Beginning and Intermediate Algebra

Practice Problems Only

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Practice - Integers

Evaluate each expression.

1) $1 - 3$

2) $4 - (-1)$

3) $(-6) - (-8)$

4) $(-6) + 8$

5) $(-3) - 3$

6) $(-8) - (-3)$

7) $3 - (-5)$

8) $7 - 7$

9) $(-7) - (-5)$

10) $(-4) + (-1)$

11) $3 - (-1)$

12) $(-1) + (-6)$

13) $6 - 3$

14) $(-8) + (-1)$

15) $(-5) + 3$

16) $(-1) - 8$

17) $2 - 3$

18) $5 - 7$

19) $(-8) - (-5)$

20) $(-5) + 7$

21) $(-2) + (-5)$

22) $1 + (-1)$

23) $5 - (-6)$

24) $8 - (-1)$

25) $(-6) + 3$

26) $(-3) + (-1)$

27) $4 - 7$

28) $7 - 3$

29) $(-7) + 7$

30) $(-3) + (-5)$

Find each product.

31) $(4)(-1)$

41) $(-5)(2)$

33) $(10)(-8)$

43) $(-5)(4)$

35) $(-4)(-2)$

45) $(4)(-6)$

37) $(-7)(8)$

32) $(7)(-5)$

39) $(9)(-4)$

34) $(-7)(-2)$

36) $(-6)(-1)$

42) $(-2)(-2)$

38) $(6)(-1)$

44) $(-3)(-9)$

40) $(-9)(-7)$

Find each quotient.

46) $\frac{30}{-10}$

47) $\frac{-49}{-7}$

48) $\frac{-12}{-4}$

49) $\frac{-2}{-1}$

50) $\frac{30}{6}$

51) $\frac{20}{10}$

52) $\frac{27}{3}$

53) $\frac{-35}{-5}$

54) $\frac{80}{-8}$

55) $\frac{-8}{-2}$

56) $\frac{50}{5}$

57) $\frac{-16}{2}$

58) $\frac{48}{8}$

59) $\frac{60}{-10}$

60) $\frac{54}{-6}$

Practice - Fractions

Simplify each. Leave your answer as an improper fraction.

1) $\frac{42}{12}$

2) $\frac{25}{20}$

3) $\frac{35}{25}$

4) $\frac{24}{9}$

5) $\frac{54}{36}$

6) $\frac{30}{24}$

7) $\frac{45}{36}$

8) $\frac{36}{27}$

9) $\frac{27}{18}$

10) $\frac{48}{18}$

11) $\frac{40}{16}$

12) $\frac{48}{42}$

13) $\frac{63}{18}$

14) $\frac{16}{12}$

15) $\frac{80}{60}$

16) $\frac{72}{48}$

17) $\frac{72}{60}$

18) $\frac{126}{108}$

19) $\frac{36}{24}$

20) $\frac{160}{140}$

Find each product.

21) $(9)\left(\frac{8}{9}\right)$

22) $(-2)\left(-\frac{5}{6}\right)$

23) $(2)\left(-\frac{2}{9}\right)$

24) $(-2)\left(\frac{1}{3}\right)$

25) $(-2)\left(\frac{13}{8}\right)$

26) $\left(\frac{3}{2}\right)\left(\frac{1}{2}\right)$

27) $\left(-\frac{6}{5}\right)\left(-\frac{11}{8}\right)$

28) $\left(-\frac{3}{7}\right)\left(-\frac{11}{8}\right)$

29) $(8)\left(\frac{1}{2}\right)$

30) $(-2)\left(-\frac{9}{7}\right)$

31) $\left(\frac{2}{3}\right)\left(\frac{3}{4}\right)$

32) $\left(-\frac{17}{9}\right)\left(-\frac{3}{5}\right)$

33) $(2)\left(\frac{3}{2}\right)$

34) $\left(\frac{17}{9}\right)\left(-\frac{3}{5}\right)$

35) $\left(\frac{1}{2}\right)\left(-\frac{7}{5}\right)$

36) $\left(\frac{1}{2}\right)\left(\frac{5}{7}\right)$

Find each quotient.

37) $-2 \div \frac{7}{4}$

39) $\frac{-1}{9} \div \frac{-1}{2}$

40) $-2 \div \frac{-3}{2}$

41) $\frac{-3}{2} \div \frac{13}{7}$

42) $\frac{5}{3} \div \frac{7}{5}$

43) $-1 \div \frac{2}{3}$

44) $\frac{10}{9} \div -6$

45) $\frac{8}{9} \div \frac{1}{5}$

46) $\frac{1}{6} \div \frac{-5}{3}$

47) $\frac{-9}{7} \div \frac{1}{5}$

48) $\frac{-13}{8} \div \frac{-15}{8}$

49) $\frac{-2}{9} \div \frac{-3}{2}$

50) $\frac{-4}{5} \div \frac{-13}{8}$

51) $\frac{1}{10} \div \frac{3}{2}$

38) $\frac{-12}{7} \div \frac{-9}{5}$

52) $\frac{5}{3} \div \frac{5}{3}$

Evaluate each expression.

53) $\frac{1}{3} + \left(-\frac{4}{3}\right)$

54) $\frac{1}{7} + \left(-\frac{11}{7}\right)$

55) $\frac{3}{7} - \frac{1}{7}$

56) $\frac{1}{3} + \frac{5}{3}$

57) $\frac{11}{6} + \frac{7}{6}$

58) $(-2) + \left(-\frac{15}{8}\right)$

59) $\frac{3}{5} + \frac{5}{4}$

60) $(7-1) - \frac{2}{3}$

61) $\frac{2}{5} + \frac{5}{4}$

62) $\frac{12}{7} - \frac{9}{7}$

63) $\frac{9}{8} + \left(-\frac{2}{7}\right)$

64) $(-2) + \frac{5}{6}$

65) $1 + \left(-\frac{1}{3}\right)$

66) $\frac{1}{2} - \frac{11}{6}$

67) $\left(-\frac{1}{2}\right) + \frac{3}{2}$

68) $\frac{11}{8} - \frac{1}{2}$

69) $\frac{1}{5} + \frac{3}{4}$

70) $\frac{6}{5} - \frac{8}{5}$

71) $\left(-\frac{5}{7}\right) - \frac{15}{8}$

72) $\left(-\frac{1}{3}\right) + \left(-\frac{8}{5}\right)$

73) $6 - \frac{8}{7}$

74) $(-6) + \left(-\frac{5}{3}\right)$

75) $\frac{3}{2} - \frac{15}{8}$

76) $(-1) - \left(-\frac{1}{3}\right)$

77) $\left(-\frac{15}{8}\right) + \frac{5}{3}$

78) $\frac{3}{2} + \frac{9}{7}$

79) $(-1) - \left(-\frac{1}{6}\right)$

80) $\left(-\frac{1}{2}\right) - \left(-\frac{3}{5}\right)$

81) $\frac{5}{3} - \left(-\frac{1}{3}\right)$

82) $\frac{9}{7} - \left(-\frac{5}{3}\right)$

Practice - Order of Operation

Solve.

1) $-6 \cdot 4(-1)$

2) $(-6 \div 6)^3$

3) $3 - (8) \div |4|$

4) $5(-5+6) \cdot 6^2$

5) $8 \div 4 \cdot 2$

6) $7 - 5 + 6$

7) $[-9 - (2-5)] \div (-6)$

8) $(-2 \cdot 2^3 \cdot 2) \div (-4)$

9) $-6 + (-3-3)^2 \div |3|$

10) $(-7-5) \div [-2-2-(-6)]$

11) $4 - 2|3^2 - 16|$

12) $\frac{-10-6}{(-2)^2} - 5$

13) $[-1-(-5)]|3+2|$

14) $-3 - \{3 - [-3(2+4) - (-2)]\}$

15) $\frac{2+4|7+2^2|}{4 \cdot 2 + 5 \cdot 3}$

16) $-4 - [2 + 4(-6) - 4 - |2^2 - 5 \cdot 2|]$

17) $[6 \cdot 2 + 2 - (-6)](-5 + \left|\frac{-18}{6}\right|)$

18) $2 \cdot (-3) + 3 - 6[-2 - (-1-3)]$

19) $\frac{-13-2}{2-(-1)^3 + (-6) - [-1-(-3)]}$

20) $\frac{-5^2 + (-5)^2}{|4^2 - 2^5| - 2 \cdot 3}$

21) $6 \cdot \frac{-8 - 4 + (-4) - [-4 - (-3)]}{(4^2 + 3^2) \div 5}$

22) $\frac{-9 \cdot 2 - (3-6)}{1 - (-2+1) - (-3)}$

23) $\frac{2^3 + 4}{4 - 6 + (-4) - [-5(-1)(-5)]}$

24) $\frac{13 + (-3)^2 + 4(-3) + 1 - [-10 - (-6)]}{\{[4+5] \div [4^2 - 3^3(4-3) - 8]\} + 2}$

25) $\frac{5 + 3^2 - 24 \div 6 \cdot 2}{[5 + 3(2^2 - 5)] + |2^2 - 5|^2}$

Practice - Properties of Algebra

Evaluate each using the values given.

1) $p + 1 + q - m$; use $m = 1, p = 3, q = 4$

2) $y^2 + y - z$; use $y = 5, z = 1$

3) $p - \frac{pq}{6}$; use $p = 6$ and $q = 5$

4) $\frac{6 + z - y}{3}$; use $y = 1, z = 4$

5) $c^2 - (a - 1)$; use $a = 3$ and $c = 5$

6) $x + 6z - 4y$; use $x = 6, y = 4, z = 4$

7) $5j + \frac{kh}{2}$; use $h = 5, j = 4, k = 2$

8) $5(b + a) + 1 + c$; use $a = 2, b = 6, c = 5$

9) $\frac{4 - (p - m)}{2} + q$; use $m = 4, p = 6, q = 6$

10) $z + x - (1^2)^3$; use $x = 5, z = 4$

12) $3 + z - 1 + y - 1$; use $y = 5, z = 4$

11) $m + n + m + \frac{n}{2}$; use $m = 1$ and $n = 2$

14) $p + (q - r)(6 - p)$; use $p = 6, q = 5, r = 5$

13) $q - p - (q - 1 - 3)$; use $p = 3, q = 6$

15) $y - (4 - y - (z - x)$; use $x = 3, y = 1, z = 6$

16) $4z - (x + x - (z - z))$; use $x = 3, z = 2$

17) $k \times 3^2 - (j + k) - 5$; use $j = 4, k = 5$

18) $a^3(c^2 - c)$; use $a = 3, c = 2$

19) $zx - (z - \frac{4 + x}{6})$; use $x = 2, z = 6$

20) $5 + qp + pq - q$; use $p = 6, q = 3$

Combine Like Terms

21) $r - 9 + 10$

22) $-4x + 2 - 4$

23) $n + m$

24) $4b + 6 + 1 + 7b$

25) $8v + 7v$

26) $-x + 8x$

27) $-7x - 2x$

28) $-7a - 6 + 5$

29) $k - 2 + 7$

30) $-8p + 5p$

31) $x - 10 - 6x + 1$

32) $1 - 10n - 10$

33) $x - 10 + 2m$

34) $1 - r - 6$

35) $9n - 1 + n + 4$

36) $-4b + 9b$

Distribute

37) $-8(x-4)$

38) $3(8v+9)$

39) $8n(n+9)$

40) $-(-5+9a)$

41) $7k(-k+6)$

42) $10x(1+2x)$

43) $-6(1+6x)$

44) $-2(n+1)$

45) $8m(5-m)$

46) $-2p(9p-1)$

47) $-9x(4-x)$

48) $4(8n-2)$

49) $-9b(b-10)$

50) $-4(1+7r)$

51) $-8n(5+10n)$

52) $2x(8x-10)$

Simplify.

53) $9(b+10)+5b$

54) $4v-7(1-8v)$

55) $-3x(1-4x)-4x^2$

56) $-8x+9(-9x+9)$

57) $-4k^2-8k\,(8k+1)$

58) $-9-10(1+9a)$

59) $1-7(5+7p)$

60) $-10(x-2)-3$

61) $-10-4(n-5)$

62) $-6(5-m)+3m$

63) $4(x+7)+8(x+4)$

64) $-2r(1+4r)+8r(-r+4)$

65) $-8(n+6)-8n(n+8)$

66) $9(6b+5)-4b(b+3)$

67) $7(7+3v)+10(3-10v)$

68) $-7(4x-6)+2(10x-10)$

69) $2n(-10n+5)-7(6-10n)$

70) $-3(4+a)+6a(9a+10)$

71) $5(1-6k)+10(k-8)$

72) $-7(4x+3)-10(10x+10)$

73) $(8n^2-3n)-(5+4n^2)$

74) $(7x^2-3)-(5x^2+6x)$

75) $(5p-6)+(1-p)$

76) $(3x^2-x)-(7-8x)$

77) $(2-4v^2)+(3v^2+2v)$

78) $(2b-8)+(b-7b^2)$

79) $(4-2k^2)+(8-2k^2)$

80) $(7a^2+7a)-(6a^2+4a)$

81) $(x^2-8)+(2x^2-7)$

82) $(3-7n^2)+(6n^2+3)$

Practice - One Step Equations

Solve each equation.

1) $v + 9 = 16$

2) $14 = b + 3$

3) $x - 11 = -16$

4) $-14 = x - 18$

5) $30 = a + 20$

6) $-1 + k = 5$

7) $x - 7 = -26$

8) $-13 + p = -19$

9) $13 = n - 5$

10) $22 = 16 + m$

11) $340 = -17x$

12) $4r = -28$

13) $-9 = \frac{n}{12}$

14) $\frac{5}{9} = \frac{b}{9}$

15) $20v = -160$

16) $-20x = -80$

17) $340 = 20n$

18) $\frac{1}{2} = \frac{a}{8}$

19) $16x = 320$

20) $\frac{k}{13} = -16$

21) $-16 + n = -13$

22) $21 = x + 5$

23) $p - 8 = -21$

24) $m - 4 = -13$

25) $180 = 12x$

26) $3n = 24$

27) $20b = -200$

28) $-17 = \frac{x}{12}$

29) $\frac{r}{14} = \frac{5}{14}$

30) $n + 8 = 10$

31) $-7 = a + 4$

32) $v - 16 = -30$

33) $10 = x - 4$

34) $-15 = x - 16$

35) $13a = -143$

36) $-8k = 120$

37) $\frac{p}{20} = -12$

38) $-15 = \frac{x}{9}$

39) $9 + m = -7$

40) $-19 = \frac{n}{20}$

Practice - Two-Step Problems

Solve each equation.

1) $5 + \frac{n}{4} = 4$

2) $-2 = -2m + 12$

3) $102 = -7r + 4$

4) $27 = 21 - 3x$

5) $-8n + 3 = -77$

6) $-4 - b = 8$

7) $0 = -6v$

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

9) $-8 = \frac{x}{5} - 6$

10) $-5 = \frac{a}{4} - 1$

11) $0 = -7 + \frac{k}{2}$

12) $-6 = 15 + 3p$

13) $-12 + 3x = 0$

14) $-5m + 2 = 27$

15) $24 = 2n - 8$

16) $-37 = 8 + 3x$

17) $2 = -12 + 2r$

18) $-8 + \frac{n}{12} = -7$

19) $\frac{b}{3} + 7 = 10$

20) $\frac{x}{1} - 8 = -8$

21) $152 = 8n + 64$

22) $-11 = -8 + \frac{v}{2}$

23) $-16 = 8a + 64$

24) $-2x - 3 = -29$

25) $56 + 8k = 64$

26) $-4 - 3n = -16$

27) $-2x + 4 = 22$

28) $67 = 5m - 8$

29) $-20 = 4p + 4$

30) $9 = 8 + \frac{x}{6}$

31) $-5 = 3 + \frac{n}{2}$

32) $\frac{m}{4} - 1 = -2$

33) $\frac{r}{8} - 6 = -5$

34) $-80 = 4x - 28$

35) $-40 = 4n - 32$

36) $33 = 3b + 3$

37) $87 = 3 - 7v$

38) $3x - 3 = -3$

39) $-x + 1 = -11$

40) $4 + \frac{a}{3} = 1$

Practice - General Linear Equations

Solve each equation.

1) $2 - (-3a - 8) = 1$

2) $2(-3n + 8) = -20$

3) $-5(-4 + 2v) = -50$

4) $2 - 8(-4 + 3x) = 34$

5) $66 = 6(6 + 5x)$

6) $32 = 2 - 5(-4n + 6)$

7) $0 = -8(p - 5)$

8) $-55 = 8 + 7(k - 5)$

9) $-2 + 2(8x - 7) = -16$

10) $-(3 - 5n) = 12$

11) $-21x + 12 = -6 - 3x$

12) $-3n - 27 = -27 - 3n$

13) $-1 - 7m = -8m + 7$

14) $56p - 48 = 6p + 2$

15) $1 - 12r = 29 - 8r$

16) $4 + 3x = -12x + 4$

17) $20 - 7b = -12b + 30$

18) $-16n + 12 = 39 - 7n$

19) $-32 - 24v = 34 - 2v$

20) $17 - 2x = 35 - 8x$

21) $-2 - 5(2 - 4m) = 33 + 5m$

22) $-25 - 7x = 6(2x - 1)$

23) $-4n + 11 = 2(1 - 8n) + 3n$

24) $-7(1 + b) = -5 - 5b$

25) $-6v - 29 = -4v - 5(v + 1)$

26) $-8(8r - 2) = 3r + 16$

27) $2(4x - 4) = -20 - 4x$

28) $-8n - 19 = -2(8n - 3) + 3n$

29) $-a - 5(8a - 1) = 39 - 7a$

30) $-4 + 4k = 4(8k - 8)$

31) $-57 = -(-p + 1) + 2(6 + 8p)$

32) $16 = -5(1 - 6x) + 3(6x + 7)$

33) $-2(m - 2) + 7(m - 8) = -67$

34) $7 = 4(n - 7) + 5(7n + 7)$

35) $50 = 8(7 + 7r) - (4r + 6)$

36) $-8(6 + 6x) + 4(-3 + 6x) = -12$

37) $-8(n - 7) + 3(3n - 3) = 41$

38) $-76 = 5(1 + 3b) + 3(3b - 3)$

39) $-61 = -5(5r - 4) + 4(3r - 4)$

40) $-6(x - 8) - 4(x - 2) = -4$

41) $-2(8n - 4) = 8(1 - n)$

42) $-4(1 + a) = 2a - 8(5 + 3a)$

43) $-3(-7v + 3) + 8v = 5v - 4(1 - 6v)$

44) $-6(x - 3) + 5 = -2 - 5(x - 5)$

45) $-7(x - 2) = -4 - 6(x - 1)$

46) $-(n + 8) + n = -8n + 2(4n - 4)$

47) $-6(8k + 4) = -8(6k + 3) - 2$

48) $-5(x + 7) = 4(-8x - 2)$

49) $-2(1 - 7p) = 8(p - 7)$

50) $8(-8n + 4) = 4(-7n + 8)$

Practice - Fractions

Solve each equation.

1) $\frac{3}{5}(1+p) = \frac{21}{20}$

2) $-\frac{1}{2} = \frac{3}{2}k + \frac{3}{2}$

3) $0 = -\frac{5}{4}(x - \frac{6}{5})$

4) $\frac{3}{2}n - \frac{8}{3} = -\frac{29}{12}$

5) $\frac{3}{4} - \frac{5}{4}m = \frac{113}{24}$

6) $\frac{11}{4} + \frac{3}{4}r = \frac{163}{32}$

7) $\frac{635}{72} = -\frac{5}{2}(-\frac{11}{4} + x)$

8) $-\frac{16}{9} = -\frac{4}{3}(\frac{5}{3} + n)$

9) $2b + \frac{9}{5} = -\frac{11}{5}$

10) $\frac{3}{2} - \frac{7}{4}v = -\frac{9}{8}$

11) $\frac{3}{2}(\frac{7}{3}n + 1) = \frac{3}{2}$

12) $\frac{41}{9} = \frac{5}{2}(x + \frac{2}{3}) - \frac{1}{3}x$

13) $-a - \frac{5}{4}(-\frac{8}{3}a + 1) = -\frac{19}{4}$

14) $\frac{1}{3}(-\frac{7}{4}k + 1) - \frac{10}{3}k = -\frac{13}{8}$

16) $-\frac{1}{2}(\frac{2}{3}x - \frac{3}{4}) - \frac{7}{2}x = -\frac{83}{24}$

15) $\frac{55}{6} = -\frac{5}{2}(\frac{3}{2}p - \frac{5}{3}$

18) $\frac{2}{3}(m + \frac{9}{4}) - \frac{10}{3} = -\frac{53}{18}$

17) $\frac{16}{9} = -\frac{4}{3}(-\frac{4}{3}n - \frac{4}{3})$

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

19) $-\frac{5}{8} = \frac{5}{4}(r - \frac{3}{2})$

22) $\frac{7}{6} - \frac{4}{3}n = -\frac{3}{2}n + 2(n + \frac{3}{2})$

21) $-\frac{11}{3} + \frac{3}{2}b = \frac{5}{2}(b - \frac{5}{3})$

24) $-\frac{149}{16} - \frac{11}{3}r = -\frac{7}{4}r - \frac{5}{4}(-\frac{4}{3}r + 1)$

23) $-(-\frac{5}{2}x - \frac{3}{2}) = -\frac{3}{2} + x$

26) $-\frac{7}{2}(\frac{5}{3}a + \frac{1}{3}) = \frac{11}{4}a + \frac{25}{8}$

25) $\frac{45}{16} + \frac{3}{2}n = -\frac{7}{4}v - \frac{19}{6}$

28) $-\frac{8}{3} - \frac{1}{2}x = -\frac{4}{3}x - \frac{2}{3}(-\frac{13}{4}x + 1)$

27) $\frac{3}{2}(v + \frac{3}{2}) = -\frac{7}{4}v - \frac{19}{6}$

30) $\frac{1}{3}n + \frac{29}{6} = 2(\frac{4}{3}n + \frac{2}{3})$

29) $\frac{47}{9} + \frac{3}{2}x = \frac{5}{3}(\frac{5}{2}x + 1)$

Practice - Formulas

Solve each of the following equations for the indicated variable.

1) ab = c for b

2) $g = \frac{h}{i}$ for h

3) $\frac{f}{g}x = b$ for x

4) $p = \frac{3y}{q}$ for y

5) $3x = \frac{a}{b}$ for x

6) $\frac{ym}{b} = \frac{c}{d}$ for y

7) $E = mc^2$ for m

8) DS = ds for D

9) $V = \frac{4}{3}\pi r^3$ for π

10) $E = \frac{mv^2}{2}$ for m

11) a + c = b for c

12) $x - f = g$ for x

13) $c = \frac{4y}{m+n}$ for y

14) $\frac{rs}{a-3} = k$ for r

15) $V = \frac{\pi Dn}{12}$ for D

16) F = k(R − L) for k

17) $P = n(p - c)$ for n

18) $S = L + 2B$ for L

19) $T = \frac{D-d}{L}$ for D

20) $I = \frac{E_a - E_q}{R}$ for E_a

21) $L = L_o(1 + at)$ for L_o

22) ax + b = c for x

23) 2m + p = 4m + q for m

24) q = 6(L − p) for L

25) $\frac{k-m}{r} = q$ for k

26) $R = aT + b$ for T

27) $h = vt - 16t^2$ for v

28) $S = \pi rh + \pi r^2$ for h

29) $Q_1 = P(Q_2 - Q_1)$ for Q_2

30) L = π(r_1 + r_2) + 2d for r_1

31) $R = \frac{kA(T_1 + T_2)}{d}$ for T_1

32) $P = \frac{V_1(V_2 - V_1)}{g}$ for V_2

33) ax + b = c for x

34) rt = d for r

35) lwh = V for w

36) $V = \frac{\pi r^2 h}{3}$ for h

37) $\frac{1}{a} + b = \frac{c}{a}$ for a

38) $\frac{1}{a} + b = \frac{c}{a}$ for b

39) $at - bw = s$ for t

40) $at - bw = s$ for w

41) ax + bx = c for x

42) x + 5y = 3 for x

43) x + 5y = 3 for y

44) 3x + 2y = 7 for x

45) 3x + 2y = 7 for y

46) $5a - 7b = 4$ for a

47) $5a - 7b = 4$ for b

48) $4x - 5y = 8$ for x

49) $4x - 5y = 8$ for y

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

Practice - Absolute Value Equations

Solve each equation.

1) $|m| = -6$

2) $|r| = -4$

3) $|n| = 4$

4) $|x| = 6$

5) $|b| = 7$

6) $\frac{|v|}{3} = 2$

7) $\frac{|x|}{7} = 5$

8) $\frac{|a|}{9} = -4$

9) $-10 + |k| = -15$

10) $-5 + |p| = 5$

11) $10|x| + 7 = 57$

12) $10|n| - 10 = 70$

13) $10 - 5|m| = 70$

14) $-6 - |r| = -11$

15) $9|x| - 4 = 5$

16) $|4 + b| = 4$

17) $\left|\frac{n}{10}\right| = 1$

18) $|x - 3| = 2$

19) $|v + 10| = 2$

20) $|9 - n| = 12$

21) $-4 - |a - 5| = -13$

22) $\frac{|9v|}{6} = 1$

23) $10|-6x| = 60$

24) $\left|\frac{x}{8}\right| + 6 = 7$

25) $-7\left|\frac{n}{7}\right| = -2$

26) $7\left|\frac{k}{7}\right| + 8 = 15$

27) $-8|-7 + p| - 6 = -14$

28) $2|n + 8| - 8 = 28$

29) $-3|7 + x| - 7 = -1$

30) $7|m - 6| - 9 = -72$

31) $|-7 - 5r| = 32$

32) $|-3x - 5| = 14$

33) $|8n - 6| = 66$

34) $|6 - 6b| = 30$

35) $|2v + 7| = 11$

36) $\frac{|-n + 6|}{6} = 0$

37) $9|10 + 6x| = 72$

38) $|2 + 6a| - 9 = 29$

39) $-3 + |6 + 6k| = -45$

40) $|p + | + 5 = 17$

41) $|2n + 5| + 5 = 0$

42) $2 + 3|6 + 5x| = 89$

43) $3 - 2|5 - m| = 9$

44) $-1 + 9|8r - 4| = 35$

45) $|-10x - 4| - 10 = 66$

46) $|5x + 3| = |2x - 1|$

47) $|2 + 3x| = |4 - 2x|$

48) $|3x - 4| = |2x + 3|$

49) $\left|\frac{2x - 5}{3}\right| = \left|\frac{3x + 4}{2}\right|$

50) $\left|\frac{4x - 2}{5}\right| = \left|\frac{6x + 3}{2}\right|$

Practice - Variation

Write the formula that expresses the relationship described

1. c varies directly as a

2. x is jointly propotional to y and z

3. w varies inversely as x

4. r varies directly as the square of s

5. f varies jointly as x and y

6. j is inversely proportional to the cube of m

7. h is directly proportional to b

8. x is jointly proportional with the square of a and the square root of b

9. a is inversely proportional to b

Find the constant of variation and write the formula to express the relationship using that constant

10. a varies directly as b and a = 15 when b = 5

11. p is jointly proportional to q and r and p = 12 when q = 8 and r = 3

12. c varies inversely as d adn c = 7 when d = 4

13. t varies directly as the square of u and t = 6 when u = 3

14. e varies jointly as f and g and e = 24 when f = 3 and g = 2

15. w is inversely proportional to the cube of x and w is 54 when x = 3

16. h is directly proportional to j and h = 12 when j = 8

17. a is jointly proportional with the square of x and the square root of y and a = 25 when x = 5 and y = 9

18. m is inversely proportional to n and m = 1.8 when n = 2.1

Solve each of the following variation problems by setting up a formulat to express the relationship, finding the constant, and then answering the question.

19. The electrical current in amperes, in a circuit varies directly as teh voltage. When 15 volts are applied, the current is 5 amperes. what is the current when 18 volts are applied?

20. The current in an electrical conductor varies inversely as the resistance of the conductor. If the current is 12 ampere when the resistance is 240 ohms, what is the current when the resistance is 540 ohms?

21. Hooke's law states that the distance that a spring is stretched by hanging object varies directly as the mass of the object. If the distance is 20 cm when the mass is 3 kg, what is the distance when the mass is 5 kg?

22. The volume of a gas varies inversely as the pressure upon it. The volume of a gas is 200 cm^3 under a pressure of 32 kg/cm^2. What will be its volume under a pressure of 40 kg/cm^2?

23. The number of aluminum cans used each year varies directly as the number of people using the cans. If 250 people use 60,000 cans in one year, how many cans are used each year in Dallas, which has a population of 1,008,000?

24. The time required to do a job varies inversely as the number of peopel working. It takes 5hr for 7 bricklayers to build a park well. How long will it take 10 bricklayers to complete the job?

25. According to Fidelity Investment Vision Magazine, the average weekly allowance of children varies directly as their grade level. In a recent year, the average allowance of a 9th-grade student was 9.66 dollars per week. What was the average weekly allowance of a 4th-grade student?

26. The wavelength of a radio wave varies inversely as its frequency. A wave with a frequency of 1200 kilohertz has a length of 300 meters. What is the length of a wave with a frequency of 800 kilohertz?

27. The number of kilograms of water in a human body varies directly as the mass of the body. A 96-kg person contains 64 kg of water. How many kilo grams of water are in a 60-kg person?

28. The time required to drive a distance of a fixed distance varies inversely as the speed. It takes 5 hr at a speed of 80 km/h to drive a fixed distance. How long will it take to drive the same distance at a speed of 70 km/h?

29. The weight of an object on Mars varies directly as its weight on Earth. A person weighs 95lb on Earth weighs 38 lb on Mars. How much would a 100-lb person weigh on Mars?

30. At a constant temperature, the volume of a gas varies inversely as the pressure. If the pressure of a certain gas is 40 newtons per square meter when the volume is 600 cubic meters what will the pressure be when the volume is reduced by 240 cubic meters?

31. The time required to empty a tank varies inversely as the rate of pumping. If a pump can empty a tank in 45 min at the rate of 600 kL/min, how long will it take the pump to empty the same tank at the rate of 1000 kL/min?

32. Wind resistance, or atmospheric drag, tends to slow down moving objects. Atmospheric drag varies jointly as an object's surface area of 37.8 ft^2 experiences a drag of 222 N (Newtons), how fast must a car with 51 ft^2 of surface area travel in order to experience a dracforce of 430 N?

