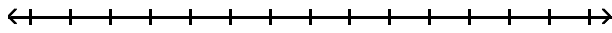
C)  $(-2, \infty)$



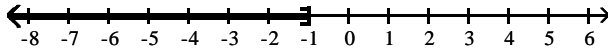
D)  $[-4, \infty)$



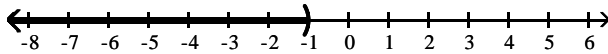
5)  $-2x + 3 \leq -3x + 2$



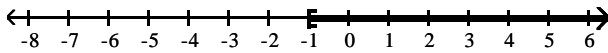
A)  $(-\infty, -1]$



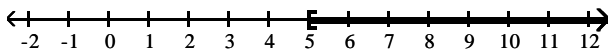
B)  $(-\infty, -1)$



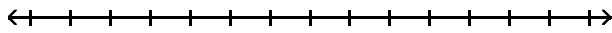
C)  $[-1, \infty)$



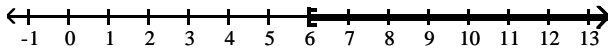
D)  $[5, \infty)$



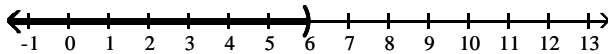
6)  $-5x + 5 \geq -6x + 11$



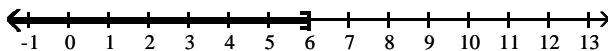
A)  $[6, \infty)$



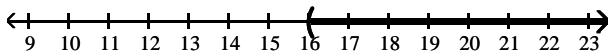
B)  $(-\infty, 6)$



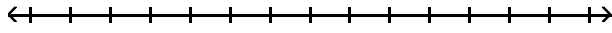
C)  $(-\infty, 6]$



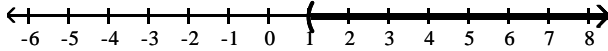
D)  $(16, \infty)$



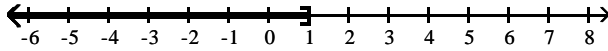
7)  $3x + 7 > 2x + 8$



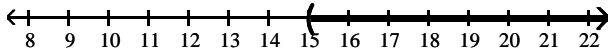
A)  $(1, \infty)$



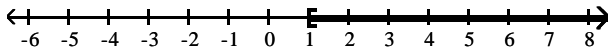
B)  $(-\infty, 1]$



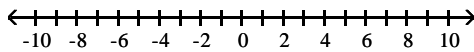
C)  $(15, \infty)$



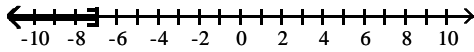
D)  $[1, \infty)$



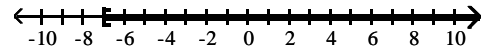
8)  $5 - 3(1 - x) \leq -19$



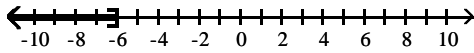
A)  $(-\infty, -7]$



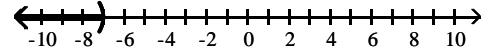
B)  $[-7, \infty)$



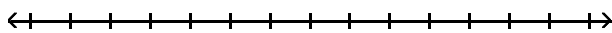
C)  $(-\infty, -6]$



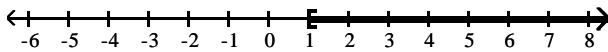
D)  $(-\infty, -7)$



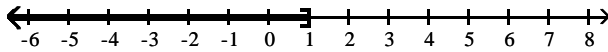
9)  $-36x - 30 \leq -6(5x + 6)$



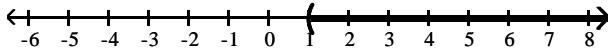
A)  $[1, \infty)$



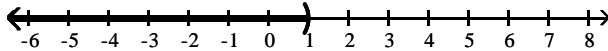
B)  $(-\infty, 1]$



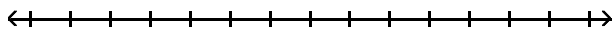
C)  $[1, \infty)$



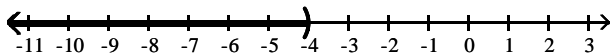
D)  $(-\infty, 1)$



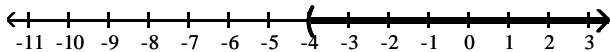
10)  $-4(6x + 1) < -28x - 20$



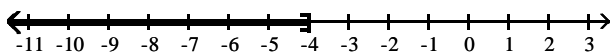
A)  $(-\infty, -4)$



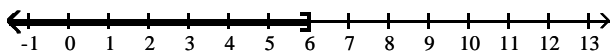
B)  $(-4, \infty)$



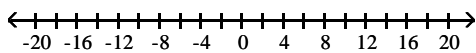
C)  $(-\infty, -4]$



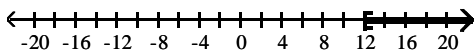
D)  $(-\infty, 6]$



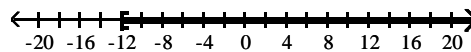
11)  $\frac{x}{2} \geq 5 + \frac{x}{12}$



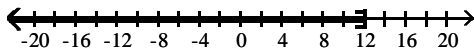
A)  $[12, \infty)$



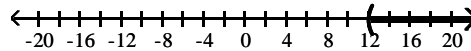
B)  $[-12, \infty)$



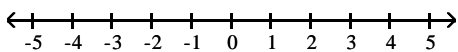
C)  $(-\infty, 12]$



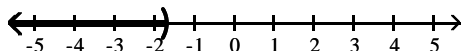
D)  $(12, \infty)$



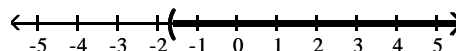
12)  $(3x + 5)^{-1} < 0$



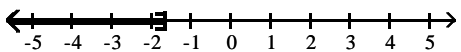
A)  $(-\infty, -\frac{5}{3})$



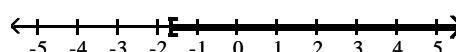
B)  $(-\frac{5}{3}, \infty)$



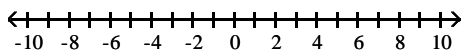
C)  $(-\infty, -\frac{5}{3}]$



D)  $[-\frac{5}{3}, \infty)$

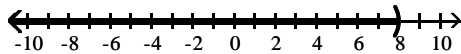


$$13) \left(4 - \frac{1}{2}x\right)^{-1/2} > 0$$

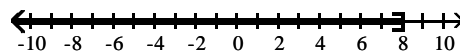


A)  $(-\infty, 8)$

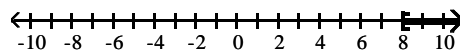
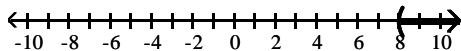
B)  $(-\infty, 8]$



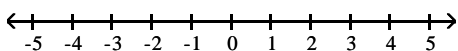
C)  $(8, \infty)$



D)  $[8, \infty)$

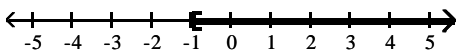


$$14) x(4x - 1) \leq (2x + 4)^2$$

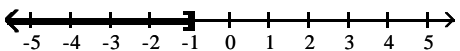


A)  $[-\frac{16}{17}, \infty)$

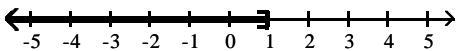
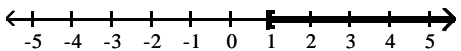
B)  $(-\infty, -\frac{16}{17}]$



C)  $[\frac{16}{17}, \infty)$



D)  $(-\infty, -\frac{16}{17}]$

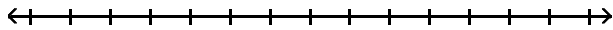


#### 4 Solve Combined Inequalities

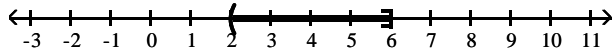
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the inequality. Express your answer using interval notation.