33. The stopping distance of a car after the brakes have been applied varies directly as the square of the speed r. If a car traveling 60 mph can stop in 200 ft, how fast can a car go and still stop in 72 ft?

34. The drag force on a boat varies jointly as the wetted surface area and the square of the velocity of a boat. If a boat going 6.5 mph experiences a drag force of 86 N when the wetted surface area is 41.2 ft^2, how fast must a boat with 28.5 ft^2 of wetted surface area go in order to experience a drag force of 94N?

35. The intensity of a light from a light bulb varies inversely as the square of the distance from the bulb. suppose intensity is 90 W/m^2 (watts per square meter) when the sitance is 5 m. How much further would it be to a point where the intesity is 40 W/m^2?

36. The volume of a cone varies jointly as its height, and the square of its radius. If a cone with a height of 8 centimeters and a radius of 2 centimeters has a volume of 33.5 cm^3, what is the volume of a cone with a height of 6 centimeters and a radius of 4 centimeters?

37. The intensity of a television signal varies inversely as teh square of the distance from the transmitter. If the intensity is 25 W/m^2 at a distance of 2 km, how far from the trasmitter are you when the intensity is 2.56 W/m^2?

38. The intensity of illumination falling on a surface from a given source of light is inversely proportional to the square of the distance from the souce of light. The unit for measuring the intesity of illumination is usually the footcandle. If a given source of light gives an illumination of 1 foot-candle at a distance of 10 feet, what would the illumination be from   the same source at a distance of 20 feet?

39. The weight of an object varies inversely as the sqare of the distance from the center of the earth. At sea level (6400 km from the center of the earch), an astronaut weighs 100 lb. How far above the earth must the astronaut be in order to weigh 64 lb?

Practice - Word Problems

Solve.

1. When five is added to three more than a certain number, the result is 19. What is the number?

2. If five is subtracted from three times a ce3rtain number, the result is 10. What is the number?

3. When 18 is subtracted from six times a certain number, the result is -42. What is the number?

4. A certain number added twice to itself equals 96. What is the number?

5. A number plus itself, plus twice itself, plus 4 times itself, is equal to -104. What is the number?

6. Sixty more than nine times a number is the same as two less than ten times the number. What is the number?

7. Eleven less tahn seven times a number is five more than six times the number. Find the number.

8. Fourteen less than eight times a number is three more than four times the number. What is the number?

9. The sum of three consectutive integers is 108. What are the integers?

10. The sum of three consecutive integers is -126. What are the integers?

11. Find three consecutive integers such that the sum of the first, twice the second, and three times the third is -76.

12. The sum of two consecutive even integers is 106. What are the integers?

13. The sum of three consecutive odd integers is 189. What are the integers?

14. The sum of three consecutive odd integers is 255. What are the integers?

15. Find three consecutive odd integers such that the sum of the first, two times the second, and three times the third is 70.

16. The second angle of a triangle is the same size as the first angle. The third angle is 12 degrees larger than the first angle. How large are the angles?

17. Two angles of a triangle are the same size. The third angle is 12 degrees smaller than the first angle. Find the measure the angles.

18. Two angles of a triangle are the same size. The third angle is 3 times as large as the first. How large are the angles?

19. The third angle of a triangle is the same size as the first. The second angle is 4 times the third. Find the measure of the angles.

20. The second angle of a triangle is 3 times as large as the first angle. The third angle is 30 degrees more than the first angle. Find the measure fo the angles.

21. The second angle of a triangle is twice as large as the first. The measure of the third angle is 20 degrees greater than the first. How large are the angles?

22. The second angle of a triangle is three times as large as the first. The measure of the third angle is 40 degrees greater than that of the first angle. How large are the three angles?

23. The second angle of a triangle is five times as large as the first. The measure of the third angle is 12 degrees greater than that of the first angle. How large are the angles?

24. The second angle of a triangle is three times the first, and the third is 12 degrees less than twice the first. Find the measures of the angles.

25. The second angle of a triangle is four times the first and the third is 5 degrees more than twice the first. Find the measures of the angles.

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

27. The perimeter of a rectangle is 304 cm. The length is 40 cm longer than the width. Find the length and width.

28. The perimeter of a rectangle is 152 meters. The width is 22 meters less than the length. Find the length and width.

29. The perimeter of a rectangle is 280 meters. The width is 26 meters less than the length. Find the length and width.

30. The perimeter of a college basketball court is 96 meters and the length is 14 meters more than the width. What are the dimensions?

31. A mountain cabin on 1 acre of land costs 30,000 dollars. If the land cost 4 times as much as the cabin, what was the cost of each?

32. A horse and a saddle cost 5000 dollars. If the horse cost 4 times as much as the saddle, what was the cost of each?

33. A bicycle and a bicycle helmet cost 240 dollars. How much did each cost, if the bicycle cost 5 times as much as the helmet?

34. Of 240 stamps that harry and his sister collected, Harry collected 3 times as many as his sisters. How many did each collect?

35. If Mr. Brown and his son together had 220 dollars, and Mr. Brown had 10 times as much as his son, how much money had each?

36. In a room containing 45 students there were twice as many girls as boys. How many of each were there?

37. Aaron had 7 tims as many sheep as Beth, and both together had 608. How many sheep had each?

38. A man bought a cow and a calf for 990 dollars, paying 8 times as much for the cow as for the calf. what was the cost of each?

39. Jamal and Moshe began a business with a capital of 7500 dollars. If Jamal furnished half as much capital as Moshe, how much did each furnish?

40. A lab technician cuts a 12 inch piece off tubing into two pieces in such a way that one piece is 2 times longer than the other.

41. A 6 ft board is cut into two pieces, on twice as long as the other. How long are the pieces?

42. An eight ft board is cut into two pieces. One piece is 2 ft longer thant he other. How long are the pieces?

43. An electrician cuts a 30 ft piece of wire into two pieces. One piece is 2 ft longer than the other. How long are the pieces?

44. The total cost for tuition plus room and board at State University is 2,584 dollars. Tuition costs 704 dollars more than room and board. What is the tuition fee?

45. The cost of a private pilot course is 1,275 dollars. The flight portion costs 625 dollars more than the groung school portion. What is the cost of each?

Practice - Age Problems

1. A boy is 10 years older than his brother. In 4 years he will be twice as old as his brother. Find the present age of each.

2. A father is 4 times as old as his son. In 20 years the father will be twice as old as his son. Find the present age of each.

3. Pat is 20 years older than his son James. In two years Pat will be twice as old as James. How old are they now?

4. Diane is 23 years older than her daughter Amy. In 6 years Diane will be twice as old as Amy. How old are they now?

5. Fred is 4 years older than Barney. Five years ago the sum of their ages was 48. How old are they now?

6. John is four times as old as Martha. Five years ago the sum of their ages was 50. How old are they now?

7. Tim is 5 years older than JoAnn. Six years from now the sumof their ages will be 79. How old are they now?

8. Jack is twice as old as Lacy. In three years the sum of their ages will be 54. How old are they now?

9. The sum of the ages of John and Mary is 32. Four years ago, John was twice as old as Mary. Find the present age of each.

10. The sum of the ages of a father and son is 56. Four years ago the father was 3 times as old as the son. Find the present age of each.

11. The sum of the ages of a china plate and a glass plate is 16 years. Four years ago the china plate was three times the age of the glass plate. Find the present age of each plate.

12. The sum of the ages of a wood plaque and a bronze plaque is 20 years. Four

years ago, the bronze plaque was one-half the age of the wood plaque. Find the present age of each plaque.

13. A is now 34 years old, and B is 4 years old. In how many years will A be twice as old as B?

14. A man's age is 36 and that of his daughter is 3 years. In how many years will the man be 4 times as old as his daughter?

15. An Oriental rug is 52 years old and a Persian rug is 16 years old. How many years ago was the Oriental rug four times as old as the Persian Rug?

16. A log cabin quilt is 24 years old and a friendship quilt is 6 years old. In how may years will the log cabin quilt be three times as old as the friendship quilt?

17. The age of the older of two boys is twice that of the younger; 5 years ago it was three times that of the younger. Find the age of each.

18. A pitcher is 30 years old, and a vase is 22 years old. How many years ago was the pitcher twice as old as the vase?

19. Marge is twice as old as Consuelo. The sum of their ages seven years ago was 13. How old are they now?

20. The sum of Jason and Mandy's age is 35. Ten years ago Jason was double Mandy's age. How old are they now?

21. A silver coin is 28 years older tha a bronze coin. In 6 years, the silver coin will be twice as old as the bronze coin. Find the present age of each coin.

22. A sofa is 12 years old and a table is 36 years old. In how many years will the sofa be twice as old as the table?

23. A limestone statue is 56 years older than a marble statue. In 12 years, the limestone will be three times as old as the marble statue. Find the present age of the statue.

24. A pewter bowl is 8 years old, and a silver bowl is 22 years old. In how many years will the silver bowl be twice the age of the pewter bowl?

25. Brandon is 9 years older than Ronda. In four years the sum of their ages will be 91. How old are they now?

26. A kerosene lamp is 95 years old, and an electric lamp is 55 years old. How many years ago was the kerosene lamp twice the age of the electric lamp?

27. A father is three tims as old as his son, and his daughter is 3 years younger

than the son. If the sum of their ages 3 years ago was 63 years, find the present age of the father.

28. The sum of Clyde and Wendy's age is 55. In four years, Wendy will be three times as old as Clyde. How old are they now?

29. The sum of the ages of two ships is 12 years. Two years ago, the age of the older ship was three times the age of the newer ship. Find the present age of each ship.

30. Chelsea's age is double Daniel's age. Eight years ago the sum of their ages was 32. How old are they now?

31. Ann is eighteen years older than her son. One year ago, she was three tims as old as her son. How old are they now?

32. The sum of the ages of Kristen and Ben is 32. Four years ago Kristen was twice as old as Ben. How old are they both now?

33. A mosaic is 74 years older than the engraving. Thirty years ago, the mosaic was three times as old as the engraving. Find the present age of each.

34. The sum of the ages of Elli and Dan is 56. Four years ago Elli was 3 times as old as Dan. How old are they now?

35. A wool tapestry is 32 years older than a linen tapestry. Twenty years ago, the wool tapestry was twice as old as the linen tapestry. Find the present age of each.

36. Carolyn's age is triple her daughter's age. In eight years the sum of their ages will be 72. How old are they now?

37. Nicole is 26 years old. Emma is 2 years old. In how many years will Nicole be triple Emma's age?

38. The sum of the ages of two children is 16 years. Four years ago, the age of the older child was three times the age of the younger child. Find the present age of each child.

39. Mike is 4 years older than Ron. In two years, the sum of their ages will be 84. How old are they now?

40. A marble bust is 25 years old, and a terra-cotta bust is 85 years old. In how many years will the terra-cotta bust be three times as old as the marble bust?

Practice - Distance, Rate, and Time Problems

1. A is 60 miles from B. An automobile at A starts for B at the rate of 20 miles an hour at the same time that an automobile at B starts for A at the rate of 25 miles an hour. How long will it be before the automobiles meet?

2. Two automobiles are 276 miles apart and start at the same time to travel toward each other. They travel at rates differing by 5 miles per hour. If they meet after 6 hours, find the rate of each.

3. Two trains travel toward each other from points which are 195 miles apart. They travel at rate of 25 and 40 miles an hour respectively. If they start at the same time, how soon will they meet?

4. A and B start toward each other at the same time from points 150 miles apart. If A went at the rate of 20 miles an hour, at what rate must B travel if they meet in 5 hours?

5. A passenger and a freight train start toward each other at the same time from two points 300 miles apart. If the rate of the passenger train exceeds the rate of the freight train by 15 miles per hour, and they meet after 4 hours, what must the rate of each be?

6. Two automobiles started at the same time from point, but traveled in opposite directions. Their rates were 25 and 35 miles per hour respectively. After how many hours were they 180 miles apart?

7. A man having ten hours at his disposal made an excursion, riding out at the rate of 10 miles an hour and returning on foot, at the rate of 3 miles an hour.

Find the distance he rode.

8. A man walks at the rate of 4 miles per hour. How far can he walk into the country and ride back on a trolley that travels at the rate of 20 miles per hour, if he must be back home 3 hours from the time he started?

9. A boy rides away from home in an automobile at the rate of 28 miles an hour and walks back at the rate of 4 miles an hour. The round trip requires 2 hours. How far does he ride?

10. A motorboat leaves a harbor and travels at an average speed of 15 mph toward an island. The average speed on the return trip was 10 mph. How far was the island from the harbor if the total trip took 5 hours?

11. A family frove to a resort at an average speed of 30 mph and later returned over the same road at an average speed of 50 mph. Find the distance to the resort if the total driving time was 8 hours.

12. As part of his flight trainging, a student pilot was required to fly to an airport and then return. The average speed to the airport was 90 mph, and the average speed returning was 120 mph. Find te distance between the two airports if the total flying time was 7 hours.

13. A, who travels 4 miles an hour starts from a certain place 2 hours in advance of B, who travels 5 miles an hour in the same direction. How many hours must B travel to overtake A?

14. A man travels 5 miles an hour. After traveling for 6 hours another man starts at the same place, following at the rate of 8 miles an hour. When will the second man overtake the first?

15. A motorboat leaves a harbor and travels at an average speed of 8 mph toward a small island. Two hours later a cabin cruiser leaves the same harbor and travels at an average speed of 16 mph toward the same island. In how many hours after the cabin cruiser leaves will the cabin cuiser be alongside the motorboat?

16. A long distance runner started on a course running at an average speed of 6 mph. One hour later, a second runner began the same course at an average speed of 8 mph. How long after the second runner started will the second runner overtake the first runner?

17. A car traveling at 48 mph overtakes a cyclist who, riding at 12 mph, has had a 3 hour head start. How far from the starting point does the car overtake the cyclist?

18. A jet plane traveling at 600 mph overtakes a propeller-driven plane which has

had a 2 hour head start. The propeller-driven plane is traveling at 200 mph. How far from the starting point does the jet overtake the propeller-driven plane?

19. Two men are traveling in opposite directions at the rate of 20 and 30 miles an hour at the same time and from the same place. In how many hours will they be 300 miles apart?

20. Running at an average rate of 8 m/s, a sprinter ran to the end of a track and then jogged back to the starting point at an average rate of 3 m/s. The sprinter took 55 s to run to the end of the track and jog back. Find the length of the track.

21. A motorboat leaves a harbor and travels at an average speed of 18 mph to an island. The average speed on the return trip was 12 mph. How far was the island from the harbor if the total trip took 5 h?

22. A motorboat leaves a harbor and travels at an average speed of 9 mph toward a small island. Two hours later a cabin cruiser leaves the same harbor and travels at an average speed of 18 mph toward the same island. In how many hours after the cabin cruiser leaves will the cabin cruiser be alongside the motorboat?

23. A jet plane traveling at 570 mph overtakes a propeller-driven plane that has had a 2 h head start. The propeller-driven plane is traveling at 190 mph. How far from the starting point does the jet overtake the propeller-driven plane?

24. Two trains start at the same time from the same place and travel in opposite directions. If the rate of one is 6 miles per hour more than the rate of the other and they are 168 miles apart at the end of 4 horus, what is the rate of each?

25. As part of flight traning, a student pilot was required to fly to an airport and then return. The average speed on the way to the airport was 100 mph, and the average speed returning was 150 mph. Find the distance between the two airports if the total flight time was 5 h.

26. Two cyclists start from the same point and ride in opposite directions. One cyclist rides twice as fast as the other. In three hours they are 72 miles apart. Find the rate of each cyclist.

27. A car traveling at 56 mph overtakes a cyclist who, riding at 14 mph, has had a 3 h head start. How far from the starting point does the car overtake the cyclist?

28. Two small planes start from the same point and fly in opposite directions.

The first plan is flying 25 mph slower than the second plane. In two hours the planes are 430 miles apart. Find the rate of each plane.

29. A bus traveling at a rate of 60 mph overtakes a car traveling at a rate of 45 mph. If the car had a 1 h head start, how far from the starting point does the bus overtake the car?

30. Two small planes start from the same point and fly in opposite directions. The first plane is flying 25 mph slower than the second plane. In 2 h, the planes are 470 mi apart. Find the rate of each plane.

31. A truck leaves a depot at 11 A.M. and travels at a speed of 45 mph. At noon, a van leaves the same place and travels the same route at a speed of 65 mph. At what time does the van overtake the truck?

32. A family drove to a resort at an average speed of 25 mph and later returned over the same road at an average speed of 40 mph. Find the distance to the resort if the total driving time was 13 h.

33. Three campers left their campsite by canoe and paddled downstream at an average rate of 10 mph. They then turned around and paddled back upstream at an average rate of 5 mph to return to their campsite. How long did it take the campers to canoe downstream if the total trip took 1 hr?

34. A motorcycle breaks down and the rider has to walk the rest of the way to work. The motorcycle was being driven at 45 mph, and the rider walks at a speed of 6 mph. The distance from home to work is 25 miles, and the total time for the trip was 2 hours. How far did the motorcycle go before if broke down?

35. A student walks and jogs to college each day. The student averages 5 km/hr walking and 9 km/hr jogging. The distance from home to college is 8 km, and the student makes the trip in one hour. How far does the student jog?

36. On a 130 mi trip, a car traveled at an average speed of 55 mph and then reduced its speed to 40 mph for the remainder of the trip. The trip took a total of 2.5 h. For how long did the car travel at 40 mph?

37. On a 220 mi trip, a car traveled at an average speed of 50 mph and then reduced its average speed to 35 mph for the remainder fo the trip. The trip took a total of 5 h. How long did the car travel at each speed?

38. An executive drove from home at an average speed of 40 mph to an airport where a helicopter was waiting. The executive boarded the helicopter adn flew to the corporate offices at and average speed of 60 mph. The entire distance was 150 mi. The entire trip took 3 h. Find the distance from the airport to the corporate offices.

Practice - Points and Lines

State the coordinates of each point.

1)
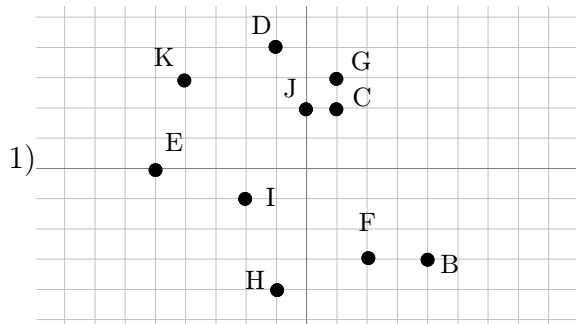
Plot each point.

2) $L(-5,5)$ $K(1,0)$ $J(-3,4)$

   $I(-3,0)$ $H(-4,2)$ $G(4, -2)$

   $F(-2,-2)$ E $(3,-2)$ D$(0, 3)$

   C $(0, 4)$

Sketch the graph of each line.

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

4) $y=x-1$

5) $y=-\frac{5}{4}x-4$

6) $y=-\frac{3}{5}x+1$

7) $y=-4x+2$

8) $y=\frac{5}{3}x+4$

9) $y=\frac{3}{2}x-5$

10) $y=-x-2$

12) $y=\frac{1}{2}x$

11) $y=-\frac{4}{5}x-3$

14) $8x-y=5$

13) $x+5y=-15$

16) $3x+4y=16$

15) $4x+y=5$

18) $7x+3y=-12$

17) $2x-y=2$

20) $3x+4y=8$

19) $x+y=-1$

22) $9x-y=-4$

21) $x-y=-3$

Practice - Slope

Find the slope of each line.

1)
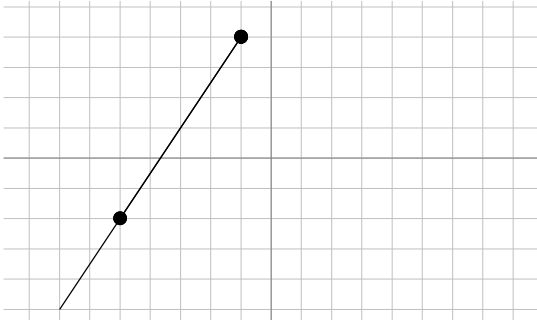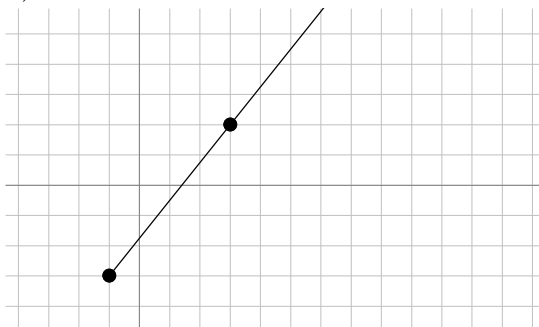

9)
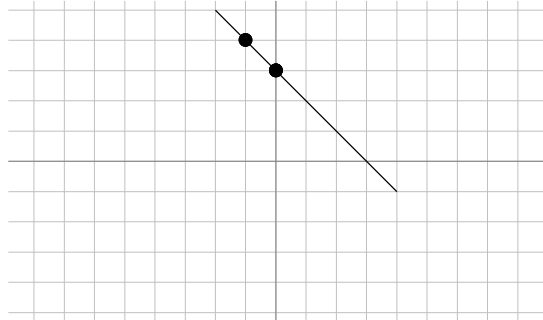
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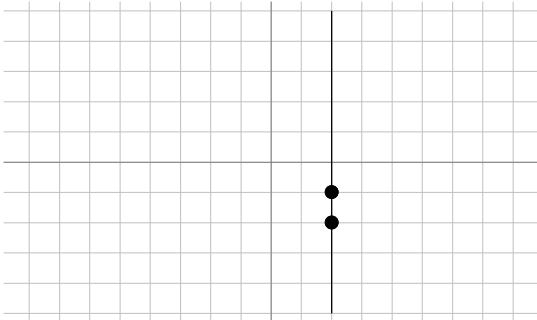
2)
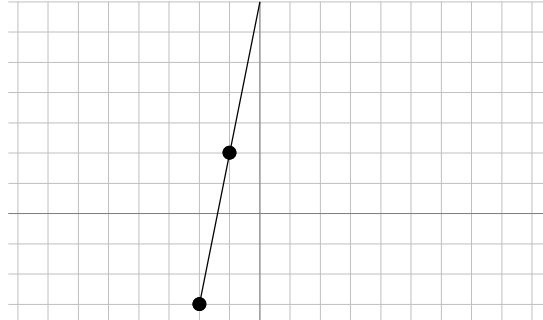
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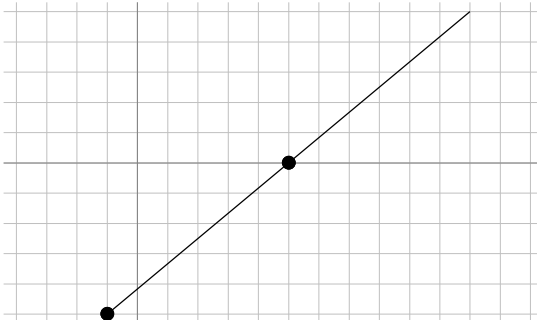
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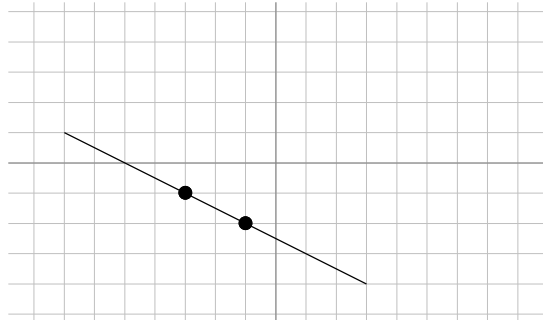
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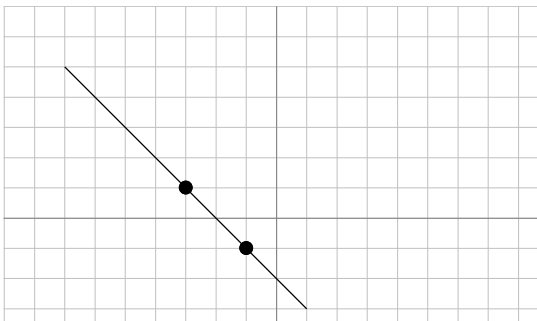
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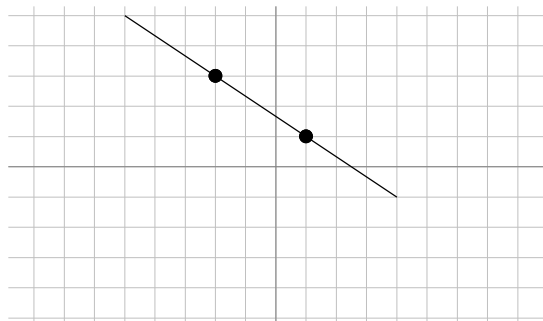
8)
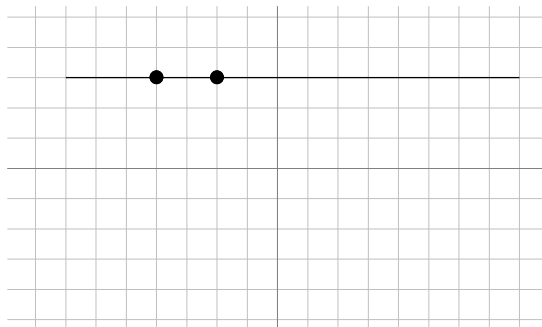
10)

Find the slope of the line through each pair of points.

11) $(-2, 10), (-2, -15)$

12) $(1, 2), (-6, -14)$

13) $(-15, 10), (16, -7)$

14) $(13, -2), (7, 7)$

15) $(10, 18), (-11, -10)$

16) $(-3, 6), (-20, 13)$

17) $(-16, -14), (11, -14)$

18) $(13, 15), (2, 10)$

19) $(-4, 14), (-16, 8)$

20) $(9, -6), (-7, -7)$

21) $(12, -19), (6, 14)$

22) $(-16, 2), (15, -10)$

23) $(-5, -10), (-5, 20)$

24) $(8, 11), (-3, -13)$

25) $(-17, 19), (10, -7)$

26) $(11, -2), (1, 17)$

27) $(7, -14), (-8, -9)$

28) $(-18, -5), (14, -3)$

29) $(-5, 7), (-18, 14)$

30) $(19, 15), (5, 11)$

Find the value of x or y so that the line through the points has the given slope.

31) $(2, 6)$ and $(x, 2)$; slope: $\frac{4}{7}$

32) $(8, y)$ and $(-2, 4)$; slope: $-\frac{1}{5}$

33) $(-3, -2)$ and $(x, 6)$; slope: $-\frac{8}{5}$

34) $(-2, y)$ and $(2, 4)$; slope: $\frac{1}{4}$

35) $(-8, y)$ and $(-1, 1)$; slope: $\frac{6}{7}$

36) $(x, -1)$ and $(-4, 6)$; slope: $-\frac{7}{10}$

37) $(x, -7)$ and $(-9, -9)$; slope: $\frac{2}{5}$

38) $(2, -5)$ and $(3, y)$; slope: 6

39) $(x, 5)$ and $(8, 0)$; slope: $-\frac{5}{6}$

40) $(6, 2)$ and $(x, 6)$; slope: $-\frac{4}{5}$

Practice - Slope-Intercept

Write the slope-intercept form of the equation of each line given the slope and the y-intercept.

1) Slope = 2, y-intercept = 5

2) Slope = -6, y-intercept = 4

3) Slope = 1, y-intercept = -4

4) Slope = -1, y-intercept = -2
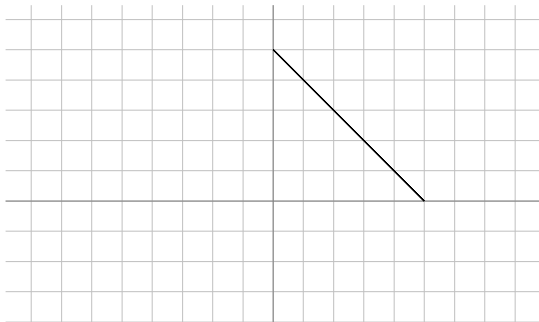
5) Slope = $-\frac{3}{4}$, y-intercept = -1

6) Slope = $-\frac{1}{4}$, y-intercept = 3

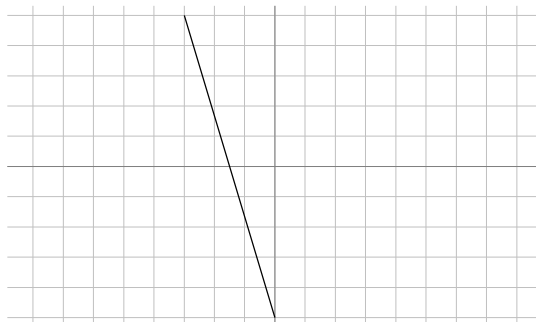7) Slope = $\frac{1}{3}$, y-intercept = 1

8) Slope = $\frac{2}{5}$, y-intercept = 5

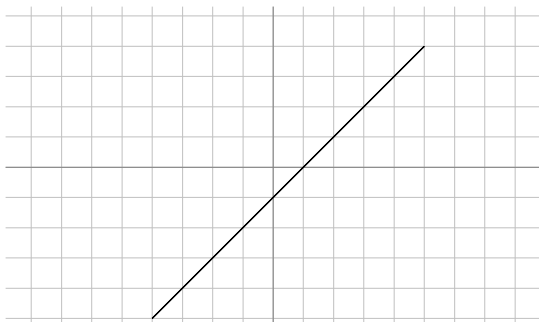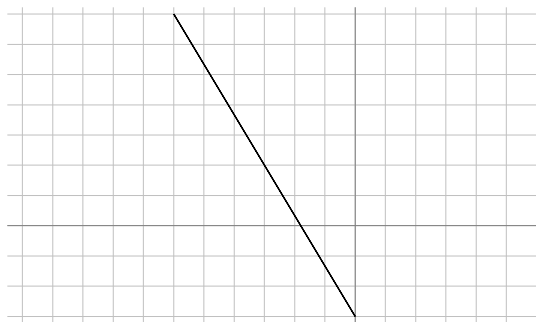**Write the slope-intercept form of the equation of each line.**
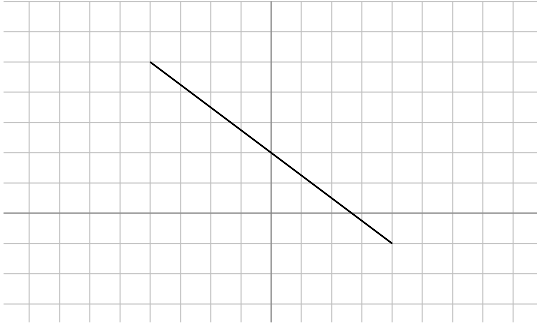
9)

10)

11)

12)

13)
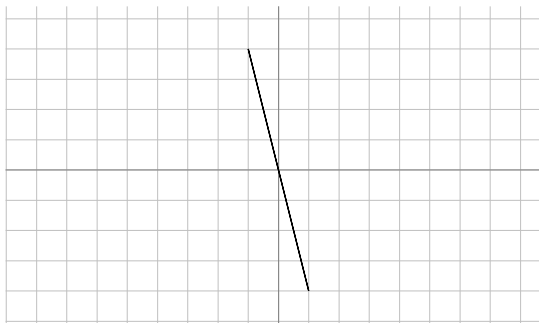
14)

15) $x + 10y = -37$

16) $x - 10y = 3$

17) $2x + y = -1$

18) $6x - 11y = -70$

19) $7x - 3y = 24$

20) $4x + 7y = 28$

21) $x = -8$

22) $x - 7y = -42$

23) $y - 4 = -(x + 5)$

24) $y - 5 = \frac{5}{2}(x - 2)$

25) $y - 4 = 4(x - 1)$

26) $y - 3 = -\frac{2}{3}(x + 3)$

27) $y + 5 = -4(x - 2)$

28) $0 = x - 4$

29) $y + 1 = \frac{1}{2}(x - 4)$

30) $y + 2 = \frac{6}{5}(x + 5)$

Sketch the graph of each line.