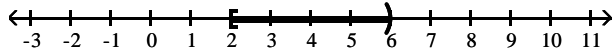
1)  $8 < 4x \leq 24$



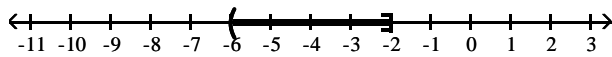
A)  $(2, 6]$



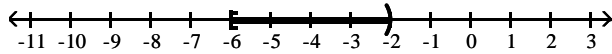
B)  $[2, 6)$



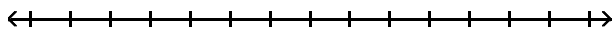
C)  $(-6, -2]$



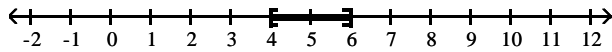
D)  $[-6, -2)$



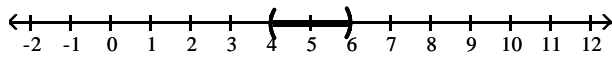
2)  $18 \leq 5x - 2 \leq 28$



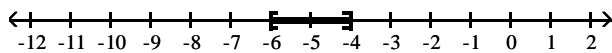
A)  $[4, 6]$



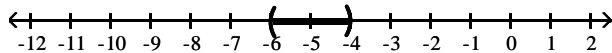
B)  $(4, 6)$



C)  $[-6, -4]$

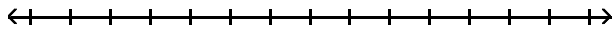


D)  $(-6, -4)$

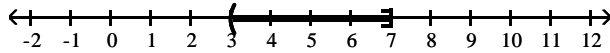




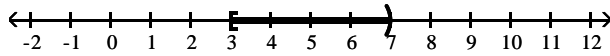
3)  $-36 \leq -5x - 1 < -16$



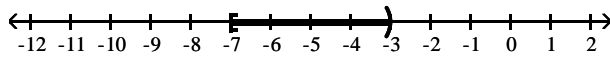
A)  $(3, 7]$



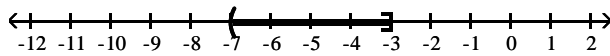
B)  $[3, 7)$



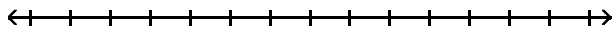
C)  $[-7, -3)$



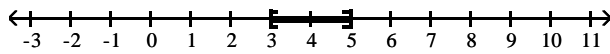
D)  $(-7, -3]$



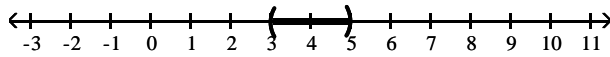
4)  $-12 \leq -3x + 3 \leq -6$



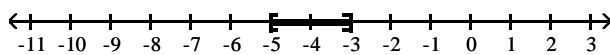
A)  $[3, 5]$



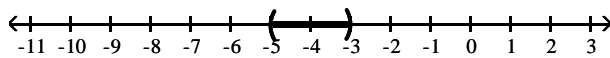
B)  $(3, 5)$



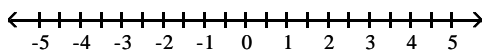
C)  $[-5, -3]$



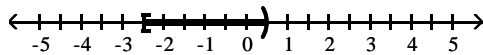
D)  $(-5, -3)$



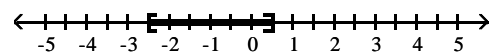
5)  $0 \leq \frac{2x + 5}{2} < 3$



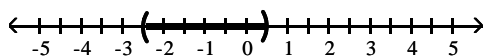
A)  $[-\frac{5}{2}, \frac{1}{2})$



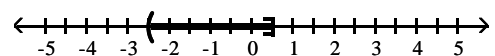
B)  $[-\frac{5}{2}, \frac{1}{2}]$



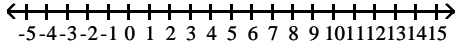
C)  $(-\frac{5}{2}, \frac{1}{2})$



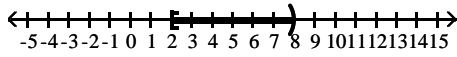
D)  $(-\frac{5}{2}, \frac{1}{2}]$



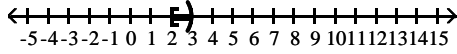
6)  $17 \leq \frac{9}{2}x + 8 < 44$



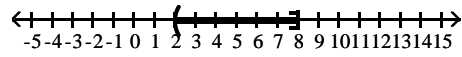
A)  $[2, 8)$



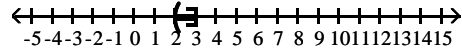
C)  $[2, 3)$



B)  $(2, 8]$

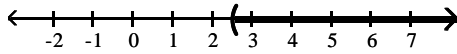


D)  $(2, 3]$

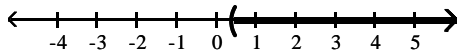


7)  $0 < \frac{1}{x} < \frac{2}{5}$

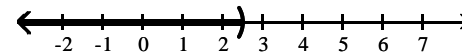
A)  $(\frac{5}{2}, \infty)$



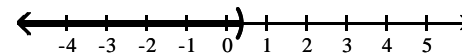
C)  $(\frac{2}{5}, \infty)$



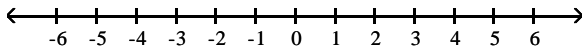
B)  $(-\infty, \frac{5}{2})$



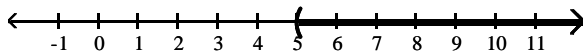
D)  $(-\infty, \frac{2}{5})$



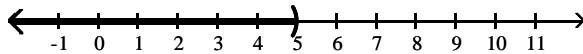
8)  $0 < (8x - 36)^{-1} < \frac{1}{4}$



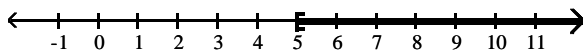
A)  $(5, \infty)$



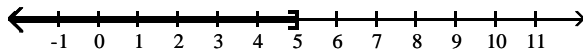
B)  $(-\infty, 5)$



C)  $[5, \infty)$



D)  $(-\infty, 5]$



Find a and b.

9) If  $-4 < x < -1$ , then  $a < \frac{2}{3}x < b$ .

A)  $a = -\frac{8}{3}, b = -\frac{2}{3}$

B)  $a = \frac{8}{3}, b = \frac{2}{3}$

C)  $a = -\frac{8}{3}, b = \frac{2}{3}$

D)  $a = \frac{8}{3}, b = -\frac{2}{3}$

10) If  $0 < 2x < 6$ , then  $a < x^2 < b$ .

A)  $a = 0, b = 9$

B)  $a = 0, b = 36$

C)  $a = 0, b = 16$

D)  $a = 0, b = 3$

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Solve the problem.**

11) What is the domain of the variable in the expression  $\sqrt{4x - 12}$  ?

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

12) In one city, the local cable TV company charges \$3.99 for each pay-per-view movie watched. In addition, each monthly bill contains a basic customer charge of \$28.50. If last month's bills ranged from a low of \$48.45 to a high of \$80.37, over what range did customers watch pay-per-view movies?

A) movies watched varied from 5 to 13 inclusive

B) movies watched varied from 4 to 12 inclusive

C) movies watched varied from 6 to 14 inclusive

D) movies watched varied from 4 to 14 inclusive

13) During the first five months of the year, Len earned commissions of \$2170, \$3680, \$3090, \$3840, and \$3090. If Len must have average monthly earnings of at least \$3140 in order to qualify for retirement benefits, what must he earn in the sixth month in order to qualify for benefits?

A) at least \$2970

B) at least \$3168

C) at least \$3140

D) at least \$3174

14) A real estate agent agrees to sell an office building according to the following commission schedule: \$33,000 plus 25% of the selling price in excess of \$700,000. Assuming that the office building will sell at some price between \$700,000 and \$1,100,000, inclusive, over what range does the agent's commission vary?

A) The commission will vary between \$33,000 and \$133,000, inclusive.

B) The commission will vary between \$34,000 and \$133,000, inclusive.

C) The commission will vary between \$33,000 and \$298,000, inclusive.

D) The commission will vary between \$208,000 and \$308,000, inclusive.

15) Jim has gotten scores of 66 and 75 on his first two tests. What score must he get on his third test to keep an average of 75 or better?

A) at least 84

B) at least 70.5

C) at least 72

D) at least 82

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

16) In his algebra class, Rob has scores of 79, 85, 81, and 65 on his first four tests. To get a grade of C, the average of the first five tests must be greater than or equal to 70 and less than 80. Solve an inequality to find the range of scores that Rob can earn on the fifth test to get a C.

17) Marianne is planning a shopping trip to buy birthday gifts for her son. She estimates that the total price of the items she plans to purchase will be between \$350 and \$400 inclusive. If sales are taxed at a rate of 8.375% in her area, what is the range of the amount of sales tax she should expect to pay on her purchases? If Marianne's budget for the shopping trip is \$425, will she necessarily be able to buy all the gifts that she has planned?

18) At Bargain Car Rental, the cost of renting an economy car for one day is \$19.95 plus 20 cents per mile. At Best Deal Car Rental, the cost of renting a similar car for one day is \$24.95 plus 15 cents per mile. Solve the inequality  $24.95 + 0.15x < 19.95 + 0.20x$  to find the range of miles driven such that Best Deal is a better deal than Bargain.