31) $y = \frac{1}{3}x + 4$

32) $y = -\frac{1}{5}x - 4$

33) $y = \frac{6}{5}x - 5$

34) $y = -\frac{3}{2}x - 1$

35) $y = \frac{3}{2}x$

36) $y = -\frac{3}{4}x + 1$

37) $x - y + 3 = 0$

38) $4x + 5 = 5y$

39) $-y - 4 + 3x = 0$

40) $-8 = 6x - 2y$

41) $-3y = -5x + 9$

42) $-3y = 3 - \frac{3}{2}x$

Practice - Point Slope

Write the point-slope form of the equation of the line through the given point with the given slope.

1) through $(2,3)$, slope = undefined

2) through $(1,2)$, slope = undefined

3) through $(2,2)$, slope = $\frac{1}{2}$

4) through $(2,1)$, slope = $-\frac{1}{2}$

5) through $(-1,-5)$, slope = 9

6) through $(2,-2)$, slope = -2

7) through $(-4,1)$, slope = $\frac{3}{4}$

8) through $(4,-3)$, slope = -2

9) through $(0,-2)$, slope = -3

10) through $(-1,1)$, slope = 4

11) through $(0,-5)$, slope = $-\frac{1}{4}$

12) through $(0,2)$, slope = $-\frac{5}{4}$

13) through $(-5,-3)$, slope = $\frac{1}{5}$

14) through $(-1,-4)$, slope = $-\frac{2}{3}$

15) through $(-1,4)$, slope =

16) through $(1,-4)$, slope = $-\frac{3}{2}$

Write the slope-intercept form of the equation of the line through the given point with the given slope.

17) through: $(-1,-5)$, slope = 2

18) through: $(2,-2)$, slope = -2

19) through: $(5,-1)$, slope = $-\frac{3}{5}$

20) through: $(-2,-2)$, slope = $-\frac{2}{3}$

21) through: $(-4,1)$, slope = $\frac{1}{2}$

22) through: $(4,-3)$, slope = $-\frac{7}{4}$

23) through: $(4,-2)$, slope = $-\frac{3}{2}$

24) through: $(-2,0)$, slope = $-\frac{5}{2}$

25) through: $(-5,-3)$, slope = $-\frac{2}{5}$

26) through: $(3,3)$, slope = $\frac{7}{3}$

27) through: $(2,-2)$, slope = 1

28) through: $(-4,-3)$, slope = 0

29) through:$(-3,4)$, slope=undefined

30) through: $(-2,-5)$, slope = 2

31) through: $(-4,2)$, slope = $-\frac{1}{2}$

32) through: $(5,3)$, slope = $\frac{6}{5}$

Write the point-slope form of the equation of the line through the

given points.

33) through: $(-4, 3)$ and $(-3, 1)$

34) through: $(1, 3)$ and $(-3, 3)$

35) through: $(5, 1)$ and $(-3, 0)$

36) through: $(-4, 5)$ and $(4, 4)$

37) through: $(-4, -2)$ and $(0, 4)$

38) through: $(-4, 1)$ and $(4, 4)$

39) through: $(3, 5)$ and $(-5, 3)$

40) through: $(-1, -4)$ and $(-5, 0)$

41) through: $(3, -3)$ and $(-4, 5)$

42) through: $(-1, -5)$ and $(-5, -4)$

Write the slope-intercept form of the equation of the line through the given points.

43) through: $(-5, 1)$ and $(-1, -2)$

44) through: $(-5, -1)$ and $(5, -2)$

45) through: $(-5, 5)$ and $(2, -3)$

46) through: $(1, -1)$ and $(-5, -4)$

47) through: $(4, 1)$ and $(1, 4)$

48) through: $(0, 1)$ and $(-3, 0)$

49) through: $(0, 2)$ and $(5, -3)$

50) through: $(0, 2)$ and $(2, 4)$

51) through: $(0, 3)$ and $(-1, -1)$

52) through: $(-2, 0)$ and $(5, 3)$

Practice - Solving Equations by Factoring

Find the slope of a line parallel to each given line.

1) $y = 2x + 4$

2) $y = -\frac{2}{3}x + 5$

3) $y = 4x - 5$

4) $y = -\frac{10}{3}x - 5$

5) $x - y = 4$

6) $6x - 5y = 20$

7) $7x + y = -2$

8) $3x + 4y = -8$

Find the slope of a line perpendicular to each given line.

9) $x = 3$

10) $y = -\frac{1}{2}x - 1$

11) $y = -\frac{1}{3}x$

12) $y = \frac{4}{5}x$

13) $x - 3y = -6$

14) $3x - y = -3$

15) $x + 2y = 8$

16) $8x - 3y = -9$

Write the point-slope form of the equation of the line described.

17) through: $(2, 5)$, parallel to $x = 0$

18) through: $(5, 2)$, parallel to $y = \frac{7}{5}x + 4$

19) through: $(3, 4)$, parallel to $y = \frac{9}{2}x - 5$

20) through: $(1, -1)$, parallel to $y = -\frac{3}{4}x + 3$

21) through: $(2, 3)$, parallel to $y = \frac{7}{5}x + 4$

22) through: $(-1, 3)$, parallel to $y = -3x - 1$

23) through: $(4, 2)$, parallel to $x = 0$

24) through: $(1, 4)$, parallel to $y = \frac{7}{5}x + 2$

25) through: $(1, -5)$, perpendicular to $y = x + 1$

26) through: $(1, -2)$, perpendicular to $y = \frac{1}{2}x + 1$

27) through: $(5, 2)$, perpendicular to $y = -5x - 3$

28) through: $(1, 3)$, perpendicular to $y = x + 1$

29) through: $(4, 2)$, perpendicular to $y = 4x$

30) through: $(-3, -5)$, perpendicular to $y = -\frac{3}{7}x$

31) through: $(2, -2)$ perpendicular to $y = \frac{1}{3}x$

32) through: $(-2, 5)$. perpendicular to $y = 2x$

Write the slope-intercept form of the equation of the line described.

33) through: $(4, -3)$, parallel to $y = -2x$

34) through: $(-5, 2)$, parallel to $y = \frac{3}{5}x$

35) through: $(-3, 1)$, parallel to $y = -\frac{4}{3}x - 1$

36) through: $(-4, 0)$, parallel to $y = -\frac{5}{4}x + 4$

37) through: $(-4, -1)$, parallel to $y = -\frac{1}{2}x + 1$

38) through: $(2, 3)$, parallel to $y = \frac{5}{2}x - 1$

39) through: $(-2, -1)$, parallel to $y = -\frac{1}{2}x - 2$

40) through: $(-5, -4)$, parallel to $y = \frac{3}{5}x - 2$

41) through: $(4, 3)$, perpendicular to $y = -x - 1$

42) through: $(-3, -5)$, perpendicular to $y = -\frac{1}{2}x - 2$

43) through: $(5, 2)$, perpendicular to $x = 0$

44) through: $(5, -1)$, perpendicular to $y = \frac{5}{2}x + 5$

45) through: $(-2, 5)$, perpendicular to $y = x - 2$

46) through: $(2, -3)$, perpendicular to $y = \frac{2}{5}x - 2$

47) through: $(4, -3)$, perpendicular to $y = \frac{1}{2}x - 3$

48) through: $(-4, 1)$, perpendicular to $y = -\frac{4}{3}x - 3$

Practice - Graphing and Solving Inequalities

Draw a graph for each inequality and give interval notation.

1) $n > -5$ 2) $n > 4$
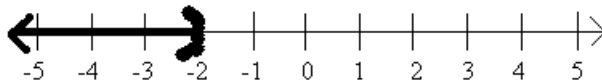
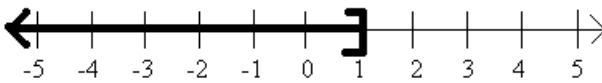3) $-2 \geqslant k$ 4) $1 \geqslant k$

5) $5 \geqslant x$ 6) $-5 < x$
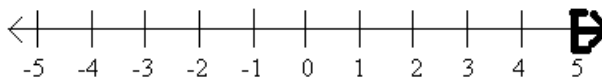
Write and inequality for each graph.
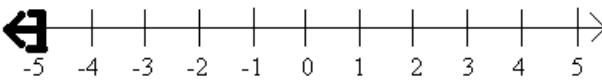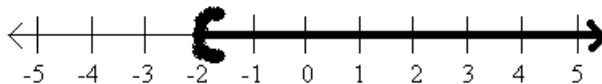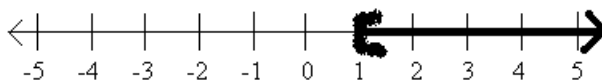
7)

8)

9)

10)

11)

12)

Solve each inequality, graph each solution, and give interval notation.

13) $\frac{x}{11} \geqslant 10$

14) $-2 \leqslant \frac{n}{13}$

15) $2 + r < 3$

16) $\frac{m}{5} \leqslant -\frac{6}{5}$

17) $8 + \frac{n}{3} \geqslant 6$

18) $11 > 8 + \frac{x}{2}$

19) $2 > \frac{a-2}{5}$

20) $\frac{v-9}{-4} \leqslant 2$

21) $-47 \geqslant 8 - 5x$

22) $\frac{6+x}{12} \leqslant -1$

23) $-2(3+k) < -44$

24) $-7n - 10 \geqslant 60$

25) $18 < -2(-8+p)$

26) $5 \geqslant \frac{x}{5} + 1$

27) $24 \geqslant -6(m-6)$

28) $-8(n-5) \geqslant 0$

29) $-r - 5(r-6) < -18$

30) $-60 \geqslant -4(-6x-3)$

31) $24 + 4b < 4(1+6b)$

32) $-8(2-2n) \geqslant -16+n$

33) $-5v - 5 < -5(4v+1)$

34) $-36 + 6x > -8(x+2) + 4x$

35) $4 + 2(a+5) < -2(-a-4)$

36) $3(n+3) + 7(8-8n) < 5n + 5 + 2$

37) $-(k-2) > -k - 20$

38) $-(4-5p) + 3 \geqslant -2(8-5p)$

Practice - Compound Inequalities

Solve each compound inequality, graph its solution, and give interval notation.

1) $\frac{n}{3} \leqslant -3$ or $-5n \leqslant -10$

2) $6m \geqslant -24$ or $m - 7 < -12$

3) $x + 7 \geqslant 12$ or $9x < -45$

4) $10r > 0$ or $r - 5 < -12$

5) $x - 6 < -13$ or $6x \leqslant -60$

6) $9 + n < 2$ or $5n > 40$

7) $\frac{v}{8} > -1$ and $v - 2 < 1$

8) $-9x < 63$ and $\frac{x}{4} < 1$

9) $-8 + b < -3$ and $4b < 20$

10) $-6n \leqslant 12$ and $\frac{n}{3} \leqslant 2$

11) $a + 10 \geqslant 3$ and $8a < 48$

12) $-6 + v \geqslant 0$ and $2v > 4$

13) $3 \leqslant 9x \leqslant 7$

14) $0 \geqslant \frac{x}{9} \geqslant -1$

15) $11 < 8 + k \leqslant 12$

16) $-11 \leqslant n - 9 \leqslant -5$

17) $-3 < x - 1 < 1$

18) $1 \leqslant \frac{p}{8} \leqslant 0$

19) $-4 < 8 - 3m \leqslant 11$

20) $3 + 7r > 59$ or $-6r - 3 > 33$

21) $-16 \leqslant 2n - 10 \leqslant -22$

22) $-6 - 8x \geqslant -6$ or $2 + 10x > 82$

23) $-5b + 10 \leqslant 30$ and $7b + 2 \leqslant -40$

24) $n + 10 \geqslant 15$ or $4n - 5 < -1$

25) $3x - 9 < 2x + 10$ and $5 + 7x \leqslant 10x - 10$

26) $-3n + 10 \leqslant -2n + 3 \leqslant 2 - 2n$

27) $-8 - 6v \leqslant 8 - 8v$ and $7v + 9 \leqslant 6 + 10v$

28) $5 - 2a \geqslant 2a + 1$ or $10a - 10 \geqslant 9a + 9$

29) $1 + 5k \leqslant 7k - 3$ or $k - 10 > 2k + 10$

30) $p - 8 \leqslant 2p + 7 < -2 - 7p$

31) $2x + 9 \geqslant 10x + 1$ and $3x - 2 < 7x + 2$

32) $-9m + 2 < -10 - 6m$ or $-m + 5 \geqslant 10 + 4m$

33) $4n + 8 < 3n - 6$ or $10n - 8 \geqslant 9 + 9n$

34) $8 - 10r \leqslant 8 + 4r$ or $-6 + 8r < 2 + 8r$

Practice - Absolute Value Inequalities

Solve each inequality graph its solution and give internal notation.

1) $|n| \leqslant -11$

3) $|b| \leqslant -10$

5) $|x| > 5$

7) $10|n| > 30$

9) $-3|x| < 36$

11) $|n| + 4 > -5$

13) $10 - 8|p| \geqslant 18$

15) $9|n| - 3 \geqslant 42$

17) $\left|\frac{m}{9}\right| \geqslant -5$

19) $|9 + x| > -2$

21) $\left|\frac{v+7}{3}\right| \geqslant 5$

23) $7|-7x| \geqslant 98$

25) $-5 + |-8k| \geqslant 51$

27) $8 - 4\left|\frac{x}{9}\right| > 12$

29) $7|-9 + m| + 3 \geqslant 66$

31) $|3n + 10| \leqslant -26$

33) $|10b + 10| > 70$

35) $|-10 + x| \geqslant 8$

37) $|-10 + a| - 3 \geqslant 7$

39) $|3x - 1| - 9 \leqslant -8$

41) $-8|8n - 1| + 4 \geqslant -116$

43) $-10 + 9|3p - 9| < -37$

45) $|9|2 - 10n| - 8 > 100$

2) $|x| \leqslant 7$

4) $|v| \leqslant 2$

6) $10|a| \geqslant 30$

8) $8|k| \leqslant -56$

10) $7|x| \geqslant 28$

12) $10 + 8|k| \geqslant 34$

14) $10|x| + 5 \geqslant 45$

16) $\left|\frac{r}{5}\right| > 2$

18) $|n - 6| > 11$

20) $|b + 8| \geqslant 9$

22) $\frac{|x + 1|}{10} \geqslant 4$

24) $-7 + |-5a| > 8$

26) $4 + 6\left|\frac{p}{2}\right| \geqslant 13$

28) $|n - 3| + 4 \geqslant 15$

30) $-10|-3 + r| + 2 \geqslant -18$

32) $|6x + 10| \leqslant 28$

34) $|8v + 1| \geqslant 23$

36) $-3 + |-6n + 1| \geqslant -74$

38) $|6 + 3k| - 4 > 14$

40) $|10x + 4| - 7 < 39$

42) $4|-1 - 9k| + 7 \leqslant -33$

44) $5|-x - 9| - 10 \geqslant 5$

Practice - Graphing

Solve each equation by graphing.

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

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

3) $y = -3$
   $y = -x - 4$

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

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

6) $y = 2x + 2$
   $y = -x - 4$

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

8) $y = 2x - 4$
   $y = \frac{1}{2}x + 2$

9) $y = \frac{5}{3}x + 4$
   $y = -\frac{2}{3}x - 3$

10) $y = \frac{1}{2}x + 4$
    $y = \frac{1}{2}x + 1$

11) $x + 3y = -9$
    $5x + 3y = 3$

12) $x + 4y = -12$
    $2x + y = 4$

13) $x - y = 4$
    $2x + y = -1$

14) $6x + y = -3$
    $x + y = 2$

15) $2x + 3y = -6$
    $2x + y = 2$

16) $3x + 2y = 2$
    $3x + 2y = -6$

17) $2x + y = 2$
    $x - y = 4$

18) $x + 2y = 6$
    $5x - 4y = 16$

19) $2x + y = -2$
    $x + 3y = 9$

20) $x - y = 3$
    $5x + 2y = 8$

21) $0 = -6x - 9y + 36$
    $12 = 6x - 3y$

22) $-2y + x = 4$
    $2 = -x + \frac{1}{2}y$

23) $2x - y = 1$
    $0 = -2x - y - 3$

24) $-2y = -4 - x$
    $-2y = -5x + 4$

25) $3 + y = -x$
    $-4 - 6x = -y$

26) $16 = -x - 4y$
    $-2x = -4 - 4y$

27) $-y + 7x = 4$
    $-y - 3 + 7x = 0$

28) $-4 + y = x$
    $x + 2 = -y$

29) $-12 + x = 4y$
    $12 - 5x = 4y$

30) $-5x + 1 = -y$
    $-y + x = -3$

Practice - Solving with Substitution

Solve each system by substitution.

1) $y = -3x$
   $y = 6x - 9$

3) $y = -2x - 9$
   $y = 2x - 1$

5) $y = 6x + 4$
   $y = -3x - 5$

7) $y = 3x + 2$
   $y = -3x + 8$

9) $y = 2x - 3$
   $y = -2x + 9$

11) $y = 6x - 6$
   $-3x - 3y = -24$

13) $y = -6$
   $3x - 6y = 20$

15) $y = -5$
   $3x + 4y = -17$

17) $-2x + 2y = 18$
   $y = 7x + 15$

19) $y = -8x + 19$
   $-x + 6y = 16$

21) $7x - 2y = -7$
   $y = 7$

23) $x - 5y = 7$
   $2x + 7y = -20$

25) $-2x - y = -10$
   $x - 8y = -23$

27) $-6x + y = 20$
   $-3x - 3y = -18$

29) $3x + y = 9$
   $2x + 8y = -16$

31) $2x + y = 2$
   $3x + 7y = 14$

33) $x + 5y = 15$
   $-3x + 7y = 6$

35) $-2x + 4y = -16$
   $y = -2$

37) $-6x + 6y = -12$
   $8x - 3y = 16$

39) $2x + 3y = 16$
   $-7x - y = 20$

2) $y = x + 5$
   $y = -2x - 4$

4) $y = -6x + 3$
   $y = 6x + 3$

6) $y = 3x + 13$
   $y = -2x - 22$

8) $y = -2x - 9$
   $y = -5x - 21$

10) $y = 7x - 24$
   $y = -3x + 16$

12) $-x + 3y = 12$
   $y = 6x + 21$

14) $6x - 4y = -8$
   $y = -6x + 2$

16) $7x + 2y = -7$
   $y = 5x + 5$

18) $y = x + 4$
$3x - 4y = -19$

20) $y = -2x + 8$
$-7x - 6y = -8$

22) $x - 2y = -13$
$4x + 2y = 18$

24) $3x - 4y = 15$
$7x + y = 4$

26) $6x + 4y = 16$
$-2x + y = -3$

28) $7x + 5y = -13$
$x - 4y = -16$

30) $-5x - 5y = -20$
$-2x + y = 7$

32) $2x + y = -7$
$5x + 3y = -21$

34) $2x + 3y = -10$
$7x + y = 3$

36) $-2x + 2y = -22$
$-5x - 7y = -19$

38) $-8x + 2y = -6$
$-2x + 3y = 11$

40) $-x - 4y = -14$
$-6x + 8y = 12$

Practice - Solving with Addition/Elimination

Solve each system by elimination.

1) $4x + 2y = 0$
   $-4x - 9y = -28$

2) $-7x + y = -10$
   $-9x - y = -22$

3) $-9x + 5y = -22$
   $9x - 5y = 13$

4) $-x - 2y = -7$
   $x + 2y = 7$

5) $-6x + 9y = 3$
   $6x - 9y = -9$

6) $5x - 5y = -15$
   $5x - 5y = -15$

7) $4x - 6y = -10$
   $4x - 6y = -14$

8) $-3x + 3y = -12$
   $-3x + 9y = -24$

9) $-x - 5y = 28$
   $-x + 4y = -17$

10) $-10x - 5y = 0$
    $-10x - 10y = -30$

11) $2x - y = 5$
    $5x + 2y = -28$

12) $-5x + 6y = -17$
    $x - 2y = 5$

13) $10x + 6y = 24$
    $-6x + y = 4$

14) $x + 3y = -1$
    $10x + 6y = -10$

15) $2x + 4y = -4$
    $4x - 12y = 8$

16) $-6x + 4y = 12$
    $12x + 6y = 18$

17) $-7x + 4y = -4$
    $10x - 8y = -8$

18) $-6x + 4y = 4$
    $-3x - y = 26$

19) $5x + 10y = 20$
    $-6x - 5y = -3$

20) $-9x - 5y = -19$
    $3x - 7y = -11$

21) $-7x - 3y = 12$
    $-6x - 5y = 20$

22) $-5x + 4y = 4$
    $-7x - 10y = -10$

23) $9x - 2y = -18$
    $5x - 7y = -10$

24) $3x + 7y = -8$
    $4x + 6y = -4$

25) $9x + 6y = -21$
    $-10x - 9y = 28$

26) $-4x - 5y = 12$
    $-10x + 6y = 30$

27) $-7x + 5y = -8$
    $-3x - 3y = 12$

28) $8x + 7y = -24$
    $6x + 3y = -18$

29) $-8x - 8y = -8$
    $10x + 9y = 1$

30) $-7x + 10y = 13$
    $4x + 9y = 22$

31) $9y = 7 - x$
    $-18y + 4x = -26$

32) $0 = -9x - 21 + 12y$
    $1 + \frac{4}{3}y + \frac{7}{3}x = 0$

33) $0 = 9x + 5y$
    $y = \frac{2}{7}x$

34) $-6 - 42y = -12x$
    $x - \frac{1}{2} - \frac{7}{2}y = 0$

Practice - Solving Equations with 3 Variables

Solve each of the following systems of equation.

1) $a - 2b + c = 5$
   $2a + b - c = -1$
   $3a + 3b - 2c = -4$

3) $3x + y - z = 11$
   $x + 3y = z + 13$
   $x + y - 3z = 11$

5) $x + 6y + 3z = 4$
   $2x + y + 2z = 3$
   $3x - 2y + z = 0$

7) $x + y + z = 6$
   $2x - y - z = -3$
   $x - 2y + 3z = 6$

9) $x + y - z = 0$
   $x - y - z = 0$
   $x + y + 2z = 0$

11) $-2x + y - 3z = 1$
   $x - 4y + z = 6$
   $4x + 16y + 4z = 24$

13) $2x + y - 3z = 0$
   $x - 4y + z = 0$
   $4x + 16y + 4z = 0$

15) $3x + 2y + 2z = 3$
   $x + 2y - z = 5$
   $2x - 4y + z = 0$

17) $x - 2y + 3z = 4$
   $2x - y + z = -1$
   $4x + y + z = 1$

19) $x - y + 2z = 0$
   $x - 2y + 3z = -1$
   $2x - 2y + z = -3$

21) $4x - 3y + 2z = 40$
   $5x + 9y - 7z = 47$
   $9x + 8y - 3z = 97$

23) $3x + 3y - 2z = 13$
   $6x + 2y - 5z = 13$
   $5x - 2y - 5z = 1$

25) $3x - 4y + 2z = 1$
   $2x + 3y - 3z = -1$
   $x + 1oy - 8z = 7$

27) $m + 6n + 3p = 8$
   $3m + 4n = -3$
   $5m + 7n = 1$

29) $-2w + 2x + 2y - 2z = -10$
   $w + x + y + z = -5$
   $3w + 2x + 2y + 4z = 1$
   $w + 3x - 2y + 2z = -6$

31) $w + x + y + z = 2$
   $w + 2x + 2y + 4z = 1$
   $-w + x - y - z = -6$
   $-w + 3x + y - z = -2$

2) $2x + 3y = z - 1$
   $3x = 8z - 1$
   $5y + 7z = -1$

4) $x + y + z = 2$
   $6x - 4y + 5z = 31$
   $5x + 2y + 2z = 13$

6) $x - y + 2z = -3$
   $x + 2y + 3z = 4$
   $2x + y + z = -3$

8) $x + y - z = 0$
   $x + 2y - 4z = 0$
   $2x + y + z = 0$

10) $x + 2y - z = 4$
   $4x - 3y + z = 8$

$$5x - y = 12$$

12) $4x + 12y + 16z = 4$
$3x + 4y + 5z = 3$
$x + 8y + 11z = 1$

14) $4x + 12y + 16z = 0$
$3x + 4y + 5z = 0$
$x + 8y + 11z = 0$

16) $p + q + r = 1$
$p + 2q + 3r = 4$
$4p + 5q + 6r = 7$

18) $x + 2y - 3z = 9$
$2x - y + 2z = -8$
$3x - y - 4z = 3$

20) $4x - 7y + 3z = 1$
$3x + y - 2z = 4$
$4x - 7y + 3z = 6$

22) $3x + y - z = 10$
$8x - y - 6z = -3$
$5x - 2y - 5z = 1$

24) $2x - 3y + 5z = 1$
$3x + 2y - z = 4$
$4x + 7y - 7z = 7$

26) $2x + y = z$
$4x + z = 4y$
$y = x + 1$

28) $3x + 2y = z + 2$
$y = 1 - 2x$
$3z = -2y$

30) $-w + 2x - 3y + z = -8$
$-w + x + y - z = -4$
$w + x + y + z = 22$
$-w + x - y - z = -4$

32) $w + x - y + z = 0$
$-w + 2x + 2y + z = 5$
$-w + 3x + y - z = -4$
$-2w + x + y - 3z = -7$

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Practice - Value Problems

Solve.

1) A collection of dimes and quaters is worth $15.25. There are 103 coins in all. How many of each is there?

2) A collection of half dollars and nickels is worth $13.40. There are 34 coins in all. How many are there?

3) The attendance at a school concert was 578. Admission was $2.00 for adults and $1.50 for children. The total receipts were $985.00. How many adults and how many children attended?

4) A purse contains $3.90 made up of dimes and quarters. If there are 21 coins in all, how many dimes and how many quarters were there?

5) A boy has $2.25 in nickels and dimes. If there are twice as many dimes as nickels, how many of each kind has he?

6) $3.75 is made up of quarters and half dollars. If the number of quarters exceeds the number of half dollars by 3, how many coins of each denomination are there?

7) A collection of 27 coins consisitng of nickels and dimes amounts to $2.25. How many coins of each kind are there?

8) $3.25 in dimes and nickels, were distributed amoung 45 boys. If each received one coin, how many received dimes and how many received nickels?

9) There were 429 people at a play. Admission was $1 each for adults and 75 cents each for children. The receipts were $372.50. How many children and how many adults attended?

10) There were 200 tickets sold for a women's basketball game. Tickets for students were 50 cents each anf for adults 75 cents each. The total amount of money collected was $132.50. How many of each type of ticket was sold?

11) There were 203 tickets sold for a volleyball game. For activity-card holders, the price was $1.25 each and for noncard holders the price was $2 each. The total amount of money collected was $310. How many of each type of ticket was sold?

12) At a local ball game the hotdogs sold for $2.50 each adn the hamburbers sold for $2.75 each. There were 131 total sandwiches sold for a total value of $342. How many of each sandwich was sold?

13) At a recent Vikings game $445 in admission tickets was taken in. The cost of a student ticket was $1.50 adn the cost of a non-student ticket was $2.50. A total of 232 tickets were sold. How many students and how many non-students attented the game?

14) A bank contains 27 coins in dimes and quarters. The coins have a total value of $4.95. Find the number of dimes and quarters in the bank.

15) A coin purse contains 18 coins in nickels and dimes. The coins have a total value of $1.15. Find the number of nickels and dimes in the coin purse.

16) A business executive bought 40 stamps for $9.60. The purchase included 25¢ stamps and 20¢ stamps. How many of each type of stamp were bought?

17) A postal clerk sold some 15¢ stamps and some 25¢ stamps. Altogether, 15 stamps werw sold for a total cost of $3.15. How many of each type of stamps were sold?

18) A drawer contains 15¢ stamps and 18¢ stamps. The number of 15¢ stamps is four less than three times the number of 18¢ stamps. The total value of all the stamps is $1.29. How many 15¢ stamps are in the drawer?

19) The toal value of dimes and quarters in a bank is $6.05. There are six more quarters than dimes. Find the number of each type of coin in the bank.

20) A child's piggy bank contains 44 coins in quarters and dimes. The coins have a total value of $8.60. Find the number of quaters in the bank.

21) A coin bank contains nickels and dimes. The number of dimes is 10 less than twice the number of nickels. The total value of all the coins is $2.75. Find the number of each type of coin in the bank.

22) A total of 26 bills are in a cash box. Some of the bills are one dollar bills, and the rest are five dollar bills. The total amount of cash in the box is $50. Find the number of each type of bill in the cash box.

23) A bank teller cashed a check for $200 using twenty dollar bills and ten dollar bills. In all, twelve bills were handed to the customer. Find the number of twenty dollar bills and the number of ten dollar bills.

24) A collection of stamps consists of 22¢ stamps and 40¢ stamps. The number of 22¢ stamps is three more than four times the number of 40¢ stamps. The total value of the stamps is $8.34. Find the number of 22¢ stamps in the collection.

25) A total of $27000 is invested, part of it at 12% adn the rest at 13%. The total interst after one year is $3385. How much was invested at each rate?

26) A total of $50000 is invested, part of it at 5% adn the rest at 7.5%. The total interest after one year is $3250. How much was invested at each rate?

27) A total of $9000 is invested, part of it at 10% and the rest at 12%. The total interest after one year is $1030. How much was invested at each rate?

28) A total of $18000 is invested, part of it at 6% and the rest at 9%. The total interest after one year is $1248. How much was invested at each rate?

29) An inheritance of $10000 is invested in 2 ways, part at 9.5% and the remainder at 11%. The combined annual interest was $1038.50. How much was invested at each rate?

30) Kerry earned a total of $900 last year on his investments. If $7000 was invested at a certain rate of return and $9000 was invested in a fund with a rate that was 2% higher, find the two rates of interest.

31) Jason earned $256 interest last year on his investments. If $1600 was invested at a certain rate of return and $2400 was invested in a fund with a rate that was double the rate of the first fund, find the two rates of interest.

32) Millicent earned $435 last yaer in interest. If $3000 was invested at a certain rate of return and $4500 was invested in a fund with a rate that was 2% lower, find the two rates of interest.

33) A total of $85000 is invested, part of it at 6% and the rest at 3.5%. The total interest after oen year is $385. How muhcw as invested at each rate?

34) A total of $12000 was invested, part of it at 9% and the rest at 7.5%. The total interest after one year is $1005. How much was invested at each rate?

35) A total of $15000 is invested, part of it at 8% and the rest at 11%. The total interest after one year is $1455. How muhc was invested at each rate?

36) A total of $17500 is invested, part of it at 7.25% and the rest at 6.5%. The total interest after one year is $1227.50. How much was invested at each rate?

37) A total of $6000 is invested, part of it at 4.25% and the rest at 5.75%. The total interest after one year is $1217.50. How much was invested at each rate?

38) A total of $14000 is invested, part of it at 5.5% and the rest at 9%. The total interest after on year is $910. How much was invested at each rate?

39) A total of $11000 is invested, part of it at 6.8% and the rest at 8.2%. The total interest after one year is $797. How much was invested at each rate?

40) An investment portfolio earned $2010 in interest last year. If $3000 was invested at a certain rate of return and $24000 was invested in a fund with a rate that was 4% lower, find the two rates of interest.

41) Samantha earned $1480 interest last year on her investments. If $5000 was invested at a certain rate of return and $11000 was invested in a fund with a rate that was two-thirds the rate of the first fund, find the two rates of interest.

42) A man has $5.10 in nickels, dimes, and quarters. There are twice as many nickels as diems and 3 more dimes than quarters. How many coins of each kind were there?

43) 30 coins having a value of $3.30 consists of nickels, dimes and quarters. If there are 40 coins in all and 3 times as many dimes as quarters, how many coins of each kind were there?

44) A bag contains nickels, dimes and quarters having a value of $3.75. If there are 40 coins in all and 3 times as many dimes as quarters, how many coins of each kind were there?

4.6
Practice - Mixture Problems

Solve.

1) A tank contains 8000 liters of a solution that is 40% acid. How much water should be added to make a solution that is 30% acid?

2) How much antifreeze should be added to 5 quarts of a 30% mixture of antifreeze to make a solution that is 50% antifreeze?

3) Of 12 pounds of salt water 10% is salt; of another mixture 3% is salt. How many pounds of the second should be added to the first in order to get a mixture of 5% salt?

4) How much alcohol must be added to 24 gallons of a 14% solution of alcohol in order to produce a 20% solution?

5) How many pounds of a 4% solution of borax must be added to 24 pounds of a 12% solution of borax to obtain a 10% solution of borax?

6) How many grams of pure acit must be added to 40 grams of a 20% acid solution to make a solution which is 36% acid?

7) A 100 LB bag of animal feed is 40% oats. How many pounds of oats must be added to this feed to produce a mixture which is 50% oats?

8) A 20 oz alloy of platinum that costs $220 per ounce is mixed with an alloy that costs $400 per ounce. How many ounces of the $400 alloy should be used to make an alloy that costs $300 per ounce?

9) How many pounds of tea that cost $4.20 per pound must be mixed with 12 lb of tea that cost $2.25 per pound to make a mixture that costs $3.40 per pound?

10) How many liters of a solvent taht costs $80 per liter must be mixed with 6 L of a solvent that costs $25 per liter to make a solvent that costs $36 per liter?

11) How many kilograms of hard candy that cost $7.50 per kilogram must be mixed with 24 kg of jelly beans that cost $3.25 per kilogram to make a mixture that sells for $4.50 per kilogram?

12) How many kilograms of soil supplement that costs $7.00 per kilogram must be mixed with 20 kg of aluminum nitrate that costs $3.50 per kilogram to make a fertilizer that costs $4.50 per kilogram?

13) How many pounds of lima beans that cost 90¢ per pound must be mixed with 16 lb of corn that cost 50¢ per pound to make a mixture of vegetables that costs 65¢ per pound?

14) How many liters of a blue dye that costs $1.60 per liter must be mixed with 18 L of anil that costs $2.50 per liter to make a mixture that costs $1.90 per liter?

15) Solution A is 50% acid and solution B is 80% acid. How much of each should be used to make 100cc. of a colutoin taht is 68% acid?

16) A certain grade of milk contains 10% butter fat and a certain grade of cream 60% butter fat. How many quarts of each must be taken so as to obtain a mixture of 100 quarts that will be 45% butter fat?

17) A farmer has some cream with is 21% butterfat and some which is 15% butter fat. How many gallons of each must be mixed to produce 60 gallons of cream which is 19% butterfat?

18) A syrup manufacturer has some pure maple syrup and some which is 85% maple syrup. How many liters of each should be mixed to make 150L which is 96% maple syrup?

19) A chemist wants to make 50ml of a 16% acid solution by mixing a 13% acid solution and an 18% acid solution. How many milliliters of each solution should the chemist use?

20) A hair dye is made by blending 7% hydrogen peroxide solution and a 4% hydrogen peroxide solution. How many milliliters of each are used to make a 300 ml solution that is 5% hydrogen peroxide?

21) A paint that contains 21% green dye is mixed wiht a paint that contains 15% green dye. How many gallons of each must be used to make 60 gal of paint that is 19% green dye?

22) A candy mix sells for $2.20 per kilogram. It contains chocolates worth $1.80 per kilogram and other candy worth $3.00 per kilogram. How much of each are in 15 kilograms of the mixture?

23) To make a weed and feed mixture, the Green Thumb Garden Shop mixes fertilizer worth $4.00/lb. with a weed killer worth $8.00/lb. The mixture will cost $6.00/lb. How much of each should be used to prepare 500 lb. of the mixture?

24) A grocer is mixing 40 cent per lb. coffee with 60 cent per lb. coffee to make a mixture worth 54¢ per lb. How much of each kind of coffee should be used to make 70 lb. of the mixture?

25) A grocer wishes to mix sugar at 9 cents per pound with sugar at 6 cents per pound to make 60 pounds at 7 cents per pound. What quantity of each must he take?

26) A high-protein diet supplement that costs $6.75 per pound is mixed with a vitamin supplement that costs $3.25 per pound. How many pounds of each should be used to make 5 lb of a mixture that costs

27) A goldsmith combined an alloy that costs $4.30 per ounce with an alloy that costs

28) A grocery store offers a cheese and fruit sampler that combines cheddar cheese that costs $8 per kilogram with kiwis that cost $3 per kilogram. How many kilograms of each were used to make a 5 kg mixture that costs $4.50 per kilogram?

29) The manager of a garden shop mixes grass seed that is 60% rye grass with 70 lb of grass seed that is 80% rye grass to make a mixture that is 74% rye grass. How much of the 60% mixture is used?

30) How many ounces of water evaporated from 50 oz of a 12% salt solution to produce a 15% salt solution?

31) A caterer made an ice cream punch by combining fruit juice that cost $2.25 per gallon with ice cream that costs $3.25 per gallon. How many gallons of each were used to make 100 gal of punch costing $2.50 per pound?

32) A clothing manufacturer has some pure silk thread and some thread that is 85% silk. How many kilograms of each must be woven together to make 75 kg of cloth that is 96% silk?

33) A carpet manufacturer blends two fibers, one 20% wool and the second 50% wool. How many pounds of each fiber should be woven together to produce 600 lb of a fabric that is 28% wool?

34) How many pounds of coffee that is 40% java beans must be mixed with 80 lb of coffee that is 30% java beans to make a coffee blen that is 32% java beans?

35) The manager of a specialty food store combined almonds that cost $4.50 per pound with walnuts that cost $2.50 per pound. How many pounds of each were used to make a 100 lb mixture that cost $3.24 per pound?

36) How many grams of pure salt must be added to 40 g of a 20% solution to make a saline solution that is 10% salt?

37) How many ounces of dried apricots must be added to 18 oz of a snack mix that contains 20% dried apricots to make a mixture that is 25% dried apricots?

38) How many milliliters of pure chocolate must be added to 150 ml of chocolate topping that is 50% chocolat3e to make a topping that is 75% chocolate?

39) How many ounces of pure bran flakes must be added to 50 oz of cereal that is 40% bran flakes to produce a mixture thatis 50% bran flakes?

40) A ground meat mixture is formed by combining meat that costs $2.20 per pound with meat that costs $4.20 per pound. How many pounds of each were used to make a 50 lb mixture tha costs $3.00 per pound?

41) How many grams of pure water must be added to 50 g of pure acid to make a solution that is 40% acid?

42) A lumber company combined oak wood chips that cost $3.10 per pound with pine wood chips that cost $2.50 per pound. How many pounds of each were used to make an 80 lb mixture costing $2.65 per pound?

43) How many ounces of pure water must be added to 50 oz of a 15% saline solution to make a saline solution that is 10% salt?

44) A tea that is 20% jasmine is blended with a tea that is 15% jasmine. How many pounds of each tea are used to make 5 lb of tea that is 18% jasmine?

Practice - Exponent Properties

Simplify.

1) $4 \cdot 4^4 \cdot 4^4$

2) $4 \cdot 4^4 \cdot 4^2$

3) $4 \cdot 2^2$

4) $3 \cdot 3^3 \cdot 3^2$

5) $3m \cdot 4mn$

6) $3x \cdot 4x^2$

7) $2m^4n^2 \cdot 4nm^2$

8) $x^2y^4 \cdot xy^2$

9) $(3^3)^4$

10) $(4^3)^4$

11) $(4^4)^2$

12) $(3^2)^3$

13) $(2u^3v^2)^2$

14) $(xy)^3$

15) $(2a^4)^4$

16) $(2xy)^4$

17) $\frac{4}{4^3}$

18) $\frac{3}{3^3}$

19) $\frac{3^2}{3}$

20) $\frac{3^4}{3}$

21) $\frac{3nm^2}{3n}$

22) $\frac{x^2y^4}{4xy}$

23) $\frac{4x^3y^3}{3xy^4}$

24) $\frac{xy^3}{4xy}$

25) $(x^3y^4 \cdot 2x^2y^3)^2$

26) $(u^2v^2 \cdot 2u^4)^3$

27) $2x(x^4y^4)^4$

28) $\frac{3vu^{4\cdot} \cdot 2v^2}{u^4v^2 \cdot 2u^3v^4}$

29) $\frac{2x^3y^2}{3x^3y^4 \cdot 4x^2y^3}$

30) $\frac{2ba^2 \cdot 2b^4}{ba^2 \cdot 3a^3b^4}$

31) $\left(\frac{(2x)^3}{x^3}\right)^2$

32) $\frac{2a^2b^2}{(ba^4)^2}$

33) $\left(\frac{2y}{(2x^2y^4)^4}\right)^3$

34) $\frac{yx^2 \cdot (y^4)^2}{2y^4}$

35) $\left(\frac{2m\,n^4}{mn^4 \cdot 2m^4n^4}\right)^3$

36) $\frac{n^3(n^4)^2}{2mn}$

37) $\frac{2xy^3 \cdot 2x^2y^2}{2xy^4 \cdot y^3}$

38) $\frac{(2yx^2)^2}{2x^2y^4 \cdot x^2}$

39) $\frac{q^3r^2 \cdot (2p^2q^2r^3)^2}{2p^3}$

40) $\frac{2x^4y^3 \cdot 2zx^2y^3}{(xy^2z^2)^4}$

41) $\left(\frac{zy^3 \cdot zx^2y^4}{x^3y^3z^3}\right)^4$

42) $\left(\frac{2qp^3r^4 \cdot 2p^3}{(qrp^3)^2}\right)^4$

43) $\frac{2x^2y^2z^2 \cdot 2zx^2y^2}{(x^2z^3)^2}$

Practice - Negative Exponents

Simplify. Your answer should contain only positive expontents.

1) $2x^4y^{-2} \cdot (2xy^3)^4$

2) $2a^{-2}b^{-3} \cdot (2a^0b^4)^4$

3) $(a^4b^{-3})^3 \cdot 2a^3b^{-2}$

4) $2x^3y^2 \cdot (2x^3)^0$

5) $(2x^2y^2)^4x^{-4}$

6) $(m^0n^3 \cdot 2m^{-3}n^{-3})^0$

7) $(x^3y^4)^3 \cdot x^{-4}y^4$

8) $2m^{-1}n^{-3} \cdot (2m^{-1}n^{-3})^4$

9) $\dfrac{2x^{-3}y^2}{3x^{-3}y^3 \cdot 3x^0}$

10) $\dfrac{3y^3}{3yx^3 \cdot 2x^4y^{-3}}$

11) $\dfrac{4xy^{-3} \cdot x^{-4}y^0}{4y^{-1}}$

12) $\dfrac{3x^3y^2}{4y^{-2} \cdot 3x^{-2}y^{-4}}$

13) $\dfrac{u^2v^{-1}}{2u^0v^4 \cdot 2uv}$

14) $\dfrac{2xy^2 \cdot 4x^3y^{-4}}{4x^{-4}y^{-4} \cdot 4x}$

15) $\dfrac{u^2}{4u^0v^3 \cdot 3v^2}$

16) $\dfrac{2x^{-2}y^2}{4yx^2}$

17) $\dfrac{2y}{(x^0y^2)^4}$

18) $\dfrac{(a^4)^4}{2b}$

19) $\left(\dfrac{2a^2b^3}{a^{-1}}\right)^4$

20) $\left(\dfrac{2y^{-4}}{x^2}\right)^{-2}$

21) $\dfrac{2nm^4}{(2m^2n^2)^4}$

22) $\dfrac{2y^2}{(x^4y^0)^{-4}}$

23) $\dfrac{(2mn)^4}{m^0n^{-2}}$

24) $\dfrac{2x^{-3}}{(x^4y^{-3})^{-1}}$

25) $\dfrac{y^3 \cdot x^{-3}y^2}{(x^4y^2)^3}$

26) $\dfrac{2x^{-2}y^0 \cdot 2xy^4}{(xy^0)^{-1}}$

27) $\dfrac{2u^{-2}v^3 \cdot (2uv^4)^{-1}}{2u^{-4}v^0}$

28) $\dfrac{2yx^2 \cdot x^{-2}}{(2x^0y^4)^{-1}}$

29) $\left(\dfrac{2x^0 \cdot y^4}{y^4}\right)^3$

30) $\dfrac{u^{-3}v^{-4}}{2v(2u^{-3}v^4)^0}$

31) $\dfrac{y(2x^4y^2)^2}{2x^4y^0}$

32) $\dfrac{b^{-1}}{(2a^4b^0)^0 \cdot 2a^{-3}b^2}$

33) $\dfrac{2yzx^2}{2x^4y^4z^{-2} \cdot (zy^2)^4}$

34) $\dfrac{2b^4c^{-2} \cdot (2b^3c^2)^{-4}}{a^{-2}b^4}$

35) $\dfrac{2kh^0 \cdot 2h^{-3}k^0}{(2kj^3)^2}$

36) $\left(\dfrac{(2x^{-3}y^0z^{-1})^3 \cdot x^{-3}y^2}{2x^3}\right)^{-2}$

37) $\dfrac{(cb^3)^2 \cdot 2a^{-3}b^2}{(a^3b^{-2}c^3)^3}$

38) $\dfrac{2q^4 \cdot m^2p^2q^4}{(2m^{-4}p^2)^3}$

39) $\dfrac{(yx^{-4}z^2)^{-1}}{z^3 \cdot x^2y^3z^{-1}}$

40) $\dfrac{2mpn^{-3}}{(m^0n^{-4}p^2)^3 \cdot 2n^2p^0}$

Practice - Scientific Notation

Write each number in scientific notiation

1) 885

2) 0.000744

3) 0.081

4) 1.09

5) 0.039

6) 15000

Write each number in standard notation

7) 8.7×10^5

8) 2.56×10^2

9) 9×10^{-4}

10) 5×10^4

11) 2×10^0

12) 6×10^{-5}

Simplify. Write each answer in scientific notation.

13) $(7 \times 10^{-1})(2 \times 10^{-3})$

14) $(2 \times 10^{-6})(8.8 \times 10^{-5})$

15) $(5.26 \times 10^{-5})(3.16 \times 10^{-2})$

16) $(5.1 \times 10^6)(9.84 \times 10^{-1})$

17) $(2.6 \times 10^{-2})(6 \times 10^{-2})$

18) $\frac{7.4 \times 10^4}{1.7 \times 10^{-4}}$

19) $\frac{4.9 \times 10^1}{2.7 \times 10^{-3}}$

20) $\frac{7.2 \times 10^{-1}}{7.32 \times 10^{-1}}$

21) $\frac{5.33 \times 10^{-6}}{9.62 \times 10^{-2}}$

22) $\frac{3.2 \times 10^{-3}}{5.02 \times 10^0}$

23) $(5.5 \times 10^{-5})^2$

24) $(9.6 \times 10^3)^{-4}$

25) $(7.8 \times 10^{-2})^5$

26) $(5.4 \times 10^6)^{-3}$

27) $(8.03 \times 10^4)^{-4}$

28) $(6.88 \times 10^{-4})(4.23 \times 10^1)$

29) $\frac{6.1 \times 10^{-6}}{5.1 \times 10^{-4}}$

30) $\frac{8.4 \times 10^5}{7 \times 10^{-2}}$

31) $(3.6 \times 10^0)(6.1 \times 10^{-3})$

32) $(3.15 \times 10^3)(8 \times 10^{-1})$

33) $(1.8 \times 10^{-5})^{-3}$

34) $\frac{9.58 \times 10^{-2}}{1.14 \times 10^{-3}}$

35) $\frac{9 \times 10^4}{7.83 \times 10^{-2}}$

36) $(8.3 \times 10^1)^5$

37) $\frac{3.22 \times 10^{-3}}{7 \times 10^{-6}}$

38) $\frac{5 \times 10^6}{6.69 \times 10^2}$

39) $\frac{2.4 \times 10^{-6}}{6.5 \times 10^0}$

40) $(9 \times 10^{-2})^{-3}$

41) $\frac{6 \times 10^3}{5.8 \times 10^{-3}}$

42) $(2 \times 10^4)(6 \times 10^1)$

Practice - Add and Subtract Polynomials

Simplify each expression.

1) $f(a) = -a^3 - a^2 + 6a - 21$ at $a = -4$

2) $f(n) = n^2 + 3n - 11$ at $n = -6$

3) $f(n) = n^3 - 7n^2 + 15n - 20$ at $n = 2$

4) $f(n) = n^3 - 9n^2 + 23n - 21$ at $n = 5$

5) $f(n) = -5n^4 - 11n^3 - 9n^2 - n - 5$ at $n = -1$

6) $f(x) = x^4 - 5x^3 - x + 13$ at $x = 5$

7) $f(x) = x^2 + 9x + 23$ at $x = -3$

8) $f(x) = -6x^3 + 41x^2 - 32x + 11$ at $x = 6$

9) $f(x) = x^4 - 6x^3 + x^2 - 24$ at $x = 6$

10) $f(m) = m^4 + 8m^3 + 14m^2 + 13m + 5$ at $m = -6$

11) $(5p - 5p^4) - (8p - 8p^4)$

12) $(7m^2 + 5m^3) - (6m^3 - 5m^2)$

13) $(3n^2 + n^3) - (2n^3 - 7n^2)$

14) $(x^2 + 5x^3) + (7x^2 + 3x^3)$

15) $(8n + n^4) - (3n - 4n^4)$

16) $(3v^4 + 1) + (5 - v^4)$

17) $(1 + 5p^3) - (1 - 8p^3)$

18) $(6x^3 + 5x) - (8x + 6x^3)$

19) $(5n^4 + 6n^3) + (8 - 3n^3 - 5n^4)$

20) $(8x^2 + 1) - (6 - x^2 - x^4)$

21) $(3 + b^4) + (7 + 2b + b^4)$

22) $(1 + 6r^2) + (6r^2 - 2 - 3r^4)$

23) $(8x^3 + 1) - (5x^4 - 6x^3 + 2)$

24) $(4n^4 + 6) - (4n - 1 - n^4)$

25) $(2a + 2a^4) - (3a^2 - 5a^4 + 4a)$

26) $(6v + 8v^3) + (3 + 4v^3 - 3v)$

27) $(4p^2 - 3 - 2p) - (3p^2 - 6p + 3)$

28) $(7 + 4m + 8m^4) - (5m^4 + 1 + 6m)$

29) $(4b^3 + 7b^2 - 3) + (8 + 5b^2 + b^3)$

30) $(7n + 1 - 8n^4) - (3n + 7n^4 + 7)$

31) $(3 + 2n^2 + 4n^4) + (n^3 - 7n^2 - 4n^4)$

32) $(7x^2 + 2x^4 + 7x^3) + (6x^3 - 8x^4 - 7x^2)$

33) $(n - 5n^4 + 7) + (n^2 - 7n^4 - n)$

34) $(8x^2 + 2x^4 + 7x^3) + (7x^4 - 7x^3 + 2x^2)$

35) $(8r^4 - 5r^3 + 5r^2) + (2r^2 + 2r^3 - 7r^4 + 1)$

36) $(4x^3 + x - 7x^2) + (x^2 - 8 + 2x + 6x^3)$

37) $(2n^2 + 7n^4 - 2) + (2 + 2n^3 + 4n^2 + 2n^4)$

38) $(7b^3 - 4b + 4b^4) - (8b^3 - 4b^2 + 2b^4 - 8b)$

39) $(8 - b + 7b^3) - (3b^4 + 7b - 8 + 7b^2) + (3 - 3b + 6b^3)$

40) $(1 - 3n^4 - 8n^3) + (7n^4 + 2 - 6n^2 + 3n^3) + (4n^3 + 8n^4 + 7)$

41) $(8x^4 + 2x^3 + 2x) + (2x + 2 - 2x^3 - x^4) - (x^3 + 5x^4 + 8x)$

42) $(6x - 5x^4 - 4x^2) - (2x - 7x^2 - 4x^4 - 8) - (8 - 6x^2 - 4x^4)$

Practice - Multiply Polynomials

Find each product.

1) $6(p-7)$

2) $4k(8k+4)$

3) $2(6x+3)$

4) $3n^2(6n+7)$

5) $5m^4(4m+4)$

6) $3(4r-7)$

7) $(4n+6)(8n+8)$

8) $(2x+1)(x-4)$

9) $(8b+3)(7b-5)$

10) $(r+8)(4r+8)$

11) $(4x+5)(2x+3)$

12) $(7n-6)(n+7)$

13) $(3v-4)(5v-2)$

14) $(6a+4)(a-8)$

15) $(6x-7)(4x+1)$

16) $(5x-6)(4x-1)$

17) $(5x+y)(6x-4y)$

18) $(2u+3v)(8u-7v)$

19) $(x+3y)(3x+4y)$

20) $(8u+6v)(5u-8v)$

21) $(7x+5y)(8x+3y)$

22) $(5a+8b)(a-3b)$

23) $(r-7)(6r^2-r+5)$

24) $(4x+8)(4x^2+3x+5)$

25) $(6n-4)(2n^2-2n+5)$

26) $(2b-3)(4b^2+4b+4)$

27) $(6x+3y)(6x^2-7xy+4y^2)$

28) $(3m-2n)(7m^2+6mn+4n^2)$

29) $(8n^2+4n+6)(6n^2-5n+6)$

30) $(2a^2+6a+3)(7a^2-6a+1)$

31) $(5k^2+3k+3)(3k^2+3k+6)$

32) $(7u^2+8uv-6v^2)(6u^2+4uv+3v^2)$

5.6

Practice - Multiply Special Products

Find each product.

1) $(x+8)(x-8)$

2) $(a-4)(a+4)$

3) $(1+3p)(1-3p)$

4) $(x-3)(x+3)$

5) $(1-7n)(1+7n)$

6) $(8m+5)(8m-5)$

7) $(5n-8)(5n+8)$

8) $(2r+3)(2r-3)$

9) $(4x+8)(4x-8)$

10) $(b-7)(b+7)$

11) $(4y-x)(4y+x)$

12) $(7a+7b)(7a-7b)$

13) $(4m-8n)(4m+8n)$

14) $(3y-3x)(3y+3x)$

15) $(6x-2y)(6x+2y)$

16) $(1+5n)^2$

17) $(a+5)^2$

18) $(v+4)^2$

19) $(x-8)^2$

20) $(1-6n)^2$

21) $(p+7)^2$

22) $(7k-7)^2$

23) $(7-5n)^2$

24) $(4x-5)^2$

25) $(5m-8)^2$

26) $(3a+3b)^2$

27) $(5x+7y)^2$

28) $(4m-n)^2$

29) $(2x+2y)^2$

30) $(8x+5y)^2$

31) $(5+2r)^2$

32) $(m-7)^2$

33) $(2+5x)^2$

34) $(8n+7)(8n-7)$

35) $(4v-7)(4v+7)$

36) $(b+4)(b-4)$

37) $(n-5)(n+5)$

38) $(7x+7)^2$

39) $(4k+2)^2$

40) $(3a-8)(3a+8)$

Practice - Dividing Polynomials

Divide.

1) $\dfrac{20x^2 + x^3 + 2x^2}{4x^3}$

2) $\dfrac{5x^4 + 45x^3 + 4x^2}{9x}$

3) $\dfrac{20n^4 + n^3 + 40n^2}{10n}$

4) $\dfrac{3k^3 + 4k^2 + 2k}{8k}$

5) $\dfrac{12x^4 + 24x^3 + 3x^2}{6x}$

6) $\dfrac{5p^4 + 16p^3 + 16p^2}{4p}$

7) $\dfrac{10n^4 + 50n^3 + 2n^2}{10n^2}$

8) $\dfrac{3m^4 + 18m^3 + 27m^2}{9m^2}$

9) $\dfrac{x^2 - 2x - 71}{x + 8}$

10) $\dfrac{r^2 - 3r - 53}{r - 9}$

11) $\dfrac{n^2 + 13n + 32}{n + 5}$

12) $\dfrac{b^2 - 10b + 16}{b - 7}$

13) $\dfrac{v^2 - 2v - 89}{v - 10}$

14) $\dfrac{x^2 + 4x - 26}{x + 7}$

15) $\dfrac{a^2 - 4a - 38}{a - 8}$

16) $\dfrac{x^2 - 10x + 22}{x - 4}$

17) $\dfrac{45p^2 + 56p + 19}{9p + 4}$

18) $\dfrac{48k^2 - 70k + 16}{6k - 2}$

19) $\dfrac{10x^2 - 32x + 9}{10x - 2}$

20) $\dfrac{n^2 + 7n + 15}{n + 4}$

21) $\dfrac{4r^2 - r - 1}{4r + 3}$

22) $\dfrac{3m^2 + 9m - 9}{3m - 3}$

23) $\dfrac{n^2 - 4}{n - 2}$

24) $\dfrac{2x^2 - 5x - 8}{2x + 3}$

25) $\dfrac{27b^2 + 87b + 35}{3b + 8}$

26) $\dfrac{3v^2 - 32}{3v - 9}$

27) $\dfrac{4x^2 - 33x + 28}{4x - 5}$

28) $\dfrac{4n^2 - 23n - 38}{4n + 5}$

29) $\dfrac{a^3 + 15a^2 + 49a - 55}{a + 7}$

30) $\dfrac{8k^3 - 66k^2 + 12k + 37}{k - 8}$

31) $\dfrac{x^3 - 26x - 41}{x + 4}$

32) $\dfrac{x^3 - 16x^2 + 71x - 56}{x - 8}$

33) $\dfrac{3n^3 + 9n^2 - 64n - 68}{n + 6}$

34) $\dfrac{k^3 - 4k^2 - 6k + 4}{k - 1}$

35) $\dfrac{x^3 - 46x + 22}{x + 7}$

36) $\dfrac{2n^3 + 21n^2 + 25n}{2n + 3}$

37) $\dfrac{9p^3 + 45p^2 + 27p - 5}{9p + 9}$

38) $\dfrac{8m^3 - 57m^2 + 42}{8m + 7}$

39) $\dfrac{r^3 - r^2 - 16r + 8}{r - 4}$

40) $\dfrac{2x^3 + 12x^2 + 4x - 37}{2x + 6}$

41) $\dfrac{12n^3 + 12n^2 - 15n - 4}{2n + 3}$

42) $\dfrac{24b^3 - 38b^2 + 29b - 60}{4b - 7}$

43) $\dfrac{4v^3 - 21v^2 + 6v + 19}{4v + 3}$

Practice - Greatest Common Factor

Factor the common factor out of each expression.