## 1.6 Equations and Inequalities Involving Absolute Value

### 1 Solve Equations Involving Absolute Value

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the equation.**

1)  $|x| = 3$

A)  $\{-3, 3\}$

B)  $\{3\}$

C)  $\{-3\}$

D)  $\{9\}$

2)  $|x| = -10$

A)  $\{10\}$

B)  $\{10, -10\}$

C)  $\{-10\}$

D) no solution

3)  $|x| + 10 = 5$

A)  $\{5\}$

B)  $\{5, -5\}$

C)  $\{-5\}$

D) no solution

4)  $|x + 9| = 6$

A)  $\{-15, -3\}$

B)  $\{15, -3\}$

C)  $\{3\}$

D) no solution

5)  $|4x + 7| = 2$

A)  $\{-\frac{5}{4}, -\frac{9}{4}\}$

B)  $\{-\frac{5}{7}, -\frac{9}{7}\}$

C)  $\{\frac{5}{4}, \frac{9}{4}\}$

D) no solution

6)  $|x + 9| = 0$

A)  $\{-9\}$

B)  $\{9, -9\}$

C)  $\{9\}$

D) no solution

7)  $3|x - 3| = 18$

A)  $\{9, -3\}$

B)  $\{3, -9\}$

C)  $\{3\}$

D) no solution

8)  $|2x + 3| + 3 = 7$

A)  $\{\frac{1}{2}, -\frac{7}{2}\}$

B)  $\{\frac{1}{3}, -\frac{7}{3}\}$

C)  $\{-\frac{1}{2}, \frac{7}{2}\}$

D) no solution

9)  $\left|\frac{4x + 12}{3}\right| = 4$

A)  $\{-6, 0\}$

B)  $\{-6, 6\}$

C)  $\{6, 0\}$

D) no solution

10)  $|3(x + 1) + 6| = 15$

A)  $\{-8, 2\}$

B)  $\{-6, 4\}$

C)  $\{-8, 0\}$

D)  $\{-6, 0\}$

11)  $|x^2 + 2x| = 0$

A)  $\{0, -2\}$

B)  $\{2, 0, -2\}$

C)  $\{2, 0\}$

D) no solution

12)  $|x^2 - 4x - 4| = 8$

A)  $\{-2, 2, 6\}$

B)  $\{2, 6\}$

C)  $\{-2, 2\}$

D)  $\{-2, 2, -6\}$

13)  $|2x^2 - x - 1| = 3$

A)  $\{\frac{1 - \sqrt{33}}{4}, \frac{1 + \sqrt{33}}{4}\}$

B)  $\{-\frac{1 - \sqrt{33}}{4}, -\frac{1 + \sqrt{33}}{4}\}$

C)  $\{\frac{1 - \sqrt{33}}{4}, -\frac{1 + \sqrt{33}}{4}\}$

D) no solution

- 14)  $|x^2 - 4x + 4| = 2$   
 A)  $\{2 - \sqrt{2}, 2 + \sqrt{2}\}$       B)  $\{2 - \sqrt{2}\}$       C)  $\{2 + \sqrt{2}\}$       D) no solution
- 15)  $|7x - 4| = |x - 3|$   
 A)  $\left\{\frac{1}{6}, \frac{7}{8}\right\}$       B)  $\left\{\frac{1}{6}, -\frac{5}{8}\right\}$       C)  $\left\{-\frac{1}{6}, -\frac{7}{8}\right\}$       D)  $\emptyset$
- 16)  $\left|\frac{11x + 44}{4}\right| = 11$   
 A)  $\{-8, 0\}$       B)  $\{-8, 8\}$       C)  $\{8, 0\}$       D)  $\emptyset$

## 2 Solve Inequalities Involving Absolute Value

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the inequality. Express your answer using interval notation.**

- 1)  $|x| < 1$   
 A)  $(-1, 1)$       B)  $(-\infty, -1)$  or  $(1, \infty)$   
 C)  $[0, 1]$       D)  $(-\infty, -1)$  and  $(1, \infty)$
- 2)  $|x| < -11$   
 A)  $(-11, 11)$       B)  $\{-11\}$       C)  $(-\infty, \infty)$       D) no solution
- 3)  $|x| > -5$   
 A)  $(-5, 5)$       B)  $\{5\}$       C)  $(-\infty, \infty)$       D) no solution
- 4)  $|5x - 4| + 7 > -1$   
 A)  $(-\infty, -\frac{4}{5})$  or  $(\frac{12}{5}, \infty)$       B)  $(-\frac{4}{5}, \frac{12}{5})$   
 C)  $(-\infty, \infty)$       D) no solution
- 5)  $|x - 2| + 3 \leq 8$   
 A)  $[-3, 7]$       B)  $(-\infty, -3)$  or  $(7, \infty)$       C)  $[3, 8]$       D) no solution
- 6)  $|3x + 2| + 8 < 11$   
 A)  $(-\frac{5}{3}, \frac{1}{3})$       B)  $(-\infty, -\frac{5}{3})$  or  $(\frac{1}{3}, \infty)$       C)  $(-\infty, -\frac{5}{3})$       D) no solution
- 7)  $|5x - 1| \geq 5$   
 A)  $(-\infty, -\frac{4}{5}]$  or  $[\frac{6}{5}, \infty)$       B)  $(-\infty, -\frac{4}{5})$  or  $(\frac{6}{5}, \infty)$       C)  $(-\frac{4}{5}, \frac{6}{5})$       D)  $[-\frac{4}{5}, \frac{6}{5}]$
- 8)  $|5x + 2| > 3$   
 A)  $(-\infty, -1)$  or  $(\frac{1}{5}, \infty)$       B)  $(-\infty, -1]$  or  $[\frac{1}{5}, \infty)$       C)  $[-1, \frac{1}{5}]$       D)  $(-1, \frac{1}{5})$
- 9)  $|5 - 7x| > 9$   
 A)  $(-\infty, -\frac{4}{7})$  or  $(2, \infty)$       B)  $(-\infty, -\frac{4}{7})$  or  $(\frac{4}{7}, \infty)$       C)  $(-\frac{4}{7}, 2)$       D)  $(-\frac{4}{7}, \infty)$  or  $(2, \infty)$