1) $9 + 8b^2$

2) $x - 5$

3) $45x^2 - 25$

4) $1 + 2n^2$

5) $56 - 35p$

6) $50x - 80y$

7) $7ab - 35a^2b$

8) $27x^2y^5 - 72x^3y^2$

9) $-3a^2b + 6a^3b^2$

10) $8x^3y^2 + 4x^3$

11) $-5x^2 - 5x^3 - 15x^4$

12) $-32n^9 + 32n^6 + 40n^5$

13) $20x^4 - 30x + 30$

14) $21p^6 + 30p^2 + 27$

15) $28m^4 + 40m^3 + 8$

16) $-10x^4 + 20y^2 + 12x$

17) $30b^9 + 5ab - 15a^2$

18) $27y^7 + 12y^2x + 9y^2$

19) $-48a^2b^2 - 56a^3b - 56a^5b$

20) $30m^6 + 15mn^2 - 25$

21) $20x^8y^2z^2 + 15x^5y^2z + 35x^3y^3z$

22) $3p + 12q - 15q^2r^2$

23) $50x^2y + 10y^2 + 70xz^2$

24) $30y^4z^3x^5 + 50y^4z^5 - 10y^4z^3x$

25) $30qpr - 5qp + 5q$

26) $28b + 14b^2 + 35b^3 + 7b$

27) $-18n^5 + 3n^3 - 21n + 3$

28) $30a^8 + 6a^5 + 27a^3 + 21a^2$

29) $-40x^{11} - 20x^{12} + 50x^{13} - 50x^4$

30) $-24x^6 - 4x^4 + 12x^3 + 4x^2$

31) $-32mn^8 + 4m^6n + 12mn^4 + 16mn$

32) $-10y^7 + 6y^{10} - 4y^{10}x - 8y^8x$

Practice - Grouping

Factor each completely.

1) $40r^3 - 8r^2 - 25r + 5$

2) $35x^3 - 10x^2 - 56x + 16$

3) $3n^3 - 2n^2 - 9n + 6$

4) $14v^3 + 10v^2 - 7v - 5$

5) $15b^3 + 21b^2 - 35b - 49$

6) $6x^3 - 48x^2 + 5x - 40$

7) $3x^3 + 15x^2 + 2x + 10$

8) $28p^3 + 21p^2 + 20p + 15$

9) $35x^3 - 28x^2 - 20x + 16$

10) $7n^3 + 21n^2 - 5n - 15$

11) $7xy - 49x + 5y - 35$

12) $42r^3 - 49r^2 + 18r - 21$

13) $32xy + 40x^2 + 12y + 15x$

14) $15ab - 6a + 5b^3 - 2b^2$

15) $16xy - 56x + 2y - 7$

16) $3mn - 8m + 15n - 40$

17) $2xy - 8x^2 + 7y^3 - 28y^2x$

18) $5mn + 2m - 25n - 10$

19) $40xy + 35x - 8y^2 - 7y$

20) $8xy + 56x - y - 7$

21) $32uv - 20u + 24v - 15$

22) $4uv + 14u^2 + 12v + 42u$

23) $10xy + 30 + 25x + 12y$

24) $24xy + 25y^2 - 20x - 30y^3$

25) $3uv + 14u - 6u^2 - 7v$

26) $56ab + 14 - 49a - 16b$

27) $16xy - 3x - 6x^2 + 8y$

Practice - Trinomials where a = 1

Factor each completely.

1) $p^2 + 17p + 72$

2) $x^2 + x - 72$

3) $n^2 - 9n + 8$

4) $x^2 + x - 30$

5) $x^2 - 9x - 10$

6) $x^2 + 13x + 40$

7) $b^2 + 12b + 32$

8) $b^2 - 17b + 70$

9) $x^2 + 3x - 70$

10) $x^2 + 3x - 18$

11) $n^2 - 8n + 15$

12) $a^2 - 6a - 27$

13) $p^2 + 15p + 54$

14) $p^2 + 7p - 30$

15) $n^2 - 15n + 56$

16) $m^2 - 15mn + 50n^2$

17) $u^2 - 8uv + 15v^2$

18) $m^2 - 3mn - 40n^2$

19) $m^2 + 2mn - 8n^2$

20) $x^2 + 10xy + 16y^2$

21) $x^2 - 11xy + 18y^2$

22) $u^2 - 9uv + 14v^2$

23) $x^2 + xy - 12y^2$

24) $x^2 + 14xy + 45y^2$

25) $x^2 + 4xy - 12y^2$

26) $4x^2 + 52x + 168$

27) $5a^2 + 60a + 100$

28) $5n^2 - 45n + 40$

29) $6a^2 + 24a - 192$

30) $5v^2 + 20v - 25$

31) $6x^2 + 18xy + 12y^2$

32) $5m^2 + 30mn - 90n^2$

33) $6x^2 + 96xy + 378y^2$

34) $6m^2 - 36mn - 162n^2$

Practice - Trinomials where a is not 1

Factor each completely.

1) $7x^2 - 48x + 36$

2) $7n^2 - 44n + 12$

3) $7b^2 + 15b + 2$

4) $7v^2 - 24v - 16$

5) $5a^2 - 13a - 28$

6) $5n^2 - 4n - 20$

7) $2x^2 - 5x + 2$

8) $3r^2 - 4r - 4$

9) $2x^2 + 19x + 35$

10) $7x^2 + 29x - 30$

11) $2b^2 - b - 3$

12) $5k^2 - 26k + 24$

13) $5k^2 + 13k + 6$

14) $3r^2 + 16r + 21$

15) $3x^2 - 17x + 20$

16) $3u^2 + 13uv - 10v^2$

17) $3x^2 + 17xy + 10y^2$

18) $7x^2 - 2xy - 5y^2$

20) $5u^2 + 31uv - 28v^2$

21) $6x^2 - 39x - 21$

22) $10a^2 - 54a - 36$

23) $21k^2 - 87k - 90$

24) $21n^2 + 45n - 54$

25) $14x^2 - 60x + 16$

26) $4r^2 + r - 3$

27) $6x^2 + 29x + 20$

28) $6p^2 + 11p - 7$

29) $4k^2 - 17k + 4$

30) $4r^2 + 3r - 7$

31) $4x^2 + 9xy + 2y^2$

32) $4m^2 + 6mn + 6n^2$

33) $4m^2 - 9mn - 9n^2$

34) $4x^2 - 6xy + 30y^2$

35) $4x^2 + 13xy + 3y^2$

36) $18u^2 - 3uv - 36v^2$

37) $12x^2 + 62xy + 70y^2$

38) $16x^2 + 60xy + 36y^2$

39) $24x^2 - 52xy + 8y^2$

40) $12x^2 + 50xy + 28y^2$

Practice - Special Products

Factor each completely.

1) $r^2 - 16$

2) $x^2 - 9$

3) $v^2 - 25$

4) $x^2 - 1$

5) $p^2 - 4$

6) $4v^2 - 1$

7) $9k^2 - 4$

8) $9a^2 - 1$

9) $3x^2 - 27$

10) $5n^2 - 20$

11) $16x^2 - 36$

12) $125x^2 + 45y^2$

13) $18a^2 - 50b^2$

14) $4m^2 + 64n^2$

15) $a^2 - 2a + 1$

16) $k^2 + 4k + 4$

17) $x^2 + 6x + 9$

18) $n^2 - 8n + 16$

19) $x^2 + 6x + 9$

20) $k^2 - 4k + 4$

21) $25p^2 - 10p + 1$

22) $x^2 + 2x + 1$

23) $25a^2 + 30ab + 9b^2$

24) $x^2 + 8xy + 16y^2$

25) $4a^2 - 20ab + 25b^2$

26) $18m^2 - 24mn + 8n^2$

27) $8x^2 - 24xy + 18y^2$

28) $20x^2 + 20xy + 5y^2$

29) $8 - m^3$

30) $x^3 + 64$

31) $x^3 - 64$

32) $x^3 + 8$

33) $216 - u^3$

34) $125x^3 - 216$

35) $125a^3 - 164$

36) $64x^3 - 27$

37) $64x^3 + 27y^3$

38) $32m^3 - 108n^3$

39) $54x^3 + 250y^3$

40) $375m^3 + 648n^3$

Practice - Strategy

Factor each completely.

1) $24az - 18ah + 60yz - 45yh$

2) $2x^2 - 11x + 15$

3) $5u^2 - 9uv + 4v^2$

4) $16x^2 + 48xy + 36y^2$

5) $-2x^3 + 128y^3$

6) $20uv - 60u^3 - 5xv + 15xu^2$

7) $5n^3 + 7n^2 - 6n$

8) $2x^3 + 5x^2y + 3y^2x$

9) $54u^3 - 16$

10) $54 - 128x^3$

11) $n^2 - n$

12) $5x^2 - 22x - 15$

13) $x^2 - 4xy + 3y^2$

14) $45u^2 - 150uv + 125v^2$

15) $9x^2 - 25y^2$

16) $x^3 - 27y^3$

17) $m^2 - 4n^2$

18) $12ab - 18a + 6nb - 9n$

19) $36b^2c - 16xd - 24b^2d + 24xc$

20) $3m^3 - 6m^2n - 24n^2m$

21) $128 + 54x^3$

22) $64m^3 + 27n^3$

23) $2x^3 + 6x^2y - 20y^2x$

24) $3ac + 15ad^2 + x^2c + 5x^2d^2$

25) $n^3 + 7n^2 + 10n$

26) $64m^3 - n^3$

27) $27x^3 - 64$

28) $16a^2 - 9b^2$

29) $5x^2 + 2x$

30) $2x^2 - 10x + 12$

31) $3k^3 - 27k^2 + 60k$

32) $32x^2 - 18y^2$

33) $mn - 12x + 3m - 4xn$

34) $2k^2 + k - 10$

35) $16x^2 - 8xy + y^2$

36) $v^2 + v$

37) $27m^2 - 48n^2$

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

39) $9x^3 + 21x^2y - 60y^2x$

40) $9n^3 - 3n^2$

41) $2m^2 + 6mn - 20n^2$

42) $2u^2v^2 - 11uv^3 + 15v^4$

Practice - Solving Equations by Factoring

Solve each equation by factoring.

1) $(k-7)(k+2)=0$

2) $(a+4)(a-3)=0$

3) $(x-1)(x+4)=0$

4) $(2x+5)(x-7)=0$

5) $6x^2-150=0$

6) $p^2+4p-32=0$

7) $2n^2+26x+15=0$

8) $m^2-m-30=0$

9) $7x^2+26x+15$

10) $40r^2-285r-280=0$

11) $5n^2-9n-2=0$

12) $2b^2-3b-2=0$

13) $x^2-4x-8=-8$

14) $v^2-8v-3=-3$

15) $x^2-5x-1=-5$

16) $a^2-6a+6=2$

17) $49p^2+371p-163=5$

18) $7k^2+57k+13=5$

19) $7x^2+17x-20=-8$

20) $4n^2-13n+8=5$

21) $7r^2+84=-49r$

22) $7m^2-224=28m$

23) $x^2-6x=16$

24) $7n^2-28n=0$

25) $3v^2+7v=40$

26) $6b^2=5+7b$

27) $35x^2+120x=-45$

28) $9n^2+39n=-36$

29) $4k^2+18k-23=6k-7$

30) $a^2+7a-9=-3+6a$

31) $9x^2-46+7x=7x+8x^2+3$

32) $x^2+10x+30=6$

33) $2m^2+19m+40=-2m$

34) $5n^2+41n+40=-2$

35) $40p^2+183p-168=p+5p^2$

36) $24x^2+11x-80=3x$

Practice - Reduce Rational Expressions

State the excluded values for each.

1) $\dfrac{3k^2 + 30k}{k + 10}$

2) $\dfrac{27p}{18p^2 - 36p}$

3) $\dfrac{15n^2}{10n + 25}$

4) $\dfrac{x + 10}{8x^2 + 80x}$

5) $\dfrac{10m^2 + 8m}{10m}$

6) $\dfrac{10x + 16}{6x + 20}$

7) $\dfrac{r^2 + 3r + 2}{5r + 10}$

8) $\dfrac{6n^2 - 21n}{6n^2 + 3n}$

9) $\dfrac{b^2 + 12b + 32}{b^2 + 4b - 32}$

10) $\dfrac{10v^2 + 30v}{35v^2 - 5v}$

Simplify each expression.

11) $\dfrac{21x^2}{18x}$

12) $\dfrac{12n}{4n^2}$

13) $\dfrac{24a}{40a^2}$

14) $\dfrac{21k}{24k^2}$

15) $\dfrac{32x^3}{8x^4}$

16) $\dfrac{90x^2}{20x}$

17) $\dfrac{18m - 24}{60}$

18) $\dfrac{10}{81n^3 + 36n^2}$

19) $\dfrac{20}{4p + 2}$

20) $\dfrac{n - 9}{9n - 81}$

21) $\dfrac{x + 1}{x^2 + 8x + 7}$

22) $\dfrac{28m + 12}{36}$

23) $\dfrac{32x^2}{28x^2 + 28x}$

24) $\dfrac{49r + 56}{56r}$

25) $\dfrac{n^2 + 4n - 12}{n^2 - 7n + 10}$

26) $\dfrac{b^2 + 14b + 48}{b^2 + 15b + 56}$

27) $\dfrac{9v + 54}{v^2 - 4v - 60}$

28) $\dfrac{30x - 90}{50x + 40}$

29) $\dfrac{12x^2 - 42x}{30x^2 - 42x}$

30) $\dfrac{k^2 - 12k + 32}{k^2 - 64}$

31) $\dfrac{6a - 10}{10a + 4}$

32) $\dfrac{9p + 18}{p^2 + 4p + 4}$

33) $\dfrac{2n^2 + 19n - 10}{9n + 90}$

34) $\dfrac{3x^2 - 29x + 40}{5x^2 - 30x - 80}$

35) $\dfrac{9m + 16}{20m - 12}$

36) $\dfrac{9r^2 + 81r}{5r^2 + 50r + 45}$

37) $\dfrac{2x^2 - 10x + 8}{3x^2 - 7x + 4}$

38) $\dfrac{50b - 80}{50b + 20}$

39) $\dfrac{7n^2 - 32n + 16}{4n - 16}$

40) $\dfrac{35v + 35}{21v + 7}$

41) $\dfrac{n^2 - 2n + 1}{6n + 6}$

42) $\dfrac{56x - 48}{24x^2 + 56x + 32}$

43) $\dfrac{7a^2 - 26a - 45}{6a^2 - 34a + 20}$

44) $\dfrac{4k^3 - 2k^2 - 2k}{9k^3 - 18k^2 + 9k}$

Practice - Multiply / Divide Rational Expressions

Simplify each expression.

1) $\frac{8x^2}{9} \cdot \frac{9}{2}$

2) $\frac{8x}{3x} \div \frac{4}{7}$

3) $\frac{9n}{2n} \cdot \frac{7}{5n}$

4) $\frac{9m}{5m^2} \cdot \frac{7}{2}$

5) $\frac{5x^2}{4} \cdot \frac{6}{5}$

6) $\frac{10p}{5} \div \frac{8}{10}$

7) $\frac{7\,(m-6)}{m-6} \cdot \frac{5m(7m-5)}{7(7m-5)}$

8) $\frac{7}{10(n+3)} \div \frac{n-2}{(n+3)(n-2)}$

9) $\frac{7r}{7r(r+10)} \div \frac{r-6}{(r-6)^2}$

10) $\frac{6x(x+4)}{x-3} \cdot \frac{(x-3)(x-6)}{6x(x-6)}$

11) $\frac{25n+25}{5} \cdot \frac{4}{30n+30}$

12) $\frac{9}{b^2-b-12} \div \frac{b-5}{b^2-b-12}$

13) $\frac{x-10}{35x+21} \div \frac{7}{35x+21}$

14) $\frac{v-1}{4} \cdot \frac{4}{v^2-11v+10}$

15) $\frac{x^2-6x-7}{x+5} \cdot \frac{x+5}{x-7}$

16) $\frac{1}{a-6} \cdot \frac{8a+80}{8}$

17) $\frac{8k}{24k^2-40k} \div \frac{1}{15k-25}$

18) $\frac{p-8}{p^2-12p+32} \div \frac{1}{p-10}$

19) $(n-8) \cdot \frac{6}{10n-80}$

20) $\frac{x^2-7x+10}{x-2} \cdot \frac{x+10}{x^2-x-20}$

21) $\frac{4m+36}{n+9} \cdot \frac{m-5}{5m^2}$

22) $\frac{2r}{r+6} \div \frac{2r}{7r+42}$

23) $\frac{3x-6}{12x-24}(x+3)$

24) $\frac{2n^2-12n-54}{n+7} \div (2n+6)$

25) $\frac{b+2}{40b^2-24b}(5b-3)$

26) $\frac{21v^2+16v-16}{3v+4} \div \frac{35v-20}{v-9}$

27) $\frac{n-7}{6n-12} \cdot \frac{12-6n}{n^2-13n+42}$

28) $\frac{x^2+11x+24}{6x^3+18x^2} \cdot \frac{6x^3+6x^2}{x^2+5x-24}$

29) $\frac{27a+36}{9a+63} \div \frac{6a+8}{2}$

30) $\frac{k-7}{k^2-k-12} \cdot \frac{7k^2-28k}{8k^2-56k}$

31) $\frac{x^2-12x+32}{x^2-6x-16} \cdot \frac{7x^2+14x}{7x^2+21x}$

32) $\frac{9x^3+54x^2}{x^2+5x-14} \cdot \frac{x^2+5x-14}{10x^2}$

33) $(10m^2+100m) \cdot \frac{18m^3-36m^2}{20m^2-40m}$

34) $\frac{n-7}{n^2-2n-35} \div \frac{9n+54}{10n+50}$

35) $\frac{7p^2+25p+12}{6p+48} \cdot \frac{3p-8}{21p^2-44p-32}$

36) $\frac{7x^2-66x+80}{49x^2+7x-72} \div \frac{7x^2+39x-70}{49x^2+7x-72}$

37) $\frac{10b^2}{30b+20} \cdot \frac{30b+20}{2b^2+10b}$

38) $\frac{35n^2-12n-32}{49n^2-91n+40} \cdot \frac{7n^2+16n-15}{5n+4}$

39) $\frac{7r^2-53r-24}{7r+2} \div \frac{49r+21}{49r+14}$

40) $\frac{12x+24}{10x^2+34x+28} \cdot \frac{15x+21}{5}$

Practice - Least Common Denominator

Build up denominators.

1) $\frac{3}{8} = \frac{?}{48}$

2) $\frac{a}{5} = \frac{?}{5a}$

3) $\frac{a}{x} = \frac{?}{xy}$

4) $\frac{5}{2x^2} = \frac{?}{8x^3y}$

5) $\frac{2}{3a^3b^2c} = \frac{?}{9a^5b^2c^4}$

6) $\frac{4}{x+5} = \frac{?}{9a^5b^2c^4}$

7) $\frac{2}{x+4} = \frac{?}{x^2-16}$

8) $\frac{x+1}{x-3} = \frac{?}{x^2-6x+9}$

9) $\frac{x-4}{x+2} = \frac{?}{x^2+5x+6}$

10) $\frac{x-6}{x+3} = \frac{?}{x^2-2x-15}$

Find Least Common Denominators

11) $2a^3, 6a^4b^2, 4a^3b^5$

12) $5x^2y, 25x^3y^5z$

13) $x^2-3x, x-3, x$

14) $4x-8, , x-2, 4$

15) $x+2, x-4$

16) $x, x-7, x+1$

17) $x^2-25, x+5$

18) x^2-9, x^2-3x+9

19) x^2+3x+2, x^2+5x+6

20) $x^2-7x+10, x^2-2x-15, x^2+x-6$

Find LCD and build up each fraction

21) $\frac{3a}{5b^2}, \frac{2}{10a^3b}$

22) $\frac{3x}{x-4}, \frac{2}{x+2}$

23) $\frac{x+2}{x-3}, \frac{x-3}{x+2}$

24) $\frac{5}{x^2-6x}, \frac{2}{x}, \frac{-3}{x-6}$

25) $\frac{x}{x^2-16}, \frac{3x}{x^2-8x+16}$

26) $\frac{5x+1}{x^2-3x-10}, \frac{4}{x-5}$

27) $\frac{x+1}{x^2-36}, \frac{2x+3}{x^2+12x+36}$

28) $\frac{3x+1}{x^2-x-6}, \frac{2x}{x^2+4x+3}$

29) $\frac{4x}{x^2-x-6}, \frac{x+2}{x-3}$

30) $\frac{3x}{x^2-6x+8}, \frac{x-2}{x^2+x-20}, \frac{5}{x^2+3x-10}$

Practice - Adding Rational Expressions

Add or subtract the rational expressions. Simplify your answers whenever possible.

1) $\frac{2}{a+3} + \frac{4}{a+3}$

2) $\frac{x^2}{x-2} - \frac{6x-8}{x-2}$

3) $\frac{t^2+4t}{t-1} + \frac{2t-7}{t-1}$

4) $\frac{a^2+3a}{a^2+5a-6} - \frac{4}{a^2+5a-6}$

5) $\frac{2x^2+3}{x^2-6x+5} - \frac{x^2-5x+9}{x^2-6x+5}$

6) $\frac{3}{x} + \frac{4}{x^2}$

7) $\frac{5}{6r} - \frac{5}{8r}$

8) $\frac{7}{xy^2} + \frac{3}{x^2y}$

9) $\frac{8}{9y^3} = \frac{5}{6t^2}$

10) $\frac{x+5}{8} + \frac{x-3}{12}$

11) $\frac{a+2}{2} - \frac{a-4}{4}$

12) $\frac{2a-1}{3a^2} + \frac{5a+1}{9a}$

13) $\frac{x-1}{4x} - \frac{2x+3}{x}$

14) $\frac{2c-d}{c^2d} - \frac{c+d}{cd^2}$

15) $\frac{5x+3y}{2x^2y} - \frac{3x+4y}{xy^2}$

16) $\frac{2}{x-1} + \frac{2}{x+1}$

17) $\frac{2z}{z-1} - \frac{3z}{z+1}$

18) $\frac{2}{x-5} + \frac{3}{4x}$

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

20) $\frac{4x}{x^2-25} + \frac{x}{x+5}$

21) $\frac{t}{t-3} - \frac{5}{4t-12}$

22) $\frac{2}{x+3} + \frac{4}{(x+3)^2}$

23) $\frac{2}{5x^2+5x} - \frac{4}{3x+3}$

24) $\frac{3a}{4a-20} + \frac{91}{6a-30}$

25) $\frac{t}{y-t} - \frac{y}{y+t}$

26) $\frac{x}{x-5} + \frac{x-5}{x}$

27) $\frac{x}{x^2+5x+6} - \frac{2}{x^2+3x+2}$

28) $\frac{2x}{x^2-1} - \frac{3}{x^2+5x+4}$

29) $\frac{x}{x^2+15x+56} - \frac{7}{x^2+13x+42}$

30) $\frac{2x}{x^2-9} + \frac{5}{x^2+x-6}$

31) $\frac{5x}{x^2-x-6} - \frac{18}{x^2-9}$

32) $\frac{4x}{x^2-2x-3} - \frac{3}{x^2-5x+6}$

33) $\frac{2x}{x^2-1} - \frac{4}{x^2+2x+3}$

34) $\frac{x-1}{x^2+3x+2} + \frac{x+5}{x^2+4x+3}$

35) $\frac{x+1}{x^2+2x-35} + \frac{x+6}{x^2+7x+10}$

36) $\frac{3x+2}{3x+6} + \frac{x}{4-x^2}$

37) $\frac{4-a^2}{a^2-9} - \frac{a-2}{3-a}$

38) $\frac{4y}{y^2-1} - \frac{2}{y} - \frac{2}{y+1}$

39) $\frac{2x}{1-2z} + \frac{3z}{2z+1} - \frac{3}{4z^2-1}$

40) $\frac{2r}{r^2-s^2} + \frac{1}{r+s} - \frac{1}{r-s}$

41) $\frac{2x-3}{x^2+3x+2} + \frac{3x-1}{x^2+5x+6}$

42) $\frac{x+2}{x^2-4x+3} + \frac{4x+5}{x^2+4x-5}$

43) $\frac{2x+7}{x^2-2x-3} - \frac{3x-2}{x^2+6x+5}$

44) $\frac{3x-8}{x^2+6x+8} + \frac{2x-3}{x^2+3x+2}$

Practice - Complex Fractions

Solve.

1) $\dfrac{1+\frac{1}{x}}{1+\frac{1}{x^2}}$

21) $\dfrac{x-1+\frac{2}{x-4}}{x+3+\frac{6}{x-4}}$

3) $\dfrac{a-2}{\frac{4}{a}-a}$

23) $\dfrac{x-4+\frac{9}{2x+3}}{x+3-\frac{5}{2x+3}}$

5) $\dfrac{\frac{1}{a^2}-\frac{1}{a}}{\frac{1}{a^2}+\frac{1}{a}}$

25) $\dfrac{\frac{2}{b}-\frac{5}{b+3}}{\frac{3}{b}+\frac{3}{b+3}}$

7) $\dfrac{2-\frac{4}{x+2}}{5-\frac{10}{x+2}}$

27) $\dfrac{\frac{2}{b^2}-\frac{5}{ab}-\frac{3}{a^2}}{\frac{2}{b^2}+\frac{7}{ab}+\frac{3}{a^2}}$

9) $\dfrac{\frac{3}{2a-3}+2}{\frac{-6}{2a-3}-4}$

29) $\dfrac{\frac{y}{y+2}-\frac{y}{y-2}}{\frac{y}{y+2}+\frac{y}{y-2}}$

11) $\dfrac{\frac{x}{x+1}-\frac{1}{x}}{\frac{x}{x+1}+\frac{1}{x}}$

2) $\dfrac{\frac{1}{y^2}-1}{1+\frac{1}{y}}$

13) $\dfrac{\frac{3}{x}}{\frac{9}{x^2}}$

4) $\dfrac{\frac{25}{a}-a}{5+a}$

15) $\dfrac{\frac{a^2-b^2}{4a^2b}}{\frac{a+b}{16ab^2}}$

6) $\dfrac{\frac{1}{b}+\frac{1}{2}}{\frac{4}{b^2-1}}$

17) $\dfrac{1-\frac{3}{x}-\frac{10}{x^2}}{1+\frac{11}{x}+\frac{18}{x^2}}$

8) $\dfrac{4+\frac{12}{2x-3}}{5+\frac{15}{2x-3}}$

19) $\dfrac{1-\frac{2x}{3x-4}}{x-\frac{32}{3x-4}}$

10) $\dfrac{\frac{-5}{b-5}-3}{\frac{10}{b-5}+6}$

12) $\dfrac{\dfrac{2a}{a-1}-\dfrac{3}{a}}{\dfrac{-6}{a-1}-4}$

22) $\dfrac{x-5-\dfrac{18}{x+2}}{x+7+\dfrac{6}{x+2}}$

14) $\dfrac{\dfrac{x}{3x-2}}{\dfrac{x}{9x^2-4}}$

24) $\dfrac{\dfrac{1}{a}-\dfrac{3}{a-2}}{\dfrac{2}{a}+\dfrac{5}{a-2}}$

16) $\dfrac{1-\dfrac{1}{x}-\dfrac{6}{x^2}}{1-\dfrac{4}{x}+\dfrac{3}{x^2}}$

26) $\dfrac{\dfrac{1}{y^2}-\dfrac{1}{xy}-\dfrac{2}{x^2}}{\dfrac{1}{y^2}-\dfrac{3}{xy}+\dfrac{2}{x^2}}$

18) $\dfrac{\dfrac{15}{x^2}-\dfrac{2}{x}-1}{\dfrac{4}{x^2}-\dfrac{5}{x}+4}$

28) $\dfrac{\dfrac{x-1}{x+1}-\dfrac{x+1}{x-1}}{\dfrac{x-1}{x+1}+\dfrac{x+1}{x-1}}$

20) $\dfrac{1-\dfrac{12}{3x+10}}{x-\dfrac{8}{3x+10}}$

30) $\dfrac{\dfrac{x+1}{x-1}-\dfrac{1-x}{1+x}}{\dfrac{1}{(x+1)^2}+\dfrac{1}{(x-1)^2}}$

Simplify each of the following fractional expressions.

31) $\dfrac{x^{-2}-y^{-2}}{x^{-1}+y^{-1}}$

32) $\dfrac{x^{-2}y+xy^{-2}}{x^{-2}-y^{-2}}$

33) $\dfrac{x^{-3}y-xy^{-3}}{x^{-2}-y^{-2}}$

34) $\dfrac{4-4x^{-1}+x^{-2}}{4-x^{-2}}$

35) $\dfrac{x^{-2}-6x^{-1}+9}{x^2-9}$

36) $\dfrac{x^{-3}+y^{-3}}{x^{-2}-x^{-1}y^{-1}+y^{-2}}$

Practice - Proportions

Solve each proportion.

1) $\frac{10}{a} = \frac{6}{8}$

2) $\frac{7}{9} = \frac{n}{6}$

3) $\frac{7}{6} = \frac{2}{k}$

4) $\frac{8}{x} = \frac{4}{8}$

5) $\frac{6}{x} = \frac{8}{2}$

6) $\frac{n-10}{8} = \frac{9}{3}$

7) $\frac{m-1}{5} = \frac{8}{2}$

8) $\frac{8}{5} = \frac{3}{x-8}$

9) $\frac{2}{9} = \frac{10}{p-4}$

10) $\frac{9}{n+2} = \frac{3}{9}$

11) $\frac{b-10}{7} = \frac{b}{4}$

12) $\frac{9}{4} = \frac{r}{r-4}$

13) $\frac{x}{5} = \frac{x+2}{9}$

14) $\frac{n}{8} = \frac{n-4}{3}$

15) $\frac{3}{10} = \frac{a}{a+2}$

16) $\frac{x+1}{9} = \frac{x+2}{2}$

17) $\frac{v-5}{v+6} = \frac{4}{9}$

18) $\frac{n+8}{10} = \frac{n-9}{4}$

19) $\frac{7}{x-1} = \frac{4}{x-6}$

20) $\frac{k+5}{k-6} = \frac{8}{5}$

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

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

23) $\frac{m+3}{4} = \frac{11}{m-4}$

24) $\frac{x-5}{8} = \frac{4}{x-1}$

25) $\frac{2}{p+4} = \frac{p+5}{3}$

26) $\frac{5}{n+1} = \frac{n-4}{10}$

27) $\frac{n+4}{3} = \frac{-3}{n-2}$

28) $\frac{1}{n+3} = \frac{n+2}{2}$

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

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

Answer each question. Round your answer to the nearest tenth. Round dollar amounts to the nearest cent.

31) The currency in Western Samoa is the Tala. The exchange rate is approximately $0.70 to 1 Tala. At this rate, how many dollars would you get if you exchanged 13.3 Tala?

32) If you can buy one plantain for $0.49 then how many can you buy with

$7.84?

33) Kali reduced the size of a painting to a height of 1.3 in. What is the new width if it was originally 5.2 in. tall and 10 in. wide?

34) A model train has a scale of 1.2 in : 2.9 ft. If the model train is 5 in tall then how tall is the real train?

35) A bird bath that is 5.3 ft tall casts a shadow that is 25.4 ft long. Find the length of the shadow that a 8.2 ft adult elephant casts.

36) Victoria and Georgetown are 36.2 mi from each other. How far apart would the cities be on a map that has a scale of 0.9 in : 10.5 mi?

37) The Vikings led the Timberwolves by 19 points at the half. If the Vikings scored 3 points for every 2 points the Timberwolves scored, what was the half time score?

38) Sarah worked 10 mroe hours than Josh. If Sarah worked 7 hr for every 2 hr Josh worked, how long did they each work?

39) Computer Services Inc. charges $8 more for a repair than Low Cost Computer Repair. If the ratio of the costs is 3 : 6, what will it cost for the repair at Low Cost Computer Repair?

40) Kelsey's commute is 15 minutes longer than Christina's. If Christina drives 12 minutes for every 17 minutes Kelsey drives, how long is each commute?

Practice - Rational Equations

Solve the following equations for the given variable:

1) $3x - \frac{1}{2} - \frac{1}{x} = 0$

3) $x + \frac{20}{x-4} = \frac{5x}{x-4} - 2$

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

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

9) $\frac{3m}{2m-5} - \frac{7}{3m+1} = \frac{3}{2}$

11) $\frac{4-x}{1-x} = \frac{12}{3-x}$

13) $\frac{7}{y-3} - \frac{1}{2} = \frac{y-2}{y-4}$

15) $\frac{1}{x+2} - \frac{1}{2-x} = \frac{3x+8}{x^2-4}$

17) $\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6}$

19) $\frac{3}{2x+1} + \frac{2x+1}{1-2x} = 1 - \frac{8x^2}{4x^2-1}$

21) $\frac{x-2}{x+3} - \frac{1}{x-2} = \frac{1}{x^2+x-6}$

23) $\frac{3}{x+2} + \frac{x-1}{x+5} = \frac{5x+20}{6x+24}$

25) $\frac{x}{x-1} - \frac{2}{x+1} = \frac{4x^2}{x^2-1}$

27) $\frac{2x}{x+1} - \frac{3}{x+5} = \frac{-8x^2}{x^2+6x+5}$

29) $\frac{x-5}{x-9} + \frac{x+3}{x-3} = \frac{-4x^2}{x^2 12x+27}$

31) $\frac{x+1}{x-4} + \frac{3x-2}{x+4} = \frac{7x^2}{x^2-16}$

33) $\frac{x+3}{x-2} + \frac{x-2}{x+1} = \frac{9x^2}{x^2-x-2}$

35) $\frac{3x-1}{x+6} - \frac{2x-3}{x-3} = \frac{-3x^2}{x^2+3x-18}$

39)

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

4) $\frac{x^2+6}{x-1} + \frac{x-2}{x-1} = 2x$

6) $\frac{4-x}{x-1} = \frac{12}{3-x} + 1$

8) $\frac{6x+5}{2x^2-2x} - \frac{2}{1-x^2} = \frac{3x}{x^2-1}$

10) $\frac{4x}{2x-6} - \frac{4}{5x-15} = \frac{1}{2}$

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

14) $\frac{2}{3-x} - \frac{6}{8-x} = 1$

16) $\frac{x+2}{3x-1} - \frac{1}{x} = \frac{3x+8}{3x^2-x}$

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

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

22) $\frac{x-1}{x-2} + \frac{x+4}{2x+1} = \frac{1}{2x^2-3x-2}$

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

26) $\frac{2x}{x+2} + \frac{2}{x-4} = \frac{5x^2}{x^2-2x-8}$

28) $\frac{x}{x+1} - \frac{3}{x+3} = \frac{-2x^2}{x^2+4x+3}$

30) $\frac{x-3}{x+6} + \frac{x-2}{x-3} = \frac{x^2}{x^2+3x-18}$

32) $\frac{x-3}{x-6} + \frac{x+5}{x+3} = \frac{-2x^2}{x^2-3x-18}$

34) $\frac{4x+1}{x+3} + \frac{5x-3}{x-1} = \frac{8x^2}{x^2+2x-3}$

Practice - Dimensional Analysis

Use dimensional analysis to convert the following:

1) 7 mi. to yards

2) 234 oz. to tons

3) 11.2 mg to grams

4) 1.35 km to centimeters

5) 9,800,000 mm (milimeters) to miles

6) 4.5 ft^2 to square yards

7) 435,000 m^2 to squre kilometers

8) 8 km^2 to square feet

9) 0.0065 km^3 to cubic meters

10) 14.62 in^3 to cubic centimeters

11) 5,500 cm^3 to cubic yards

12) 3.5 mph (miles per hour) to feet per second

13) 185 yd. per min. to miles per hour

14) 153 ft/s (feet per second) to miles per hour

15) 248 mph to meters per second

16) 186,000 mph to kilometers per year

17) 7.50 T/yd^2 (tons per square yard) to pounds per square inch

18) 16 ft/s^2 to kilometers per hour squared

Use dimensional analysis to solve the following:

19) On a recent trip, Jan traveled 260 miles using 8 gallons of gas. How many

miles per 1-gallon did she travel? How many yards per 1-ounce?

20) A chair lift at the Divide ski resort in Cold Springs, WY is 4806 feet long and takes 9 minutes. What is the average speed in miles per hour? How many feet per second does the lift travel?

21) A certain laser printer can print 12 pages per minute. Determine this printer's output in pages per day, and reams per month. (1 ream = 5000 pages)

22) An average human heart beats 60 times per minute. If an average person lives to the age of 75, how many times does the average heart beat in a lifetime?

23) Blood sugar levels are measured in miligrams of gluclose per deciliter of blood volume. If a person's blood sugar level measured 128 mg/dL, how much is this in grams per liter?

24) You are buying carpet to cover a room that measures 38 ft by 40 ft. The carpet cost $18 per square yard. How much will the carpet cost?

25) A car travels 14 miles in 15 minutes. How fast is it going in miles per hour? in meters per second?

26) A cargo container is 50 ft long, 10 ft wide, and 8 ft tall. Find its volume in cubic yards and cubic meters.

27) A local zoning ordinance says that a house's "footprint" (area of its ground floor) cannot occupy more than $\frac{1}{4}$ of the lot it is built on. Suppose you own a $\frac{1}{3}$-acre lot, what is teh maximum allowed footprint for your house in square feet? in square inches? (1 acre = 43560 ft^2)

28) Computer memory is measured in units of bytes, where one byte is enough memory to store one character (a letter in the alphabet or a number). How many typical pages of text can be stored on a 700-megabyte compact disc? Assume that one typical page of text contains 2000 characters. (1 megabyte = 1,000,000 bytes)

29) In April 1996, the Department of the Interior released a "spike flood" from the Glen Canyon Dam on the Colorado River. Its purpose was to restore the river and the habitants along its bank. The release from teh dam lasted a week at a rate of 25,800 cubic feet of water per second. About how much water was released during the 1-week flood?

30) The largest single rough diamond ever found, the Cullinan diamond, weighed 3106 carats; how much does the diamond weigh in miligrams? in pounds?
(1 carat - 0.2 grams)

Practice - Square Roots

Simplify.

1) $\sqrt{245}$

2) $\sqrt{125}$

3) $\sqrt{36}$

4) $\sqrt{196}$

5) $\sqrt{12}$

6) $\sqrt{72}$

7) $3\sqrt{12}$

8) $5\sqrt{32}$

9) $6\sqrt{128}$

10) $7\sqrt{128}$

11) $-8\sqrt{392}$

12) $-7\sqrt{63}$

13) $\sqrt{192n}$

14) $\sqrt{343b}$

15) $\sqrt{196v^2}$

16) $\sqrt{100n^3}$

17) $\sqrt{252x^2}$

18) $\sqrt{200a^3}$

19) $-\sqrt{100k^4}$

20) $-4\sqrt{175p^4}$

21) $-7\sqrt{64x^4}$

22) $-2\sqrt{128n}$

23) $-5\sqrt{36m}$

24) $8\sqrt{112p^2}$

25) $\sqrt{45x^2y^2}$

26) $\sqrt{72a^3b^4}$

27) $\sqrt{16x^3y^3}$

28) $\sqrt{512a^4b^2}$

29) $\sqrt{320x^4y^4}$

30) $\sqrt{512m^4n^3}$

31) $3\sqrt{320x^4y^4}$

32) $8\sqrt{98mn}$

33) $5\sqrt{245x^2y^3}$

34) $2\sqrt{72x^2y^2}$

35) $-2\sqrt{180u^3v}$

36) $-5\sqrt{72x^3y^4}$

37) $-8\sqrt{180x^4y^2z^4}$

38) $6\sqrt{50a^4bc^2}$

39) $2\sqrt{80hj^4k}$

40) $-\sqrt{32xy^2z^3}$

41) $-4\sqrt{54mnp^2}$

42) $-8\sqrt{32m^2p^4q}$

Practice - Higher Roots

Simplify.

1) $\sqrt[3]{625}$

2) $\sqrt[3]{375}$

3) $\sqrt[3]{750}$

4) $\sqrt[3]{250}$

5) $\sqrt[3]{875}$

6) $\sqrt[3]{24}$

7) $-4\sqrt[4]{96}$

8) $-8\sqrt[4]{48}$

9) $6\sqrt[4]{112}$

10) $3\sqrt[4]{48}$

11) $-\sqrt[4]{112}$

12) $5\sqrt[4]{243}$

13) $\sqrt[4]{648a^2}$

14) $\sqrt[4]{64n^3}$

15) $\sqrt[5]{224n^3}$

16) $\sqrt[5]{-96x^3}$

17) $\sqrt[5]{224p^5}$

18) $\sqrt[6]{256x^6}$

19) $-3\sqrt[7]{896r}$

20) $-8\sqrt[7]{384b^8}$

21) $-2\sqrt[3]{-48v^7}$

22) $4\sqrt[3]{250a^6}$

23) $-7\sqrt[3]{320n^6}$

24) $-\sqrt[3]{512n^6}$

25) $\sqrt[3]{-135x^5y^3}$

26) $\sqrt[3]{64u^5v^3}$

27) $\sqrt[3]{-32x^4y^4}$

28) $\sqrt[3]{1000a^4b^5}$

29) $\sqrt[3]{256x^4y^6}$

30) $\sqrt[3]{189x^3y^6}$

31) $7\sqrt[3]{-81x^3y^7}$

32) $-4\sqrt[3]{56x^2y^8}$

33) $2\sqrt[3]{375u^2v^8}$

34) $8\sqrt[3]{-750xy}$

35) $-3\sqrt[3]{192ab^2}$

36) $3\sqrt[3]{135xy^3}$

37) $6\sqrt[3]{-54m^8n^3p^7}$

38) $-6\sqrt[4]{80m^4p^7q^4}$

39) $6\sqrt[4]{648x^5y^7z^2}$

40) $-6\sqrt[4]{405a^5b^8c}$

41) $7\sqrt[4]{128h^6j^8k^8}$

42) $-6\sqrt[4]{324x^7yz^7}$

Practice - Add and Subtract Radicals

Simiplify

1) $2\sqrt{5} + 2\sqrt{5} + 2\sqrt{5}$

2) $-3\sqrt{6} - 3\sqrt{3} - 2\sqrt{3}$

3) $-3\sqrt{2} + 3\sqrt{5} + 3\sqrt{5}$

4) $-2\sqrt{6} - \sqrt{3} - 3\sqrt{6}$

5) $-2\sqrt{6} - 2\sqrt{6} - \sqrt{6}$

6) $-3\sqrt{3} + 2\sqrt{3} - 2\sqrt{3}$

7) $3\sqrt{6} + 3\sqrt{5} + 2\sqrt{5}$

8) $-\sqrt{5} + 2\sqrt{3} - 2\sqrt{3}$

9) $2\sqrt{2} - 3\sqrt{18} - \sqrt{2}$

10) $-\sqrt{54} - 3\sqrt{6} + 3\sqrt{27}$

11) $-3\sqrt{6} - \sqrt{12} + 3\sqrt{3}$

12) $-\sqrt{5} - \sqrt{5} - 2\sqrt{54}$

13) $3\sqrt{2} + 2\sqrt{8} - 3\sqrt{18}$

14) $2\sqrt{20} + 2\sqrt{20} - \sqrt{3}$

15) $3\sqrt{18} - \sqrt{2} - 3\sqrt{2}$

16) $-3\sqrt{27} + 2\sqrt{3} - \sqrt{12}$

17) $-3\sqrt{6} - 3\sqrt{6} - \sqrt{3} + 3\sqrt{6}$

18) $-2\sqrt{2} - \sqrt{2} + 3\sqrt{8} + 3\sqrt{6}$

19) $-2\sqrt{18} - 3\sqrt{8} - \sqrt{20} + 2\sqrt{20}$

20) $-3\sqrt{18} - \sqrt{8} + 2\sqrt{8} + 2\sqrt{8}$

21) $-2\sqrt{24} - 2\sqrt{6} + 2\sqrt{6} + 2\sqrt{20}$

22) $-3\sqrt{8} - \sqrt{5} - 3\sqrt{6} + 2\sqrt{18}$

23) $3\sqrt{24} - 3\sqrt{27} + 2\sqrt{6} + 2\sqrt{8}$

24) $2\sqrt{6} - \sqrt{54} - 3\sqrt{27} - \sqrt{3}$

25) $-2\sqrt[3]{16} + 2\sqrt[3]{16} - 2\sqrt[3]{2}$

26) $3\sqrt[3]{135} - \sqrt[3]{81} - \sqrt[3]{135}$

27) $2\sqrt[4]{243} - 2\sqrt[4]{243} - \sqrt[4]{3}$

28) $-3\sqrt[4]{4} + 3\sqrt[4]{324} + 2\sqrt[4]{64}$

29) $3\sqrt[4]{2} - 2\sqrt[4]{2} - \sqrt[4]{243}$

30) $2\sqrt[4]{6} + 2\sqrt[4]{4} + 3\sqrt[4]{6}$

31) $-\sqrt[4]{324} + 3\sqrt[4]{324} - 3\sqrt[4]{4}$

32) $-2\sqrt[4]{243} - \sqrt[4]{96} + 2\sqrt[4]{96}$

33) $2\sqrt[4]{2} + 2\sqrt[4]{3} + 3\sqrt[4]{64} - \sqrt[4]{3}$

34) $2\sqrt[4]{48} - 3\sqrt[4]{405} - 3\sqrt[4]{48} - \sqrt[4]{162}$

35) $-3\sqrt[5]{6} - \sqrt[5]{64} + 2\sqrt[5]{192} - 2\sqrt[5]{160}$

36) $2\sqrt[5]{256} - 2\sqrt[7]{256} - 3\sqrt[7]{2} - \sqrt[7]{640}$

37) $2\sqrt[5]{160} - 2\sqrt[5]{192} - \sqrt[5]{160} - \sqrt[5]{-160}$

38) $-2\sqrt[7]{256} - 2\sqrt[7]{256} - 3\sqrt[7]{2} - \sqrt[7]{640}$

39) $-\sqrt[6]{256} - 2\sqrt[6]{4} - 3\sqrt[6]{320} - 2\sqrt[6]{128}$

40) $-3\sqrt[7]{3} - 3\sqrt[7]{768} + 2\sqrt[7]{384} + 3\sqrt[7]{5}$

Practice - Multiply and Divide Radicals

State if the given functions are inverses.

1) $3\sqrt{5} \cdot -4\sqrt{16}$

2) $-5\sqrt{10} \cdot \sqrt{15}$

3) $\sqrt{12m} \cdot \sqrt{15m}$

4) $\sqrt{5r^3} \cdot -5\sqrt{10r^2}$

5) $\sqrt[3]{4x^3} \cdot \sqrt[3]{2x^4}$

6) $3\sqrt[3]{4a^4} \cdot \sqrt[3]{10a^3}$

7) $\sqrt{6}(\sqrt{2} + 2)$

8) $\sqrt{10}(\sqrt{5} + \sqrt{2})$

9) $-5\sqrt{15}(3\sqrt{3} + 2)$

10) $5\sqrt{15}(3\sqrt{3} + 2)$

11) $5\sqrt{10}(5n + \sqrt{2})$

12) $\sqrt{15}(\sqrt{5} - 3\sqrt{3v})$

13) $(2 + 2\sqrt{2})(-3 + \sqrt{2})$

14) $(-2 + \sqrt{3})(-5 + 2\sqrt{3})$

15) $(\sqrt{5} - 5)(2\sqrt{5} - 1)$

16) $(2\sqrt{3} + \sqrt{5})(5\sqrt{3} + 2\sqrt{4})$

17) $(\sqrt{2a} + 2\sqrt{3a})(3\sqrt{2a} + \sqrt{5a})$

18) $(-2\sqrt{2p} + 5\sqrt{5})(\sqrt{5p} + \sqrt{5p})$

19) $(-5 - 4\sqrt{3})(-3 - 4\sqrt{3})$

20) $(5\sqrt{2} - 1)(-\sqrt{2m} + 5)$

21) $\frac{\sqrt{12}}{5\sqrt{100}}$

22) $\frac{\sqrt{15}}{2\sqrt{4}}$

23) $\frac{\sqrt{5}}{4\sqrt{125}}$

24) $\frac{\sqrt{12}}{\sqrt{3}}$

25) $\frac{\sqrt{10}}{\sqrt{6}}$

26) $\frac{\sqrt{2}}{3\sqrt{5}}$

27) $\frac{2\sqrt{4}}{3\sqrt{3}}$

28) $\frac{4\sqrt{3}}{\sqrt{15}}$

29) $\frac{5x^2}{4\sqrt{3x^3y^3}}$

30) $\frac{4}{5\sqrt{3xy^4}}$

31) $\frac{\sqrt{2p^2}}{\sqrt{3p}}$

32) $\frac{\sqrt{8n^2}}{\sqrt{10n}}$

33) $\frac{3\sqrt[3]{10}}{5\sqrt[3]{27}}$

34) $\frac{\sqrt[3]{15}}{\sqrt[3]{64}}$

35) $\frac{\sqrt[3]{5}}{4\sqrt[3]{4}}$

36) $\frac{\sqrt[4]{2}}{2\sqrt[4]{64}}$

37) $\frac{5\sqrt[4]{5r^4}}{\sqrt[4]{8r^2}}$

38) $\frac{4}{\sqrt[4]{65m^4n^2}}$

Practice - Rationalize Denominators

Simplify.

1) $\dfrac{4+2\sqrt{3}}{\sqrt{9}}$

3) $\dfrac{4+2\sqrt{3}}{5\sqrt{4}}$

5) $\dfrac{2-5\sqrt{5}}{4\sqrt{13}}$

7) $\dfrac{\sqrt{2}-3\sqrt{3}}{\sqrt{3}}$

9) $\dfrac{2p+3\sqrt{5p^4}}{5\sqrt{20p^2}}$

11) $\dfrac{\sqrt{3m^2}-4\sqrt{2m^4}}{5\sqrt{12m^4}}$

13) $\dfrac{5}{3\sqrt{5}+\sqrt{2}}$

15) $\dfrac{2}{5+\sqrt{2}}$

17) $\dfrac{3}{4-3\sqrt{3}}$

19) $\dfrac{4}{3+\sqrt{5}}$

21) $-\dfrac{4}{4-4\sqrt{2}}$

23) $\dfrac{5}{\sqrt{n^4}-5}$

25) $\dfrac{4p}{3-5\sqrt{p^4}}$

27) $\dfrac{4}{5+\sqrt{5x^2}}$

29) $\dfrac{5}{2+\sqrt{5r^3}}$

31) $\dfrac{5}{-5v-3\sqrt{v}}$

33) $\dfrac{4\sqrt{2}+3}{3\sqrt{2}+\sqrt{3}}$

35) $\dfrac{2-\sqrt{5}}{-3+\sqrt{5}}$

37) $\dfrac{5\sqrt{2}+\sqrt{3}}{5+5\sqrt{2}}$

39) $\dfrac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}-\sqrt{2}}$

41) $\dfrac{\sqrt{3}-\sqrt{2}}{4+\sqrt{5}}$

43) $\dfrac{4+2\sqrt{2x^2}}{5+2\sqrt{5x^3}}$

45) $\dfrac{2\sqrt{3m^2}-\sqrt{2m^4}}{5-\sqrt{3m^2}}$

47) $\dfrac{2b-5\sqrt{2b}}{-1+\sqrt{2b^4}}$

49) $\dfrac{2-\sqrt{2x}}{4x-5\sqrt{3x^3}}$

51) $\dfrac{-4p-\sqrt{p}}{-p-\sqrt{p^3}}$

2) $\dfrac{-4+\sqrt{3}}{4\sqrt{9}}$

4) $\dfrac{2\sqrt{3}-2}{2\sqrt{16}}$

6) $\dfrac{\sqrt{5}+4}{4\sqrt{17}}$

8) $\dfrac{\sqrt{5}-\sqrt{2}}{3\sqrt{6}}$

10) $\dfrac{5x-\sqrt{3x^4}}{2\sqrt{19x^2}}$

12) $\dfrac{3\sqrt{2r^4}-\sqrt{3r^4}}{\sqrt{14r^3}}$

14) $\dfrac{5}{\sqrt{3}+4\sqrt{5}}$

16) $\dfrac{5}{2\sqrt{3} - \sqrt{2}}$

18) $\dfrac{4}{\sqrt{2} - 2}$

20) $\dfrac{2}{2\sqrt{5} + 2\sqrt{3}}$

22) $\dfrac{4}{4\sqrt{3} - \sqrt{5}}$

24) $\dfrac{\sqrt{3n^3}}{-5 - \sqrt{2n^4}}$

26) $\dfrac{5x^2}{5 - 3\sqrt{5x}}$

28) $\dfrac{4b^3}{-4b^4 - 2\sqrt{b^4}}$

30) $\dfrac{5}{\sqrt{3a^4} + 4a}$

32) $\dfrac{4}{2\sqrt{2n^2} + \sqrt{n^3}}$

34) $\dfrac{-5 - 4\sqrt{5}}{5 - 5\sqrt{3}}$

36) $\dfrac{-1 + \sqrt{5}}{2\sqrt{5} + 5\sqrt{2}}$

38) $\dfrac{4\sqrt{2} + 2\sqrt{3}}{\sqrt{5} - 4}$

40) $\dfrac{\sqrt{3} - \sqrt{5}}{4 - \sqrt{2}}$

42) $\dfrac{2\sqrt{2} - \sqrt{3}}{\sqrt{5} - 3\sqrt{3}}$

44) $\dfrac{3\sqrt{p^4} + \sqrt{5p^3}}{4 - \sqrt{2p^4}}$

46) $\dfrac{4v - 2\sqrt{2v^2}}{-4 - 5\sqrt{v}}$

48) $\dfrac{-4n - \sqrt{3n^2}}{-3 - \sqrt{n^4}}$

50) $\dfrac{3a + 2\sqrt{2a^2}}{3 - 5\sqrt{3a^2}}$

52) $\dfrac{4 - \sqrt{5x}}{-2x - \sqrt{3x^2}}$

Practice - Rational Exponents

Write each expression in radical form.

1) $m^{\frac{3}{5}}$

2) $(10r)^{-\frac{3}{4}}$

3) $(7x)^{\frac{3}{2}}$

4) $(6b)^{-\frac{4}{3}}$

Write each expression in exponential form.

5) $\frac{1}{(\sqrt{6x})^3}$

6) $\sqrt{v}$

7) $\frac{1}{(\sqrt[4]{n})^7}$

8) $\sqrt{5a}$

Simplify. Your answer should contain only positive exponents.

13) $yx^{\frac{1}{3}} \cdot xy^{\frac{3}{2}}$

14) $4v^{\frac{2}{3}} \cdot v^{-1}$

15) $(a^{\frac{1}{2}}b^{\frac{1}{2}})^{-1}$

16) $(x^{\frac{5}{3}}y^{-2})^0$

17) $\frac{a^2b^0}{3a^4}$

18) $\frac{2x^{\frac{1}{2}}y^{\frac{1}{3}}}{2x^{\frac{4}{3}}y^{-\frac{7}{4}}}$

19) $uv \cdot u \cdot (v^{\frac{3}{2}})^3$

20) $(x \cdot xy^2)^0$

21) $(x^0y^{\frac{1}{3}})^{\frac{3}{2}}x^0$

22) $u^{-\frac{5}{4}}v^2 \cdot (u^{\frac{3}{2}})^{-\frac{3}{2}}$

23) $\frac{a^{\frac{3}{4}}b^{-1} \cdot b^{\frac{7}{4}}}{3b^{-1}}$

24) $\frac{2x^{-2}y^{\frac{5}{3}}}{x^{-\frac{5}{4}}y^{-\frac{5}{3}} \cdot xy^{\frac{1}{2}}}$

25) $\frac{3y^{-\frac{5}{4}}}{y^{-1} \cdot 2y^{-\frac{1}{3}}}$

26) $\frac{ab^{\frac{1}{3}} \cdot 2b^{-\frac{5}{4}}}{4a^{-\frac{1}{2}}b^{-\frac{2}{3}}}$

27) $(\frac{m^{\frac{3}{2}}n^{-2}}{(mn^{\frac{4}{3}})^{-1}})^{\frac{7}{4}}$

28) $\frac{(y^{-\frac{1}{2}})^{\frac{3}{2}}}{x^{\frac{3}{2}}y^{\frac{1}{2}}}$

29) $\frac{(m^2n^{\frac{1}{2}})^0}{n^{\frac{3}{4}}}$

30) $\frac{y^0}{(x^{\frac{3}{4}}y^{-1})^{\frac{1}{3}}}$

31) $\frac{(x^{-\frac{4}{3}}y^{-\frac{1}{3}} \cdot y)^{-1}}{x^{\frac{1}{3}}y^{-2}}$

32) $\frac{(x^{\frac{1}{2}}y^0)^{-\frac{4}{3}}}{y^4 \cdot x^{-2}y^{-\frac{2}{3}}}$

33) $\frac{(uv^2)^{\frac{1}{2}}}{v^{-\frac{1}{4}}v^2}$

34) $(\frac{y^{\frac{1}{3}}y^{-2}}{(x^{\frac{5}{3}}y^3)^{-\frac{3}{2}}})^{\frac{3}{2}}$

8.7
Practice - Radicals of Mixed Index

Reduce the following radicals.

1) $\sqrt[8]{16x^4y^6}$

2) $\sqrt[4]{9x^2y^6}$

3) $\sqrt[12]{64x^4y^6z^8}$

4) $\sqrt[4]{\frac{25x^3}{16x^5}}$

5) $\sqrt[6]{\frac{16x^2}{9y^4}}$

6) $\sqrt[15]{x^9y^{12}z^6}$

7) $\sqrt[12]{x^6y^9}$

8) $\sqrt[10]{64x^8y^4}$

9) $\sqrt[8]{8x^3y^6}$

10) $\sqrt[4]{25y^2}$

11) $\sqrt[9]{8x^3y^6}$

12) $\sqrt[16]{81x^8y^{12}}$

Combine the following radicals.

13) $\sqrt[3]{5}\sqrt{6}$

14) $\sqrt[3]{7}\sqrt[4]{5}$

15) $\sqrt{x}\sqrt[3]{7y}$

16) $\sqrt[3]{y}\sqrt[5]{3z}$

17) $\sqrt{x}\sqrt[3]{x-2}$

18) $\sqrt[4]{3x}\sqrt{y+4}$

19) $\sqrt[5]{x^2y}\sqrt{xy}$

20) $\sqrt{ab}\sqrt[5]{2a^2b^2}$

21) $\sqrt[4]{xy^2}\sqrt[3]{x^2y}$

22) $\sqrt[5]{a^2b^3}\sqrt[4]{a^2b}$

23) $\sqrt[4]{a^2bc^2}\sqrt[5]{a^2b^3c}$

24) $\sqrt[6]{x^2yz^3}\sqrt[5]{x^2yz^2}$

25) $\sqrt{a}\sqrt[4]{a^3}$

26) $\sqrt[3]{x^2}\sqrt[6]{x^5}$

27) $\sqrt[5]{b^2}\sqrt{b^3}$

28) $\sqrt[4]{a^3}\sqrt[3]{a^2}$

29) $\sqrt{xy^3}\sqrt[3]{x^2y}$

30) $\sqrt[5]{a^3b}\sqrt{ab}$

31) $\sqrt[4]{9ab^3}\sqrt[4]{9x^3yz^2}$

32) $\sqrt{2x^3y^3}\sqrt[3]{4xy^2}$

33) $\sqrt[3]{3xy^2z}\sqrt[4]{9x^3yz^2}$

34) $\sqrt{a^4b^3c^4}\sqrt[3]{ab^2c}$

35) $\sqrt{27a^5(b+1)}\sqrt[3]{81a(b+1)^4}$

36) $\sqrt{8x(y+z)^5}\sqrt[3]{4x^2(y+z)^2}$

37) $\frac{\sqrt[3]{a^2}}{\sqrt[4]{a}}$

38) $\frac{\sqrt[3]{x^2}}{\sqrt[5]{x}}$

39) $\frac{\sqrt[4]{x^2y^3}}{\sqrt[3]{xy}}$

40) $\frac{\sqrt[5]{a^4b^2}}{\sqrt[3]{ab^2}}$

41) $\frac{\sqrt{ab^3c}}{\sqrt[5]{a^2b^3c^{-1}}}$

42) $\frac{\sqrt[5]{x^3y^4z^9}}{\sqrt{xy^{-2}z}}$

43) $\frac{\sqrt[4]{(3x-1)^3}}{\sqrt[5]{(3x-1)^3}}$

44) $\frac{\sqrt[3]{(2+5x)^2}}{\sqrt[4]{(2+5x)}}$

45) $\frac{\sqrt[3]{(2x+1)^2}}{\sqrt[5]{(2x+1)^2}}$

46) $\frac{\sqrt[4]{(5-3x)^3}}{\sqrt[3]{(5-3x)^2}}$

Practice - Complex Numbers

Simplify.