10)  $|4x + 5| + |-7| \leq 11$

A)  $[-\frac{9}{4}, -\frac{1}{4}]$

B)  $(-\infty, -\frac{9}{4}]$  or  $[-\frac{1}{4}, \infty)$

C)  $[\frac{1}{4}, \frac{9}{4}]$

D)  $(-\infty, \frac{1}{4}]$  or  $[\frac{9}{4}, \infty)$

11)  $|x - 7| < 0$

A)  $(-7, 7)$

B)  $(-\infty, 7)$

C)  $(-7, \infty)$

D) no solution

12)  $|x + 1| \leq 0$

A)  $\{-1\}$

B)  $\{1\}$

C)  $(-\infty, -1)$

D) no solution

**Solve the inequality. Express your answer in set notation.**

13)  $x^2 < 81$

A)  $\{x \mid 9 < x < 9\}$

B)  $\{x \mid x < 9\}$

C)  $\{x \mid -9 \leq x \leq 9\}$

D)  $\{x \mid x < -9$  or  $x > 9\}$

14)  $x^2 \geq 4$

A)  $\{x \mid x \leq -2$  or  $x \geq 2\}$

B)  $\{x \mid x < -2$  or  $x > 2\}$

C)  $\{x \mid -2 \leq x \leq 2\}$

D)  $\{x \mid x < -2$  or  $x \geq 2\}$

15)  $x^2 > 36$

A)  $\{x \mid x < -6$  or  $x > 6\}$

B)  $\{x \mid x \leq -6$  or  $x \geq 6\}$

C)  $\{x \mid -6 \leq x \leq 6\}$

D)  $\{x \mid x < -6$  or  $x \geq 6\}$

16)  $x^2 \leq 9$

A)  $\{x \mid -3 \leq x \leq 3\}$

B)  $\{x \mid x \leq 3\}$

C)  $\{x \mid -3 < x < 3\}$

D)  $\{x \mid x \leq -3$  or  $x \geq 3\}$

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Solve the problem.**

17) Express that  $x$  differs from  $-7$  by more than 3 as an inequality involving absolute value. Solve for  $x$ .

18) A landscaping company sells 40-pound bags of top soil. The actual weight  $x$  of a bag, however, may differ from the advertised weight by as much as 0.75 pound. Write an inequality involving absolute value that expresses the relationship between the actual weight  $x$  of a bag and 40 pounds. Over what range may the weight of a 40-pound bag of top soil vary?

19) Chi is assigned to construct a triangle with the measure  $b$  of the base and the measure  $h$  of the height differing by no more than 0.2 centimeters. Express the relationship between  $b$  and  $h$  as an inequality involving absolute value.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Find  $a$  and  $b$ .**

20) If  $|x + 1| < 3$ , then  $a < x + 3 < b$ .

A)  $a = -1, b = 5$

B)  $a = 0, b = 6$

C)  $a = -4, b = 2$

D)  $a = -6, b = 0$

21) If  $|x + 1| \leq 2$ , then  $a \leq \frac{1}{x+5} \leq b$ .

A)  $a = \frac{1}{6}, b = \frac{1}{2}$

B)  $a = \frac{1}{2}, b = \frac{1}{6}$

C)  $a = \frac{1}{6}, b = \frac{1}{8}$

D)  $a = \frac{1}{8}, b = \frac{1}{6}$

## 1.7 Problem Solving: Interest, Mixture, Uniform Motion, Constant Rate Job Applications

### 1 Translate Verbal Descriptions into Mathematical Expressions

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Translate the sentence into a mathematical equation. Be sure to identify the meaning of all symbols.**

1) The surface area of a sphere is  $4\pi$  times the square of the radius.

A) If  $S$  represents the surface area and  $r$  the radius, then  $S = 4\pi r^2$ .

B) If  $S$  represents the surface area and  $r$  the radius, then  $S = 4\pi r$ .

C) If  $S$  represents the surface area and  $r$  the radius, then  $S = \pi r^2$ .

D) If  $S$  represents the surface area and  $r$  the radius, then  $4\pi S = r^2$ .

2) The volume of a right prism is the area of the base times the height of the prism.

A) If  $V$  represents the volume,  $B$  the area of the base, and  $h$  the height, then  $V = Bh$ .

B) If  $V$  represents the volume,  $B$  the area of the base, and  $h$  the height, then  $V = B + h$ .

C) If  $V$  represents the volume,  $B$  the area of the base, and  $h$  the height, then  $V = \frac{B}{h}$ .

D) If  $V$  represents the volume,  $B$  the area of the base, and  $h$  the height, then  $V = \frac{1}{2}Bh$ .

3) Speed is measured by distance divided by time.

A) If  $S$  represents speed,  $d$  distance, and  $t$  time, then  $S = \frac{d}{t}$ .

B) If  $S$  represents speed,  $d$  distance, and  $t$  time, then  $S = \frac{t}{d}$ .

C) If  $S$  represents speed,  $d$  distance, and  $t$  time, then  $d = \frac{S}{t}$ .

D) If  $S$  represents speed,  $d$  distance, and  $t$  time, then  $t = \frac{S}{d}$ .

4) Momentum is the product of the mass of an object and its velocity.

A) If  $M$  represents momentum,  $m$  mass, and  $v$  velocity, then  $M = mv$ .

B) If  $M$  represents momentum,  $m$  mass, and  $v$  velocity, then  $M = \frac{1}{2}mv$ .

C) If  $M$  represents momentum,  $m$  mass, and  $v$  velocity, then  $M = \frac{m}{v}$ .

D) If  $M$  represents momentum,  $m$  mass, and  $v$  velocity, then  $M = m + v$ .