1) $3 - (-8 + 4i)$

2) $(3i) - (7i)$

3) $(7i) - (3 - 2i)$

4) $5 + (-6 - 6i)$

5) $(-6i) - (3 + 7i)$

6) $(-8i) - (7i) - (5 - 3i)$

7) $(3 - 3i) + (-7 - 8i)$

8) $(-4 - i) + (1 - 5i)$

9) $(i) - (2 + 3i) - 6$

10) $(5 - 4i) + (8 - 4i)$

11) $(6i)(-8i)$

12) $(3i)(-8i)$

13) $(-5i)(8i)$

14) $(8i)(-4i)$

15) $(-7i)^2$

16) $(-i)(7i)(4 - 3i)$

17) $(6 + 5i)^2$

18) $(8i)(-2i)(-2 - 8i)$

19) $(-7 - 4i)(-8 + 6i)$

20) $(3i)(-3i)(4 - 4i)$

21) $(-4 + 5i)(2 - 7i)$

22) $-8(4 - 8i) - 2(-2 - 6i)$

23) $(-8 - 6i)(-4 + 2i)$

24) $(-6i)(3 - 2i) - (7i)(4i)$

25) $(1 + 5i)(2 + i)$

26) $(-2 + i)(3 - 5i)$

27) $\frac{-9 + 5i}{i}$

28) $\frac{-3 + 2i}{-3i}$

29) $\frac{-10 - 9i}{6i}$

30) $\frac{-4 + 2i}{3i}$

31) $\frac{-3 - 6i}{4i}$

32) $\frac{-5 + 9i}{9i}$

33) $\frac{10 - i}{-i}$

34) $\frac{10}{5i}$

35) $\frac{4i}{-10 + i}$

36) $\frac{9i}{1 - 5i}$

37) $\frac{8}{-10 + i}$

38) $\frac{4}{4 + 6i}$

39) $\frac{7}{10 - 7i}$

40) $\frac{9}{-8 - 6i}$

41) $\frac{5i}{-6 - i}$

42) $\frac{8i}{6 - 7i}$

Practice - Solving with Radicals

Solve.

1) $\sqrt{2x+3} - 3 = 0$

2) $\sqrt{5x+1} - 4 = 0$

3) $\sqrt{6x-5} - x = 0$

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

5) $3 + x = \sqrt{6x+13}$

6) $x - 2 = \sqrt{7-x}$

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

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

9) $\sqrt{4x+5} - \sqrt{x+4} = 2$

10) $\sqrt{3x+4} - \sqrt{x+2} = 2$

11) $\sqrt{2x+4} - \sqrt{x+3} = 1$

12) $\sqrt{7x+2} - \sqrt{3x+6} = 1$

13) $\sqrt{2x+6} - \sqrt{x+4} = 2$

14) $\sqrt{4x-3} - \sqrt{3x+1} = 1$

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

16) $\sqrt{2-3x} - \sqrt{3x+7} = 3$

Practice - Solving with Exponents

Solve.

1) $x^2 = 75$

2) $x^3 = -8$

3) $x^2 + 5 = 13$

4) $4x^3 - 2 = 106$

5) $3x^2 + 1 = 73$

6) $(x-4)^2 = 49$

7) $(x+2)^5 = -243$

8) $(5x+1)^4 = 16$

9) $(2x+5)^3 - 6 = 21$

10) $(2x+1)^2 + 3 = 21$

11) $(x-1)^{\frac{2}{3}} = 16$

12) $(x-1)^{\frac{3}{2}} = 8$

13) $(2-x)^{\frac{3}{2}} = 27$

14) $(2x+3)^{\frac{4}{3}} = 16$

15) $(2x-3)^{\frac{2}{3}} = 4$

16) $(x+3)^{-\frac{1}{3}} = 4$

17) $(x+\frac{1}{2})^{-\frac{2}{3}} = 4$

18) $(x-1)^{-\frac{5}{3}} = 32$

19) $(x-1)^{-\frac{5}{2}} = 32$

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

21) $(3x-2)^{\frac{4}{5}} = 16$

22) $(2x+3)^{\frac{3}{2}} = 27$

23) $(4x+2)^{\frac{3}{5}} = -8$

24) $(3-2x)^{\frac{4}{3}} = -81$

Practice - Complete the Square

Find the value that completes the square and then rewrite as a perfect square.

1) $x^2 - 30x + $ __

2) $a^2 - 24a + $ __

3) $m^2 - 36m + $ __

4) $x^2 - 34x + $ __

5) $x^2 - 15x + $ __

6) $r^2 - \frac{1}{9}r + $ __

7) $y^2 - y + $ __

8) $p^2 - 17p + $ __

Solve each equation by completing the square.

9) $x^2 - 16x + 55 = 0$

10) $n^2 - 8n - 12 = 0$

11) $v^2 - 8v + 45 = 0$

12) $b^2 + 2b + 43 = 0$

13) $6x^2 + 12x + 63 = 0$

14) $3x^2 - 6x + 47 = 0$

15) $5k^2 - 10k + 48 = 0$

16) $8a^2 + 16a - 1 = 0$

17) $x^2 + 10x - 57 = 4$

18) $p^2 - 16p - 52 = 0$

19) $n^2 - 16n + 67 = 4$

20) $m^2 - 8m - 3 = 6$

21) $2x^2 + 4x + 38 = -6$

22) $6r^2 + 12r - 24 = -6$

23) $8b^2 + 16b - 37 = 5$

24) $6n^2 - 12n - 14 = 4$

25) $x^2 = -10x - 29$

26) $v^2 = 14v + 36$

27) $n^2 = -21 + 10n$

28) $a^2 - 56 = -10a$

29) $3k^2 + 9 = 6k$

30) $5x^2 = -26 + 10x$

31) $2x^2 + 63 = 8x$

32) $5n^2 = -10n + 15$

33) $p^2 - 8p = -55$

34) $x^2 + 8x + 15 = 8$

35) $7n^2 - n + 7 = 7n + 6n^2$

36) $n^2 + 4n = 12$

37) $13b^2 + 15b + 44 = -5 + 7b^2 + 3b$

38) $-3r^2 + 12r + 49 = -6r^2$

39) $5x^2 + 5x = -31 - 5x$

40) $8n^2 + 16n = 64$

41) $v^2 + 5v + 28 = 0$

42) $b^2 + 7b - 33 = 0$

43) $7x^2 - 6x + 40 = 0$

44) $4x^2 + 4x + 25 = 0$

45) $k^2 - 7k + 50 = 3$

46) $a^2 - 5a + 25 = 3$

47) $5x^2 + 8x - 40 = 8$

48) $2p^2 - p + 56 = -8$

49) $m^2 = -15 + 9m$

50) $n^2 - n = -41$

51) $8r^2 + 10r = -55$

52) $3x^2 - 11x = -18$

53) $5n^2 - 8n + 60 = -3n + 6 + 4n^2$

54) $4b^2 - 15b + 56 = 3b^2$

55) $-2x^2 + 3x - 5 = -4x^2$

56) $10v^2 - 15v = 27 + 4v^2 - 6v$

Practice - Quadratic Formula

Solve each equation with the quadratic formula.

1) $4a^2 + 6 = 0$

2) $3k^2 + 2 = 0$

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

4) $6n^2 - 1 = 0$

5) $2m^2 - 3 = 0$

6) $5p^2 + 2p + 6 = 0$

7) $3r^2 - 2r - 1 = 0$

8) $2x^2 - 2x - 15 = 0$

9) $4n^2 - 36 = 0$

10) $3b^2 + 6 = 0$

11) $v^2 - 4v - 5 = -8$

12) $2x^2 + 4x + 12 = 8$

13) $2a^2 + 3a + 14 = 6$

14) $6n^2 - 3n + 3 = -4$

15) $3k^2 - 3k - 4 = 7$

16) $4x^2 - 14 = -2$

17) $7x^2 + 3x - 16 = -2$

18) $4n^2 + 5n = 7$

19) $2p^2 + 6p - 16 = 4$

20) $m^2 + 4m - 48 = -3$

21) $3n^2 + 3n = -3$

22) $3b^2 - 3 = 8b$

23) $2x^2 = -7x + 49$

24) $3r^2 + 4 = -6r$

25) $5x^2 = 7x + 7$

26) $6a^2 = -5a + 13$

27) $8n^2 = -3n - 8$

28) $6v^2 = 4 + 6v$

29) $2x^2 + 5x = -3$

30) $x^2 = 8$

31) $4a^2 - 64 = 0$

32) $2k^2 + 6k - 16 = 2k$

33) $4p^2 + 5p - 36 = 3p^2$

34) $12x^2 + x + 7 = 5x^2 + 5x$

35) $-5n^2 - 3n - 52 = 2 - 7n^2$

36) $7m^2 - 6m + 6 = -m$

37) $7r^2 - 12 = -3r$

38) $3x^2 - 3 = x^2$

39) $2n^2 - 9 = 4$

40) $6b^2 = b^2 + 7 - b$

Practice - Quadratic from Roots

From each problem, find a quadratic equation with those numbers as its solutions.

1) 2, 5

2) 3, 6

3) 20, 2

4) 13, 1

5) 4, 4

6) 0, 9

7) 0, 0

8) $-2, -5$

9) $-4, 11$

10) 3, -1

11) $\frac{3}{4}, \frac{1}{4}$

12) $\frac{5}{8}, \frac{5}{7}$

13) $\frac{1}{2}, \frac{1}{3}$

14) $\frac{1}{2}, \frac{2}{3}$

15) $\frac{3}{7}, 4$

16) $2, \frac{2}{9}$

17) $-\frac{1}{3}, \frac{5}{6}$

18) $\frac{5}{3}, -\frac{1}{2}$

19) $-6, \frac{1}{9}$

20) $-\frac{2}{5}, 0$

21) ± 5

22) ± 1

23) $\pm \frac{1}{5}$

24) $\pm \sqrt{7}$

25) $\pm \sqrt{11}$

26) $\pm 2\sqrt{3}$

27) $\pm \frac{\sqrt{3}}{4}$

28) $\pm 11i$

29) $\pm i\sqrt{13}$

30) $\pm 5i\sqrt{2}$

31) $2 \pm \sqrt{6}$

32) $-3 \pm \sqrt{2}$

33) $1 \pm 3i$

34) $-2 \pm 4i$

35) $6 \pm i\sqrt{3}$

36) $-9 \pm i\sqrt{5}$

37) $\frac{-1 \pm \sqrt{6}}{2}$

38) $\frac{2 \pm 5i}{3}$

39) $\frac{6 \pm i\sqrt{2}}{8}$

40) $\frac{-2 \pm i\sqrt{15}}{2}$

Practice - Equations with Quadratics

Solve each of the following equations. Some equations will have complex roots.

1) $x^4 - 5x^2 + 4 = 0$

2) $y^4 - 9y^2 + 20 = 0$

3) $m^4 - 7m^2 - 8 = 0$

4) $y^4 - 29y^2 + 100 = 0$

5) $a^4 - 50a^2 + 49 = 0$

6) $b^4 - 10b^2 + 9 = 0$

7) $x^4 - 25x^2 + 144 = 0$

8) $y^4 - 40y^2 + 144 = 0$

9) $m^4 - 20m^2 + 64 = 0$

10) $x^6 - 35x^3 + 216 = 0$

11) $z^6 - 216 = 19z^3$

12) $y^4 - 2y^2 = 24$

13) $6z^4 - z^2 = 12$

14) $x^{-2} - x^{-1} - 12 = 0$

15) $x^{\frac{2}{3}} - 35 = 2x^{\frac{1}{3}}$

16) $5y^{-2} - 20 = 21y^{-1}$

17) $y^{-6} + 7y^{-3} = 8$

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

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

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

21) $2x^4 - 5x^2 + 2 = 0$

22) $2x^4 - x^2 - 3 = 0$

23) $x^4 = 9x^2 + 8 = 0$

24) $x^6 - 10x^3 + 16 = 0$

25) $8x^6 - 9x^3 + 1 = 0$

26) $8x^6 + 7x^3 - 1 = 0$

27) $x^6 - 17x^4 + 16 = 0$

28) $(x - 1)^2 - 4(x - 1) = 5$

29) $(y + b)^2 - 4(y + b) = 21$

30) $(x + 1)^2 + 6(x + 1) + 9 = 0$

31) $(y + 2)^2 - 6(y + 2) = 16$

32) $(m - 1)^2 - 5(m - 1) = 14$

33) $(x - 3)^2 - 2(x - 3) = 35$

34) $(a + 1)^2 + 2(a - 1) = 15$

35) $(r - 1)^2 - 8(r - 1) = 20$

36) $2(x - 1)^2 - (x - 1) = 3$

37) $3(y + 1)^2 - 14(y + 1) = 5$

38) $(x^2 - 3)^2 - 2(x^2 - 3) = 3$

39) $(3x^2 - 2x)^2 + 5 = 5(3x^2 - 2x)$

40) $(x^2 + x + 3)^2 + 15 = 8(x^2 + x + 3)$

41) $2(3x + 1)^{\frac{2}{3}} - 5(3x + 1)^{\frac{1}{3}} = 88$

42) $(x^2 + x)^2 - 8(x^2 + x) + 12 = 0$

43) $(x^2 + 2x)^2 - 2(x^2 + 2x) = 3$

44) $(2x^2 + 3x)^2 = 8(2x^2 + 3x) + 9$

45) $(2x^2 - x)^2 - 4(2x^2 - x) + 3 = 0$

46) $(3x^2 - 4x)^2 = 3(3x^2 - 4x) + 4$

Practice - Rectangles

1) In a landscape plan, a rectangular flowerbed is designed to be 4 meters longer than it is wide. If 60 square meters are needed for the plants in the bed, what should the dimensions of the rectangular bed be?

2) If the side of a square is increased by 5 the area is multiplied by 4. Find the side of the original square.

3) A rectangular lot is 20 yards longer than it is wide and its area is 2400 square yards. Find the dimensions of the lot.

4) The length of a room is 8 ft greater than its width. If each dimension is increased by 2 ft, the area will be increased by 60 sq. ft. Find the dimensions of the rooms.

5) The length of a rectangular lot is 4 rods greater than its width, and its area is 60 square rods. Find the dimensions of the lot.

6) The length of a rectangle is 15 ft greater than its width. If each dimension is decreased by 2 ft, the area will be decreased by 106 ft^2. Find the dimensions.

7) A rectangular piece of paper is twice as long as a square piece and 3 inches wider. The area of the rectangular piece is 108 in^2. Find the dimensions of the square piece.

8) A room is one yard longer than it is wide. At 75¢ per sq. yd. a covering for the floor costs $31.50. Find the dimensions of the floor.

9) The area of a rectangle is 48 ft^2 and its perimeter is 32 ft. Find its length and width.

10) The dimensions of a picture inside a frame of uniform width are 12 by 16 inches. If the whole area (picture and frame) is 288 in^2, what is the width of the frame?

11) A mirror 14 inches by 15 inches has a frame of uniform width. If the area of the frame equals that of the mirror, what is the width of the frame.

12) A lawn is 60 ft by 80 ft. How wide a strip must be cut around it when mowing the grass to have cut half of it.

13) A grass plot 9 yards long and 6 yards wide has a path of uniform width around it. If the area of the path is equal to the area of the plot, determine the width of the path.

15) A page is to have a margin of 1 inch, and is to contain 35 in^2 of painting. How large must the page be if teh length is to exceed the width by 2 inches?

16) A picture 10 inches long by 8 inches wide has a frame whose area is one half the area of the picture. What are the outside dimensions of the frame?

17) A rectangular wheat field is 80 rods long by 60 rods wide. A strip of uniform width is cut around the field, so that half the grain is left standing in the form of a rectangular plot. How wide is the strip that is cut?

18) A picture 8 inches by 12 inches is placed in a frame of uniform width. If the area of the frame equals the area of the picture find the width of the frame.

19) A rectangular field 225 ft by 120 ft has a ring of uniform width cut around the outside edge. The ring leaves 65% of the field uncut in the center. What is the width of the ring?

20) One Saturday morning George goes out to cut his lot that is 100 ft by 120 ft. He starts cutting around the outside boundary spiraling around towards the center. By noon he has cut 60% of the lawn. What is the width of the ring that he has cut?

21) A frame is 15 in by 25 in and is of uniform width. The inside of the frame leaves 75% of the total area available for the picture. What is the width of the frame?

22) A farmer has a field 180 ft by 240 ft. He wants to increase the area of the field by 50% by cultivating a band of uniform width around the outside. How wide a band should he cultivate?

23) The farmer in the previous problem has a neighbor who has a field 325 ft by 420 ft. His neighbor wants to increase the size of his field by 20% by cultivating a band of uniform width around the outside of his lot. How wide a band should his neighbor cultivate?

24) A third farmer has a field that is 500 ft by 550 ft. He wants to increase his field by 20%. How wide a ring should he cultivate around the outside of his field?

25) Donna has a garden that is 30 ft by 36 ft. She wants to increase the size of the garden by 40%. How wide a ring around teh outside should she cultivate?

26) A picture is 12 in by 25 in and is surrounded by a frame of uniform width. The area of the fram is 30% of the area of the picture. How wide is the fram?

27) A landscape architect is designing a rectangular flowerbed to be borded with 28 plants taht are placed 1 meter apart. He needs an inner rectangular space in the center for plants that must be 1 meter from the border of the bed and that require 24 square meters for planting. What should the overall dimensions of the flowerbed be?

Practice - Teamwork

1) Bills father can paint a room in two hours less than Bill can paint it. Working together they can complete the job in two hours and 24 minutes. How much time would each require working alone?

2) Of two inlet pipes, the smaller pipe takes four hours loner than the larger pipe to fill a pool. When both pipes are open, the pool is filled in three hours and forty-five minutes. If only the larger pipe is open, how many hours are required to fill the pool?

3) Jack can wash and wax teh family car in one hour less than Bob can. The two working together can complete teh job in $1\frac{1}{5}$ hours. How much time would each require if they worked alone?

4) If A can do a piece of work alone in 6 days and B can do it alone in 4 days, how long will it take the two working together to complete the job?

5) Working alone it takes John 8 hours longer than Carlos to do a job. Working

together they can do the job in 3 hours. How long will it take each to do the job working alone?

6) A can do a piece of work in 3 days, B in 4 days, and C in 5 days each working alone. How long will it take them to do it working together?

7) A can do a piece of work in 4 days and B can do it in half the time. How long will it take them to do the work together?

8) A cistern can be filled by one pipe in 20 minutes and by another in 30 minutes. How long will it take both pipes together to fill the tank?

9) If A can do a piece of work in 24 days and A and B together can do it in 6 days, how long would it take B to do the work alone?

10) A carpenter and his assistant can do a piece of work in $3\frac{3}{4}$ days. If the carpenter himself could do teh work alone in 5 days, how long would the assistant take to do the work alone?

11) If Sam can do a certain job in 3 days, while it takes Fred 6 days to do the same job, how long will it take them, working together, to complete the job?

12) Tim can finish a certain job in 10 hours. It take his wife JoAnn only 8 hours to do the same job. If they work together, how long will it take them to complete the job?

13) Two people working together can complete a job in 6 hours. If one of them works twice as fast as the other, how long would it take the faster person, working alone, to do the job?

14) If two peopel working together can do a job in 3 hours, how long will it take the slower person to do the same job if one of them is 3 times as fast as the other?

15) A water tank can be filled by an inlet pipe in 8 hours. It takes twice that long for the outlet pipe to empty the tank. How long will it take to fill the tank if both pipes are open?

16) A sink can be filled from the faucet in 5 minutes. It takes only 3 minutes to empty the sink when the drain is open. If the sink is full and both the faucet and the drain are open, how lon will it take to empty the sink?

17) It takes 10 hours to fill a pool with the inlet pipe. It can be emptied in 15 hrs with the outlet pipe. If the pool is half full to begin with, how long will it take to fill it from there if both pipes are open?

18) A sink is $\frac{1}{4}$ full when both the faucet and the drain are opened. The faucet

alone can fill the sink in 6 minutes, while it takes 8 minutes to empty it with the drain. How long will it take to fill the remaining $\frac{3}{4}$ of the sink?

19) A sink has two faucets, one for hot water and one for cold water. The sink can be filled by a cold-water faucet in 3.5 minutes. If both faucets are open, the sink is filled in 2.1 minutes. How long does it take to fill the sink with just the hot-water faucet open?

20) A water tank is being filled by two inlet pipes. Pipe A can fill the tank in $4\frac{1}{2}$ hrs, while both pipes together can fill teh tank in 2 hours. How long does it take to fill the tank using only pipe B?

21) A tank can be emptied by any one of three taps. The first can empty the tank in 20 minutes whlie the second takes 32 minutes. If all three working together could empty the tank in $8\frac{8}{59}$ minutes, how long would the third take to empty the tank?

22) One pipe can fill a cistern in $1\frac{1}{2}$ hours while a second pipe can fill it in $2\frac{1}{3}$ hrs. Three pipes working together fill the cistern in 42 minutes. How long would it take the third pipe alone to fill the tank?

23) Sam takes 6 hours longer than Susan to wax a floor. Working together they can wax the floor in 4 hours. How long will it take each of them working alone to wax the floor?

24) It takes Robert 9 hours longer than Paul to rapair a transmission. If it takes them $2\frac{2}{5}$ hours to do the job if they work together, how long will it take each of them working alone?

25) It takes Sally $10\frac{1}{2}$ minutes longer than Patricia to clean kup their dorm room. If they work together they can clean it in 5 minutes. How long will it take each of them if they work alone?

26) A takes $7\frac{1}{2}$ minutes longer than B to do a job. Working together they can do the job in 9 minutes. How long does it take each working alone?

27) Secretary A takes 6 minutes longer than Secretary B to type 10 pages of manuscript. If they divide the job and work together it will take them $8\frac{3}{4}$ minutes to type 10 pages. How long will it take each working alone to type the 10 pages?

28) It takes John 24 minutes longer than Sally to mow the lawn. If they work together they can mow the lawn in 9 minutes. How long will it take each to mow the lawn if they work alone?

Practice - Simultaneous Product Equations

Solve.

1) $xy = 72$
     $(x+2)(y-4) = 128$

2) $xy = 180$
     $(x-1)(y - \frac{1}{2}) = 205$

3) $xy = 150$
     $(x-6)(y+1) = 64$

4) $xy = 120$
     $(x+2)(y-3) = 120$

5) $xy = 45$
     $(x+2)(y+1) = 70$

6) $xy = 65$
     $(x-8)(y+2) = 35$

7) $xy = 90$
     $(x-5)(y+1) = 120$

8) $xy = 48$
     $(x-6)(y+3) = 60$

9) $xy = 16$
     $(x+1)(y-4) = 16$

10) $xy = 60$
      $(x+5)(y+3) = 150$

11) $xy = 45$
      $(x-5)(y+3) = 160$

12) $xy = 80$
      $(x-5)(y+5) = 45$

Practice - Revenue and Distance

1) A merchant bought some pieces of silk for $900. Had he bought 3 pieces more for the same money, he would have paid $15 less for each piece. Find the number of pieces purchased.

2) A number of men subscribed a certain amount to make up a deficit of $100 but 5 men failed to pay and thus increased the share of the others by $1 each. Find the amount that each man paid.

3) A merchant bought a number of barrels of apples for $120. He kept two barrels and sold the remainder at a profit of $2 per barrel making a total profit of $34. How many barrels did he originally buy?

4) A dealer bought a number of sheep for $440. After 5 had died he sold the remainder at a profit of $2 each making a profit of $60 for the sheep. How many sheep did he originally purchase?

5) A man bought a number of articles at equal cost for $500. He sold all but two for $540 at a profit of $5 for each item. How many articles did he buy?

6) A clothier bought a job lot of suits for $750. He sold all but 3 of them for $864 making a profit of $7 on each suit sold. How many suits did he buy?

7) A goup of boys bought a boat for $450. Five boys failed to pay their share, hence each remaining boys were compelled to pay $4.50 more. How many boys were in the original group and how much had each agreed to pay?

8) The total expenses of a camping party were $72. If there had been 3 fewer persons in the party, it would have cost each person $2 more than it did. How many people were in the party and how much did it cost each one?

9) A factory tests the road performance of new model cars by driving them at two different rates of speed for at least 100 kilometers at each rate. The speed rates range from 50 to 70 km/hr in the lower range and from 70 to 90 km/hr in the higher range. A driver plans to test a car on an available speedway by driving it for 120 kilometers at a speed in the lower range and then driving 120 kilometers at a rate that is 20 km/hr faster. At what rates should he drive if he plans to complete te test in $3\frac{1}{2}$ hours?

10) A train traveled 240 kilometers at a certain speed. When the engine was replaced by an improved model, the speed was increased by 20 km/hr and the travel time for the trip was decreased by 1 hour. What was the rate of each engine?

11) The rate of teh current in a stream is 3 km/hr. A man rowed upstream for 3 kilometers and then returned. The round trip required 1 hour and 20 minutes. How fast was he rowing?

12) A pilot flying at a constant rate against a headwind of 50 km/hr flew for 750 kilometers, then reversed direction and returned to his starting point. He completed the round trip in 8 hours. What was the speed of the plane?

13) Two drivers are testing teh same model car at speeds that differ by 20 km/hr. The one driving at the slower rate drives 70 kilometers down a speedway and returns by the same route. The one driving at the faster rate drives 76 kilometers down the speedway and returns by the same route. Both drivers leave at the same time, and the faster car returns $\frac{1}{2}$ hour earlier than the slower car. At what rates were the cars driven?

14) An athlete plans to row upstream a distance of 2 kilometers and then return to his startin point in a total time of 2 hours and 20 minutes. If the rate of ther current is 2 km/hr, how fast should he row?

15) An automobile goes to a place 72 miles distant and then returns, the round trip occupying 9 hours. His speed in returning is 12 miles per hour faster than his speed in going. Find the rate of speed in both going and returning.

16) An automobile made a trip of 120 miles and then returned, the round trip occupying 7 hours. Returning the rate was increased 10 miles an hour. Find the rate of each.

17) The rate of a stream is 3 miles an hour. If a crew rows downstream for a distance of 8 miles and then back again, the round trip occupying 5 hours, what is the rate of teh crew in still water?

18) The railroad distance between two towns is 240 miles. If the speed of a train were incrased 4 miles an hour, the trip would take 40 minutes less. What is the usual rate of the train?

19) By going 15 miles per hour faster, a train would have required 1 hour less to travel 180 miles. How fast did it travel?

20) Mr. Jones visits his grandmother who lives 100 miles away on a regular basis. Recently a new freeway has opend up and, although the freeway rout is 120 miles, he can drive 20 mph faster on average and takes 30 minutes less time to make the trip. What is Mr. Jones rate of both the old route and on the freeway?

21) If a train had traveled 5 miles an hour faster, it would have needed $1\frac{1}{2}$ hours less time to travel 150 miles. Find the rate of the train.

22) A traveler having 18 miles to go, calculates that his usual rate would make him one-half hour late for an appointment; he finds that in order to arrive on time he must travel at a rate one-half mile an hour faster. What is his usual rate?

Practice - Graphing Quadratic Functions

Find the vertex and intercepts of the following quadratics. Use this information to graph the quadratic.

1) $y = x^2 - 2x - 8$

2) $y = x^2 - 2x - 3$

3) $y = 2x^2 - 12x + 10$

4) $y = 2x^2 - 12x + 16$

5) $y = -2x^2 + 12x - 18$

6) $y = -2x^2 + 12x - 10$

7) $y = -3x^2 + 24x - 45$

8) $y = -3x^2 + 12x - 9$

9) $y = -x^2 + 4x + 55$

10) $y = -x^2 + 4x - 3$

11) $y = -x^2 + 6x - 5$

12) $y = -2x^2 + 16x - 30$

13) $y = -2x^2 + 16x - 24$

14) $y = 2x^2 + 4x - 6$

15) $y = 3x^2 + 12x + 9$

16) $y = 5x^2 + 30x + 45$

17) $y = 5x^2 - 40x + 75$

18) $y = 5x^2 + 20x + 15$

19) $y = -5x^2 - 60x - 175$

20) $y = -5x^2 + 20x - 15$

Practice - Function Notation

1) Which of the following is a function?

a)
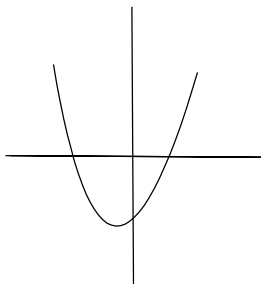
b)
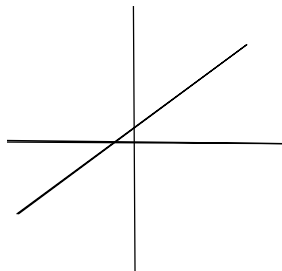
c)
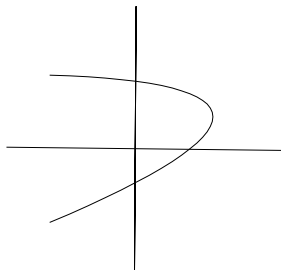
d)
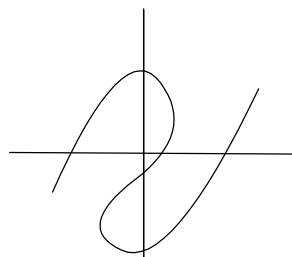
e) $y = 3x - 7$

f) $y^2 - x^2 = 1$

g) $\sqrt{y} + x = 2$

h) $x^2 + y^2 = 1$

Specify the domain of each of the following funcitons.

2) $f(x) = -5x + 1$

3) $f(x) = \sqrt{5 - 4x}$

4) $s(t) = \frac{1}{t^2}$

5) $f(x) = x^2 - 3x - 4$

6) $s(t) = \frac{1}{t^2 + 1}$

7) $f(x) = \sqrt{x - 16}$

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

9) $h(x) = \frac{\sqrt{3x - 12}}{x^2 - 25}$

10 $y(x) = \frac{x}{x^2 - 25}$

Evaluate each function.