- 5) The force of gravity between two objects is the gravitational constant times the product of their masses divided by the square of the distance between them.
- A) If  $F$  is the force of gravity,  $G$  the gravitational constant,  $m_1$  the mass of one object,  $m_2$  the mass of the second, and  $d$  the distance between them, then  $F = G \frac{m_1 m_2}{d^2}$ .
- B) If  $F$  is the force of gravity,  $G$  the gravitational constant,  $m_1$  the mass of one object,  $m_2$  the mass of the second, and  $d$  the distance between them, then  $FG = \frac{m_1 m_2}{d^2}$ .
- C) If  $F$  is the force of gravity,  $G$  the gravitational constant,  $m_1$  the mass of one object,  $m_2$  the mass of the second, and  $d$  the distance between them, then  $F = G \frac{m_1 m_2}{d}$ .
- D) If  $F$  is the force of gravity,  $G$  the gravitational constant,  $m_1$  the mass of one object,  $m_2$  the mass of the second, and  $d$  the distance between them, then  $F = G \frac{m_1 + m_2}{d^2}$ .
- 6) The total cost of producing refrigerators in one production line is \$4100 plus \$200 per unit produced.
- A) If  $C$  is the total cost and  $x$  is the number of units produced, then  $C = 4100 + 200x$ .
- B) If  $C$  is the total cost and  $x$  is the number of units produced, then  $C = 4100x + 200$ .
- C) If  $C$  is the total cost and  $x$  is the number of units produced, then  $C = (4100 + 200)x$ .
- D) If  $C$  is the total cost and  $x$  is the number of units produced, then  $C = \frac{4100}{200x}$ .
- 7) The profit derived from the sale of  $x$  video cameras is \$450 per unit less the sum of \$2200 costs plus \$200 per unit.
- A) If  $P$  is profit and  $x$  the units sold, then  $P = 450x - (2200 + 200x)$  or  $P = 250x - 2200$ .
- B) If  $P$  is profit and  $x$  the units sold, then  $P = 450x - (2200 - 200x)$  or  $P = 650x - 2200$ .
- C) If  $P$  is profit and  $x$  the units sold, then  $P = \frac{450}{x} - (2200 + \frac{200}{x})$  or  $P = \frac{250}{x} - 2200$ .
- D) If  $P$  is profit and  $x$  the units sold, then  $P = 450x + 2200 - 200x$  or  $P = 250x + 2200$ .

## 2 Solve Interest Problems

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Solve the problem.**

- 1) Don James wants to invest \$67,000 to earn \$5200 per year. He can invest in B-rated bonds paying 13% per year or in a Certificate of Deposit (CD) paying 4% per year. How much money should be invested in each to realize exactly \$5200 in interest per year?
- A) \$28,000 in B-rated bonds and \$39,000 in a CD      B) \$39,000 in B-rated bonds and \$28,000 in a CD  
 C) \$29,000 in B-rated bonds and \$38,000 in a CD      D) \$38,000 in B-rated bonds and \$29,000 in a CD
- 2) A bank loaned out \$51,000, part of it at the rate of 11% per year and the rest at a rate of 5% per year. If the interest received was \$4650, how much was loaned at 11%?
- A) \$35,000      B) \$16,000      C) \$36,000      D) \$15,000
- 3) A loan officer at a bank has \$92,000 to lend and is required to obtain an average return of 16% per year. If he can lend at the rate of 17% or the rate of 11%, how much can he lend at the 11% rate and still meet his required return?
- A) \$15,333.33      B) \$3285.71      C) \$506,000.00      D) \$5411.76



- 4) A college student earned \$8800 during summer vacation working as a waiter in a popular restaurant. The student invested part of the money at 10% and the rest at 9%. If the student received a total of \$825 in interest at the end of the year, how much was invested at 10%?  
 A) \$3300                      B) \$5500                      C) \$4400                      D) \$977
- 5) Susan purchased some municipal bonds yielding 7% annually and some certificates of deposit yielding 9% annually. If Susan's investment amounts to \$19,000 and the annual income is \$1590, how much money is invested in bonds and how much is invested in certificates of deposit?  
 A) \$5500 in bonds; \$13,500 in certificates of deposit  
 B) \$13,000 in bonds; \$6000 in certificates of deposit  
 C) \$13,500 in bonds; \$5500 in certificates of deposit  
 D) \$6000 in bonds; \$13,000 in certificates of deposit

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 6) Martin purchased some municipal bonds yielding 8% annually and some certificates of deposit yielding 11% annually. If Martin's investment amounts to \$23,000 and the annual income is \$2230, how much money is invested in bonds and how much is invested in certificates of deposit?

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 7) Kevin invested part of his \$10,000 bonus in a certificate of deposit that paid 6% annual simple interest, and the remainder in a mutual fund that paid 11% annual simple interest. If his total interest for that year was \$700, how much did Kevin invest in the mutual fund?  
 A) \$2000                      B) \$8000                      C) \$3000                      D) \$1000

### 3 Solve Mixture Problems

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Solve the problem.**

- 1) The manager of a coffee shop has one type of coffee that sells for \$9 per pound and another type that sells for \$12 per pound. The manager wishes to mix 100 pounds of the \$12 coffee to get a mixture that will sell for \$10 per pound. How many pounds of the \$9 coffee should be used?  
 A) 200 lb                      B) 100 lb                      C) 300 lb                      D) 150 lb
- 2) The owners of a candy store want to sell, for \$6 per pound, a mixture of chocolate-covered raisins, which usually sells for \$3 per pound, and chocolate-covered macadamia nuts, which usually sells for \$8 per pound. They have a 50-pound barrel of the raisins. How many pounds of the nuts should they mix with the barrel of raisins so that they hit their target value of \$6 per pound for the mixture?  
 A) 75 lb                      B) 70 lb                      C) 65 lb                      D) 80 lb
- 3) The manager of a candy shop sells chocolate covered peanuts for \$6 per pound and chocolate covered cashews for \$9 per pound. The manager wishes to mix 70 pounds of the cashews to get a cashew-peanut mixture that will sell for \$7 per pound. How many pounds of peanuts should be used?  
 A) 140 lb                      B) 70 lb                      C) 210 lb                      D) 105 lb
- 4) A chemist needs 180 milliliters of a 52% solution but has only 44% and 62% solutions available. Find how many milliliters of each that should be mixed to get the desired solution.  
 A) 100 mL of 44%; 80 mL of 62%                      B) 110 mL of 44%; 70 mL of 62%  
 C) 80 mL of 44%; 100 mL of 62%                      D) 70 mL of 44%; 110 mL of 62%

- 5) How much pure acid should be mixed with 4 gallons of a 50% acid solution in order to get an 80% acid solution?  
 A) 6 gal                                      B) 2 gal                                      C) 16 gal                                      D) 10 gal
- 6) The radiator in a certain make of car needs to contain 50 liters of 40% antifreeze. The radiator now contains 50 liters of 20% antifreeze. How many liters of this solution must be drained and replaced with 100% antifreeze to get the desired strength?  
 A) 12.5 L                                      B) 20 L                                      C) 25 L                                      D) 16.7 L
- 7) How many gallons of a 30% alcohol solution must be mixed with 60 gallons of a 14% solution to obtain a solution that is 20% alcohol?  
 A) 36 gal                                      B) 27 gal                                      C) 7 gal                                      D) 12 gal
- 8) How many liters of 80% hydrochloric acid must be mixed with 40% hydrochloric acid to get 15 liters of 65% hydrochloric acid? Write your answer rounded to three decimals.  
 A) 9.375 L                                      B) 3.125 L                                      C) 4.688 L                                      D) 8 L

#### 4 Solve Uniform Motion Problems

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Solve the problem.**

- 1) An airplane flies 460 miles with the wind and 310 against the wind in the same length of time. If the speed of the wind is 30, what is the speed of the airplane in still air?  
 A) 154 mph                                      B) 144 mph                                      C) 159 mph                                      D) 62 mph
- 2) A boat heads upstream a distance of 30 miles on the Mississippi river, whose current is running at 5 miles per hour. If the trip back takes an hour less, what was the speed of the boat in still water? Give the answer rounded to two decimal places, if necessary.  
 A) 18.03 mph                                      B) 16.58 mph                                      C) 6 mph                                      D) 15 mph
- 3) Two friends decide to meet in Chicago to attend a Cub's baseball game. Rob travels 172 miles in the same time that Carl travels 156 miles. Rob's trip uses more interstate highways and he can average 4 mph more than Carl. What is Rob's average speed?  
 A) 43 mph                                      B) 39 mph                                      C) 46 mph                                      D) 40 mph
- 4) Gary can hike on level ground 3 miles an hour faster than he can on uphill terrain. Yesterday, he hiked 36 miles, spending 2 hours on level ground and 5 hours on uphill terrain. Find his average speed on level ground.  
 A)  $7\frac{2}{7}$  mph                                      B)  $4\frac{2}{7}$  mph                                      C)  $5\frac{1}{7}$  mph                                      D)  $7\frac{5}{7}$  mph
- 5) Two cars start from the same point and travel in the same direction. If one car is traveling 63 miles per hour and the other car is traveling at 57 miles per hour, how far apart will they be after 8 hours?  
 A) 48 mi                                      B) 960 mi                                      C) 504 mi                                      D) 456 mi
- 6) Two trains leave a train station at the same time. One travels east at 11 miles per hour. The other train travels west at 10 miles per hour. In how many hours will the two trains be 73.5 miles apart?  
 A) 3.5 hr                                      B) 7 hr                                      C) 1.8 hr                                      D) 4 hr

- 7) Ken and Kara are 25 miles apart on a calm lake paddling toward each other. Ken paddles at 3 miles per hour, while Kara paddles at 6 miles per hour. How long will it take them to meet?
- A)  $2\frac{7}{9}$  hr                      B)  $2\frac{2}{3}$  hr                      C) 16 hr                      D)  $8\frac{1}{3}$  hr
- 8) A freight train leaves a station traveling at 32 km/h. Two hours later, a passenger train leaves the same station traveling in the same direction at 52 km/h. How long does it take the passenger train to catch up to the freight train?
- A) 3.2 hr                      B) 4.2 hr                      C) 5.2 hr                      D) 2.2 hr
- 9) Five friends drove at an average rate of 60 miles per hour to a weekend retreat. On the way home, they took the same route but averaged 65 miles per hour. What was the distance between home and the retreat if the round trip took 10 hours?
- A) 312 mi                      B)  $5\frac{1}{5}$  mi                      C) 7800 mi                      D) 624 mi
- 10) During a hurricane evacuation from the east coast of Georgia, a family traveled 290 miles west. For part of the trip, they averaged 60 mph, but as the congestion got bad, they had to slow to 30 mph. If the total time of travel was 8 hours, how many miles did they drive at the reduced speed?
- A) 190 mi                      B) 195 mi                      C) 200 mi                      D) 185 mi

## 5 Solve Constant Rate Job Problems

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Solve the problem.**

- 1) An experienced bank auditor can check a bank's deposits twice as fast as a new auditor. Working together it takes the auditors 4 hours to do the job. How long would it take the experienced auditor working alone?
- A) 6 hr                      B) 12 hr                      C) 4 hr                      D) 8 hr
- 2) BJ can overhaul a boat's diesel inboard engine in 15 hours. His apprentice takes 30 hours to do the same job. How long would it take them working together assuming no gain or loss in efficiency?
- A) 10 hr                      B) 4 hr                      C) 45 hr                      D) 6 hr
- 3) Tracy can wallpaper 3 rooms in a new house in 12 hours. Together with her trainee they can wallpaper the 3 rooms in 8 hours. How long would it take the trainee working by herself to do the job?
- A) 27 hr                      B) 12 hr                      C) 39 hr                      D) 54 hr
- 4) Brandon can paint a fence in 12 hours and Elaine can paint the same fence in 11 hours. How long will they take to paint the fence if they work together?
- A)  $5\frac{13}{24}$  hr                      B)  $5\frac{3}{4}$  hr                      C)  $5\frac{17}{23}$  hr                      D)  $11\frac{1}{2}$  hr
- 5) Sue can sew a precut dress in 3 hours. Helen can sew the same dress in 2 hours. If they work together, how long will it take them to complete sewing that dress? Give your answer rounded to one decimal place, if necessary.
- A) 1.2 hr                      B) 5 hr                      C) 1.8 hr                      D) 2.5 hr

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

- 6) Two pumps can fill a water tank in 45 minutes when working together. Alone, the second pump takes 3 times longer than the first to fill the tank. How long does it take the first pump alone to fill the tank?

## Ch. 1 Equations and Inequalities

### Answer Key

#### 1.1 Linear Equations

##### 1 Solve a Linear Equation

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) A
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A
- 17) A
- 18) A
- 19) A
- 20) A
- 21) A
- 22) A
- 23) A
- 24) A
- 25) A
- 26) A

##### 2 Solve Equations That Lead to Linear Equations

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) A
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A
- 17) A

##### 3 Solve Problems That Can Be Modeled by Linear Equations

- 1) A
- 2) A
- 3) A

- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) A
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A
- 17) A
- 18) A
- 19) A
- 20) A
- 21) A
- 22) A
- 23) A
- 24) A

## 1.2 Quadratic Equations

### 1 Solve a Quadratic Equation by Factoring

- 1) A
- 2) A
- 3) A
- 4)  $\{-8, 9\}$
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) C
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A
- 17) A
- 18) A
- 19) A

### 2 Solve a Quadratic Equation by Completing the Square

- 1)  $\{2 + \sqrt{3}, 2 - \sqrt{3}\}$
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A

10) A

11) A

**3 Solve a Quadratic Equation Using the Quadratic Formula**

1) A

2) A

3) A

4) D

5) A

6) A

7) A

8) A

9) A

10) A

11) A

12) A

13) D

14) A

15) A

16) B

17) A

18) C

19) A

**4 Solve Problems That Can Be Modeled by Quadratic Equations**

1) A

2) A

3) A

4) 3.2 in.

5) A

6) A

7) A

8) A

9) A

10) A

11) A

**1.3 Complex Numbers; Quadratic Equations in the Complex Number System**

**1 Add, Subtract, Multiply, and Divide Complex Numbers**

1) A

2) A

3) A

4) A

5) A

6) A

7) A

8) A

9) A

10) A

11) A

12) A

13) A

14) A

15) A

16) A

- 17) A
- 18) A
- 19) A
- 20) A
- 21) A
- 22) A
- 23) A
- 24) A
- 25) A
- 26) A
- 27) A
- 28) A
- 29) A
- 30) A
- 31) A
- 32) A
- 33) A
- 34) A
- 35) A
- 36) A

**2 Solve Quadratic Equations in the Complex Number System**

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) A
- 12) A
- 13)  $4 - i$

**1.4 Radical Equations; Equations Quadratic in Form; Factorable Equations**

**1 Solve Radical Equations**

- 1) A
- 2) A
- 3) A
- 4)  $\{\frac{3}{2}\}$
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) A
- 12) A
- 13) A
- 14) A
- 15) A

- 16) A
- 17) A
- 18) D
- 19) A
- 20) A
- 21)  $\{\frac{3}{2}\}$
- 22) A
- 23) A
- 24) A
- 25) A
- 26) A

## 2 Solve Equations Quadratic in Form

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) D
- 9) A
- 10) A
- 11) A
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A
- 17) A
- 18) A
- 19) A
- 20) A
- 21) A
- 22) A
- 23) A
- 24) A

## 3 Solve Equations by Factoring

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A

## 1.5 Solving Inequalities

### 1 Use Interval Notation

- 1) A
- 2) A
- 3) A



- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) A
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A

## 2 Use Properties of Inequalities

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A

## 3 Solve Inequalities

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

## 4 Solve Combined Inequalities

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11)  $x \geq 3$
- 12) A
- 13) A
- 14) A
- 15) A

- 16)  $40 \leq x < 90$ , where  $x$  represents Bob's score on the fifth test
- 17)  $\$29.31 \leq x \leq \$33.50$ , where  $x$  represents the amount of sales tax; no
- 18)  $x > 100$  mi

## 1.6 Equations and Inequalities Involving Absolute Value

### 1 Solve Equations Involving Absolute Value

- 1) A
- 2) D
- 3) D
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) A
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A

### 2 Solve Inequalities Involving Absolute Value

- 1) A
- 2) D
- 3) C
- 4) C
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A
- 11) D
- 12) A
- 13) A
- 14) A
- 15) A
- 16) A
- 17)  $|x + 7| > 3$ ;  $x < -10$  or  $x > -4$
- 18)  $|x - 40| \leq 0.75$ ;  $39.25 \leq x \leq 40.75$
- 19)  $|b - h| \leq 0.2$
- 20) A
- 21) A

## 1.7 Problem Solving: Interest, Mixture, Uniform Motion, Constant Rate Job Applications

### 1 Translate Verbal Descriptions into Mathematical Expressions

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A

## 2 Solve Interest Problems

- 1) A
- 2) A
- 3) A
- 4) A
- 5) D
- 6) \$10,000 in bonds; \$13,000 in certificates of deposit
- 7) A

## 3 Solve Mixture Problems

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A

## 4 Solve Uniform Motion Problems

- 1) A
- 2) A
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) A
- 10) A

## 5 Solve Constant Rate Job Problems

- 1) A
- 2) A
- 3) A
- 4) C
- 5) A
- 6) 60 min