11) $g(x) = 4x - 4$; Find $g(0)$

12) $g(n) = -3 \cdot 5^{-n}$; Find $g(2)$

13) $f(x) = |3x + 1| + 1$; Find $f(0)$

14) $f(x) = x^2 + 4$; Find $f(-9)$

15) $f(n) = -2|-n - 2| + 1$; Find $f(-6)$

16) $f(n) = n - 3$; Find $f(10)$

17) $f(t) = 3^t - 2$; Find $f(-2)$

18) $f(a) - 3^{a-1} - 3$; Find $f(2)$

19) $f(t) = |t + 3|$; Find $f(10)$

20) $w(x) = x^2 + 4x$; Find $w(-5)$

21) $w(n) = 4n + 3$; Find $w(2)$

22) $w(x) = -4x + 3$; Find $w(6)$

23) $w(n) = 2^{n+2}$; Find $w(-2)$

24) $p(x) = -|x| + 1$; Find $p(5)$

25) $p(n) = -3|n|$; Find $p(7)$

26) $k(a) = a + 3$; Find $k(-1)$

27) $p(t) = -t^3 + t$; Find $p(4)$

28) $k(x) = -2 \cdot 4^{2x-2}$; Find $k(2)$

29) $k(n) = |n - 1|$; Find $k(3)$

30) $p(t) = -2 \cdot 4^{2t+1} + 1$; Find $p(-2)$

31) $h(x) = x^3 + 2$; Find $h(-4x)$

32) $h(n) = 4n + 2$; Find $h(n + 2)$

33) $h(x) = 3x + 2$; Find $h(-1 + x)$

34) $h(a) = -3 \cdot 2^{a+3}$; Find $h(\frac{a}{4})$

35) $h(t) = 2|-3t - 1| + 2$; Find $h(n^2)$

36) $h(x) = x^2 + 1$; Find $h(\frac{x}{4})$

37) $g(x) = x + 1$; Find $g(3x)$

38) $h(t) = t^2 + t$; Find $h(t^2)$

39) $g(x) = 5^x$; Find $g(-3 - x)$

40) $h(n) = 5^{n-1} + 1$; Find $h(\frac{n}{2})$

Practice - Algebra of Functions

Perform the indicated operations.

1) $g(a) = a^3 + 5a^2$
   $f(a) = 2a + 4$
   Find $g(3) + f(3)$

3) $g(a) = 3a + 3$
   $f(a) = 2a - 2$
   Find $(g + f)(9)$

5) $g(x) = x + 3$
   $f(x) = -x + 4$
   Find $(g - f)(3)$

7) $g(x) = x^2 + 2$
   $f(x) = 2x + 5$
   Find $(g - f)(0)$

9) $g(t) = t - 3$
   $h(t) = -3t^3 + 6t$
   Find $g(1) + h(1)$

11) $h(t) = t + 5$
    $g(t) = 3t - 5$
    Find $(h \cdot g)(5)$

13) $h(n) = 2n - 1$
    $g(n) = 3n - 5$
    Find $h(0) \div g(0)$

15) $f(a) = -2a - 4$
    $g(a) = a^2 + 3$
    Find $(\frac{f}{g})(7)$

17) $g(x) = -x^3 - 2$
    $h(x) = 4x$
    Find $(g - h)(x)$

19) $f(x) = -3x + 2$
    $g(x) = x^2 + 5x$
    Find $(f - g)(x)$

21) $g(x) = 4x + 5$
    $h(x) = x^2 + 5x$
    Find $g(x) \cdot h(x)$

23) $f(x) = x^2 - 5x$
    $g(x) = x + 5$
    Find $(f + g)(x)$

25) $g(n) = n^2 + 5$
    $f(n) = 3n + 5$
    Find $g(n) \div f(n)$

27) $g(a) = -2a + 5$
    $f(a) = 3a + 5$
    Find $(\frac{g}{f})(a)$

29) $h(n) = n^3 + 4n$
    $g(n) = 4n + 5$
    Find $h(n) + g(n)$

31) $g(n) = n^2 - 4n$
    $h(n) = n - 5$
    Find $g(n^2) \cdot h(n^2)$

33) $f(x) = 2x$
    $g(x) = -3x - 1$
    Find $(f + g)(-4 - x)$

35) $f(t) = t^2 + 4t$
    $g(t) = 4t + 2$
    Find $f(t^2) + g(t^2)$

37) $g(a) = a^3 + 2a$
    $h(a) = 3a + 4$
    Find $(\frac{g}{h})(-x)$

39) $f(n) = -3n^2 + 1$
    $g(n) = 2n + 1$
    Find $(f - g)(\frac{n}{3})$

41) $f(x) = -4x + 1$
    $g(x) = 4x + 3$
    Find $(f \circ g)(9)$

43) $h(a) = 3a + 3$
    $g(a) = a + 1$

Find $(h \circ g)(5)$

45) $g(x) = x + 4$
   $h(x) = x^2 - 1$
   Find $(g \circ h)(10)$

47) $f(n) = -4n + 2$
   $g(n) = n + 4$
   Find $(f \circ g)(9)$

49) $g(x) = 2x - 4$
   $h(x) = 2x^3 + 4x^2$
   Find $(g \circ h)(3)$

51) $g(x) = x^2 - 5x$
   $h(x) = 4x + 4$
   Find $(g \circ h)(x)$

53) $f(a) = -2a + 2$
   $g(a) = 4a$
   Find $(f \circ g)(a)$

55) $g(x) = 4x + 4$
   $f(x) = x^3 - 1$
   Find $(g \circ f)(x)$

57) $g(x) = -x + 5$
   $f(x) = 2x - 3$
   Find $(g \circ f)(x)$

59) $f(t) = 4t + 3$
   $g(t) = -4t - 2$
   Find $(f \circ g)(t)$

2) $f(x) = -3x^2 + 3x$
   $g(x) = 2x + 5$
   Find $f(-4) \div g(-4)$

4) $g(x) = 4x + 3$
   $h(x) = x^3 - 2x^2$
   Find $(g - h)(-1)$

6) $g(x) = -4x + 1$
   $h(x) = -2x - 1$
   Find $g(5) + h(5)$

8) $g(x) = 3x + 1$
   $f(x) = x^3 + 3x^2$
   Find $g(2) \cdot f(2)$

10) $f(n) = n - 5$
   $g(n) = 4n + 2$
   Find $(f + g)(-8)$

12) $g(a) = 3a - 2$
   $h(a) = 4a - 2$
   Find $(g + h)(-10)$

14) $g(x) = x^2 - 2$
   $h(x) = 2x + 5$
   Find $g(-6) + h(-6)$

16) $g(n) = n^2 - 3$
   $h(n) = 2n - 3$
   Find $(g - h)(n)$

18) $g(x) = 2x - 3$
   $h(x) = x^3 - 2x^2 + 2x$
   Find $(g - h)(x)$

20) $g(t) = t - 4$
   $h(t) = 2t$
   Find $(g \cdot h)(t)$

22) $g(t) = -2t^2 - 5t$
   $h(t) = t + 5$
   Find $g(t) \cdot h(t)$

24) $f(x) = 4x - 4$
   $g(x) = 3x^2 - 5$
   Find $(f + g)(x)$

26) $f(x) = 2x + 4$
   $g(x) = 4x - 5$
   Find $f(x) - g(x)$

28) $g(t) = t^3 + 3t^2$
   $h(t) = 3t - 5$
   Find $g(t) - h(t)$

30) $f(x) = 4x + 2$
   $g(x) = x^2 + 2x$
   Find $f(x) \div g(x)$

32) $g(n) = n + 5$
   $h(n) = 2n - 5$
   Find $(g \cdot h)(-3n)$

34) $g(a) = -2a$
   $h(a) = 3a$

Find $g(4n) \div h(4n)$

36) $h(n) = 3n - 2$
$g(n) = -3n^2 - 4n$
Find $h(\frac{n}{3}) \div g(\frac{n}{3})$

38) $g(x) = -4x + 2$
$h(x) = x^2 - 5$
Find $g(x^2) + h(x^2)$

40) $f(n) = 3n + 4$
$g(n) = n^3 - 5n$
Find $f(\frac{n}{2}) - g(\frac{n}{2})$

42) $g(x) = x - 1$
Find $(g \circ g)(7)$

44) $g(t) = t + 3$
$h(t) = 2t - 5$
Find $(g \circ h)(3)$

46) $f(a) = 2a - 4$
$g(a) = a^2 + 2a$
Find $(f \circ g)(-4)$

48) $g(x) = 3x + 4$
$h(x) = x^3 + 3x$
Find $(g \circ h)(3)$

50) $g(a) = a^2 + 3$
Find $(g \circ g)(-3)$

52) $g(a) = 2a + 4$
$h(a) = -4a + 5$
Find $(g \circ h)(a)$

54) $g(t) = -t - 4$
Find $(g \circ g)(t)$

56) $f(n) = -2n^2 - 4n$
$g(n) = n + 2$
Find $(f \circ g)(n)$

58) $g(t) = t^3 - t$
$f(t) = 3t - 4$
Find $(g \circ f)(t)$

60) $f(x) = 3x - 4$
$g(x) = x^3 + 2x^2$
Find $(f \circ g)(x)$

Practice - Inverse Functions

State if the given functions are inverses.

1) $g(x) = -x^5 - 3$
   $f(x) = \sqrt[5]{-x - 3}$

2) $g(x) = \frac{4 - x}{x}$
   $f(x) = \frac{4}{x}$

3) $f(x) = \frac{-x - 1}{x - 2}$
   $g(x) = \frac{-2x + 1}{-x - 1}$

4) $h(x) = \frac{-2 - 2x}{x}$
   $f(x) = \frac{4}{x}$

5) $g(x) = -10x + 5$
   $f(x) = \frac{x - 5}{10}$

6) $f(x) = \frac{x - 5}{10}$
   $h(x) = 10x + 5$

7) $f(x) = -\frac{2}{x + 3}$
   $g(x) = \frac{3x + 2}{x + 2}$

8) $f(x) = \sqrt[5]{\frac{x + 1}{2}}$
   $g(x) = 2x^5 - 1$

9) $g(x) = \sqrt[5]{\frac{x - 1}{2}}$
   $f(x) = 2x^5 + 1$

10) $g(x) = \frac{8 + 9x}{2}$
    $f(x) = \frac{5x - 9}{2}$

Find the inverse of each functions.

11) $f(x) = (x - 2)^5 + 3$

12) $g(x) = \sqrt[3]{x + 1} + 2$

13) $g(x) = \frac{4}{x + 2}$

14) $f(x) = \frac{-3}{x - 3}$

15) $f(x) = \frac{-2x - 2}{x + 2}$

16) $g(x) = \frac{9 + x}{3}$

17) $f(x) = \frac{10 - x}{5}$

18) $f(x) = \frac{5x - 15}{2}$

19) $g(x) = -(x - 1)^3$

20) $f(x) = \frac{12 - 3x}{4}$

21) $f(x) = (x - 3)^3$

22) $g(x) = \sqrt[5]{\frac{-x + 2}{2}}$

23) $g(x) = \frac{x}{x - 1}$

24) $f(x) = \frac{-3 - 2x}{x + 3}$

25) $f(x) = \frac{x - 1}{x + 1}$

26) $h(x) = \frac{x}{x + 2}$

27) $g(x) = \frac{8 - 5x}{4}$

28) $g(x) = \frac{-x + 2}{3}$

29) $g(x) = -5x + 1$

30) $f(x) = \frac{5x - 5}{4}$

31) $g(x) = -1 + x^3$

32) $f(x) = 3 - 2x^5$

33) $h(x) = \frac{4 - \sqrt[3]{4x}}{2}$

34) $g(x) = (x - 1)^3 + 2$

35) $f(x) = \frac{x + 1}{x + 2}$

36) $f(x) = \frac{-1}{x + 1}$

37) $f(x) = \frac{7 - 3x}{x - 2}$

38) $f(x) = -\frac{3x}{4}$

39) $g(x) = -x$

40) $g(x) = \frac{-2x + 1}{3}$

10.4

Practice - Exponential Functions

Solve each equation.

1) $3^{1-2n} = 3^{1-3n}$

2) $4^{2x} = \frac{1}{16}$

3) $4^{2a} = 1$

4) $16^{-3p} = 64^{-3p}$

5) $(\frac{1}{25})^{-k} = 125^{-2k-2}$

6) $625^{-n-2} = \frac{1}{125}$

7) $6^{2m+1} = \frac{1}{36}$

8) $6^{2r-3} = 6^{r-3}$

9) $6^{-3x} = 36$

10) $5^{2n} = 5^{-n}$

11) $64^{b} = 2^{5}$

12) $216^{-3v} = 36^{3v}$

13) $(\frac{1}{4})^{x} = 16$

14) $27^{-2n-1} = 9$

15) $4^{3a} = 4^{3}$

16) $4^{-3v} = 64$

17) $36^{3x} = 216^{2x+1}$

18) $64^{x+2} = 16$

19) $9^{2n+3} = 243$

20) $16^{2k} = \frac{1}{64}$

21) $3^{3x-2} = 3^{3x+1}$

22) $243^{p} = 27^{-3p}$

23) $3^{-2x} = 3^{3}$

24) $4^{2n} = 4^{2-3n}$

25) $5^{m+2} = 5^{-m}$

26) $625^{2x} = 25$

27) $(\frac{1}{36})^{b-1} = 216$

28) $216^{2n} = 36$

29) $6^{2-2x} = 6^{2}$

30) $(\frac{1}{4})^{3v-2} = 64^{1-v}$

31) $4 \cdot 2^{-3n-1} = \frac{1}{4}$

32) $\frac{216}{6^{-2a}} = 6^{3a}$

33) $4^{3k-3} \cdot 4^{2-2k} = 16^{-k}$

34) $32^{2p-2} \cdot 8^{p} = (\frac{1}{2})^{2p}$

35) $9^{-2x} \cdot (\frac{1}{243})^{3x} = 243^{-x}$

36) $3^{2m} \cdot 3^{3m} = 1$

37) $64^{n-2} \cdot 16^{n+2} = (\frac{1}{4})^{3n-1}$

38) $3^{2-x} \cdot 3^{3m} = 1$

39) $5^{-3n-3} \cdot 5^{2n} = 1$

40) $4^{3r} \cdot 4^{-3r} = \frac{1}{64}$

Practice - Logarithmic Functions

Rewrite each equation in exponential form.

1) $\log_9 81 = 2$

2) $\log_b a = -16$

3) $\log_7 \frac{1}{49} = -2$

4) $\log_{16} 256 = 2$

5) $\log_{13} 169 = 2$

6) $\log_{11} 1 = 0$

Rewrite each equations in logarithmic form.

7) $8^0 = 1$

8) $17^{-2} = \frac{1}{289}$

9) $15^2 = 225$

10) $144^{\frac{1}{2}} = 12$

11) $64^{\frac{1}{6}} = 2$

12) $19^2 = 361$

Evaluate each expression.

13) $\log_{125} 5$

14) $\log_5 125$

15) $\log_{343} \frac{1}{7}$

16) $\log_7 1$

17) $\log_4 16$

18) $\log_4 \frac{1}{64}$

19) $\log_6 36$

20) $\log_{36} 6$

21) $\log_2 64$

22) $\log_3 243$

Solve each equation.

23) $\log_5 x = 1$

24) $\log_8 k = 3$

25) $\log_2 x = -2$

26) $\log n = 3$

27) $\log_{11} k = 2$

28) $\log_4 p = 4$

29) $\log_9 (n + 9) = 4$

30) $\log_{11} (x - 4) = -1$

31) $\log_5 -3m = 3$

32) $\log_2 -8r = 1$

33) $\log_{11} (x + 5) = -1$

34) $\log_7 -3n = 4$

35) $\log_4 (6b + 4) = 0$

36) $\log_{11} (10v + 1) = -1$

37) $\log_5 (-10x + 4) = 4$

38) $\log_9 (7 - 6x) = -2$

39) $\log_2 (10 - 5a) = 3$

40) $\log_8 (3k - 1) = 1$

Practice - Interest Rate Problems

Solve

1) Find each of the following:
   a. $500 invested at 4% compounded annually for 10 years.
   b. $600 invested at 6% compounded annually for 6 years.
   c. $750 invested at 3% compounded annually for 8 years.
   d. $1500 invested at 4% compounded semiannually for 7 years.
   e. $900 invested at 6% compounded semiannually for 5 years.
   f. $950 invested at 4% compounded semiannually for 12 years.
   g. $2000 invested at 5% compounded quarterly for 6 years.
   h. $2250 invested at 4% compounded quarterly for 9 years.
   i. $3500 invested at 6% compounded quarterly for 12 years.

j. All of the above compunded continuously.

2) What principal will amount to $2000 if invested at 4% interest compounded semiannually for 5 years?

3) What principal will amount to $3500 if invested at 4% interest compounded quarterly for 5 years?

4) What principal will amount to $3000 if invested at 3% interest compounded semiannually for 10 years?

5) What principal will amount to $2500 if invested at 5% interest compounded semiannually for 7.5 years?

6) What principal will amount to $1750 if invested at 3% interest compounded quarterly for 5 years?

7) A thousand dollars is left in a bank savings account drawing 7% interest, compounded quarterly for 10 years. What is the balance at the end of that time?

8) A thousand dollars is left in a credit union drawing 7% compounded monthly. What is the balance at the end of 10 years?

9) $1750 is invested in an account earning 13.5% interest compounded monthly for a 2 year period.

10) You lend out $5500 at 10% compounded monthly. If the debt is repaid in 18 months, what is the total owed at the time of repayment?

11) A $10,000 Treasury Bill earned 16% compounded monthly. If the bill matured in 2 years, what was it worth at maturity?

12) You borrow $25,000 at 12.25% interest compounded monthly. If you are unable to make any payments the first year, how much do you owe, excluding penalties?

13) A savings institution advertises 7% annual interest, compounded daily, How much more interest would you earn over the bank savings account or credit union in problems 7 and 8?

14) An 8.5% account earns continuous interest. If $2500 is deposited for 5 years, what is the total accumulated?

15) You lend $100 at 10% continuous interest. If you are repaid 2 months later, what is owed?

Practice - Trigonometry

Find the value of each. Round your answers to the nearest ten-thousandth.

1) $\cos 71°$

2) $\cos 23°$

3) $\sin 75°$

4) $\sin 50°$

Find the value of the trig function indicated.

5) $\sin \theta$

6) $\tan \theta$

7) $\sin \theta$

8) $\sin \theta$

9) $\sin \theta$

10) $\cos \theta$
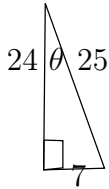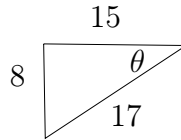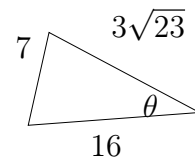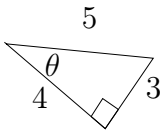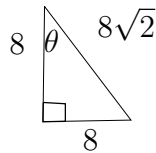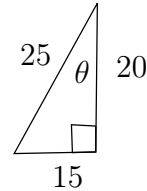
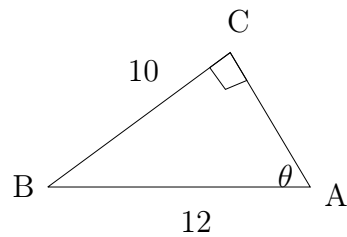**Find the measure of each side indicated. Round to the nearest tenth.**

11)

13)

15)

A

x

71°

B   9   C

17)

B

x

67°

A   4   C

25)

C

x

68°

A   6   B

19)

6   C

B
71.4°

x

A

27)

B

x

67.2°

A   4   C

21)

B

x

A   32°

4   C

29)

A

5   38°
x

B   C

23)

A   2.4   C

22°

x

B

31)

117

B

61°   3

x

C   A

33)

C

13.1

A   40°
     x   B

12)

B   11   A
30°

x

C

35)

B   5
56°
C   x   A

14)

C

x   11
75°
B   A

37)

B
5   x
52.3°
C   A

16)

A   x   B
63°
7.6
C

39)

18)

C

6

A 52.2° B

x

A

7

C 16° B

x

20)

28)

B

69° 11

C x A

A

x 13.1

B 64° C

22)

30)

C B

x 28° 12

A

A x B

3.9 29°

C

24)

32)

B

48° 12

C x A

B

12

A 53°

x C

26)

34)

119

C

x

47°

B — 3 — A

36)

C

1.4

65°

A — x — B

40)

B

43°

x

A — 3 — C

38)

C

18.1

35.5°

A — x — B
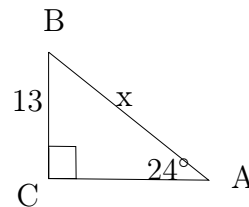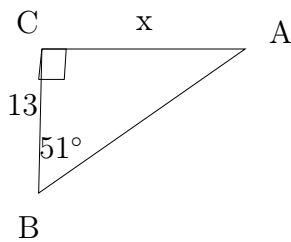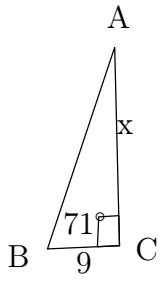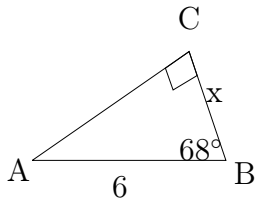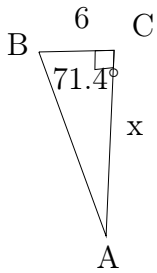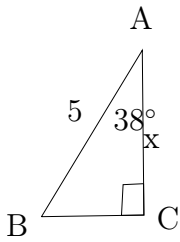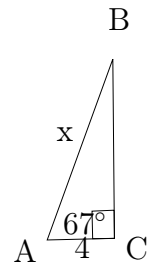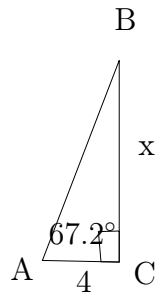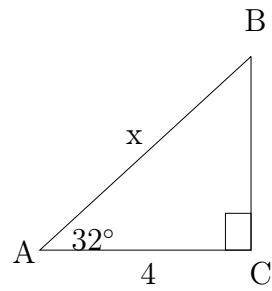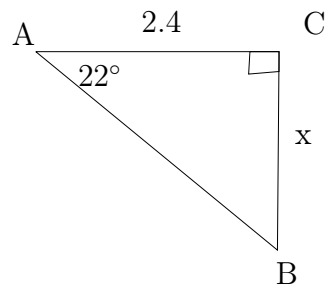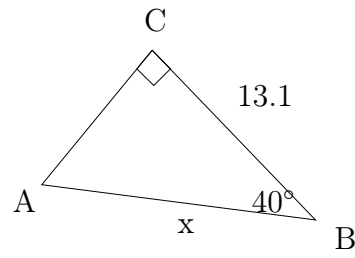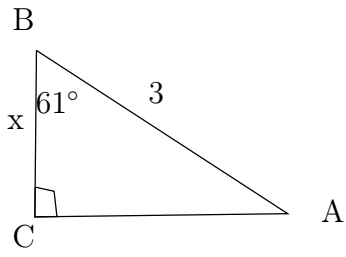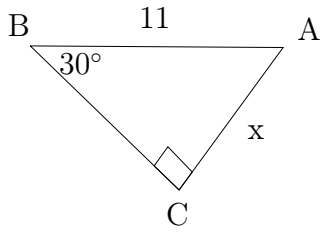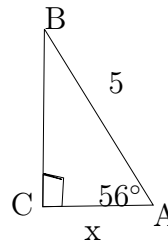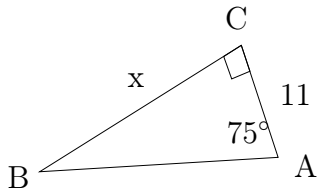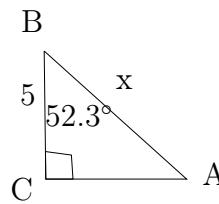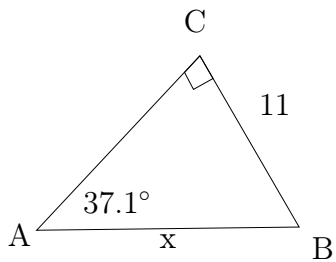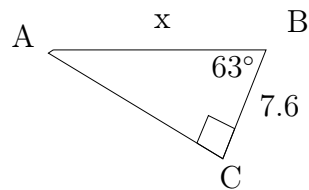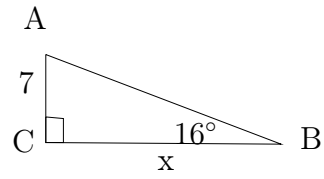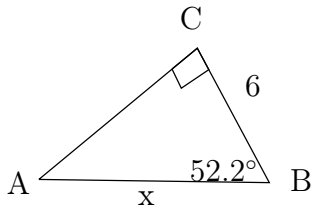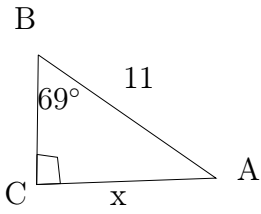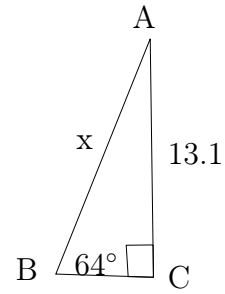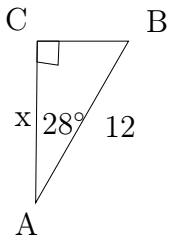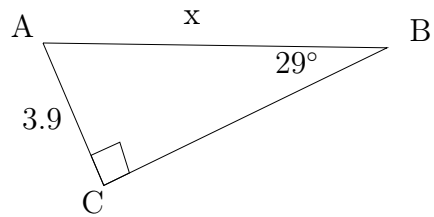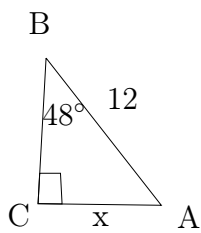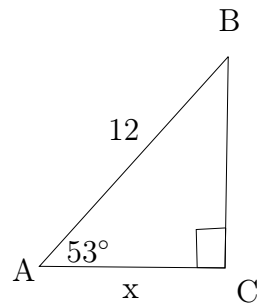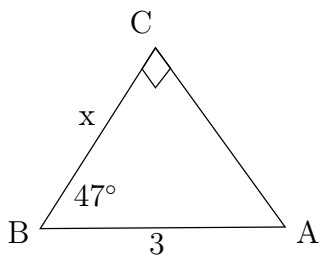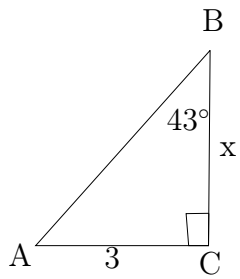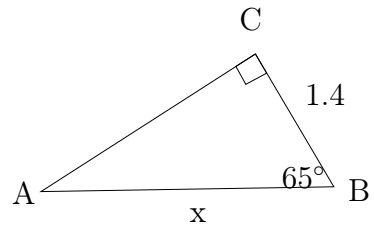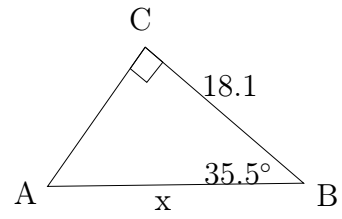
Practice - Inverse Trigonometry

Find each angle measure to the nearest degree.

1) $\sin Z = 0.4848$

2) $\sin Y = 0.6293$

3) $\sin Y = 0.6561$

4) $\cos Y = 0.6157$

Find the measure of the indicated angle to the nearest degree.

5)

6)

7)

8)

9)

10)
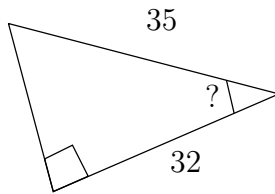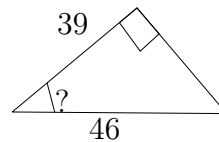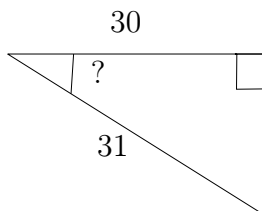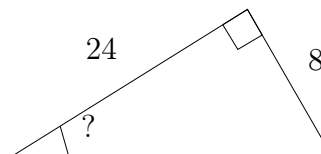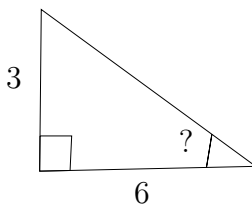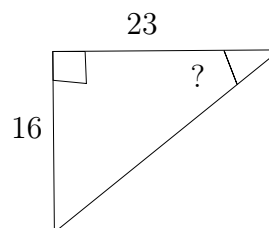
Find the measure of each angle indicated. Round to the nearest tenth.

11)

19)

13)

21)

15)

23)

17)

25)

27)

A

θ

14

C   15   B

29)

B

12

A   θ

13   C

18)

C

7

A   θ   B

14

12)

B

5.6

θ

C   15.3   A

20)

B

7   θ

C   13   A

14)

A   θ

2   7

C   B

22)

C

7   θ

B   9.7   A

16)

B   A

θ

15   15

C

24)

123
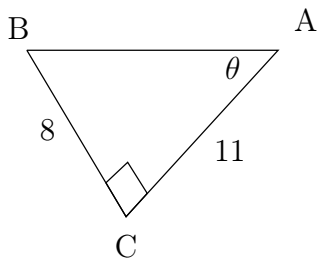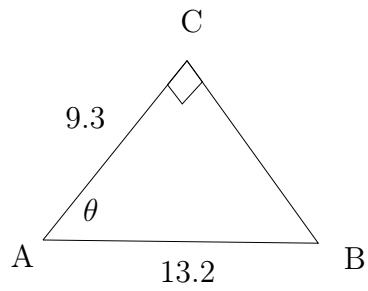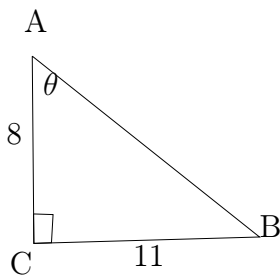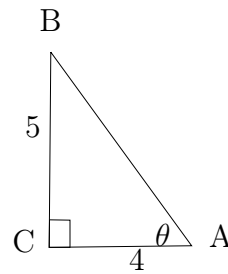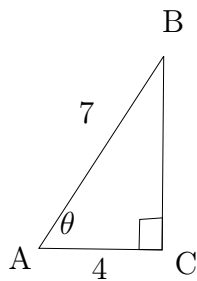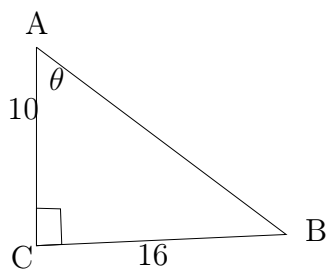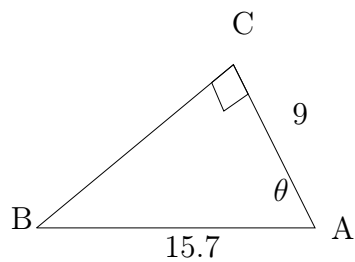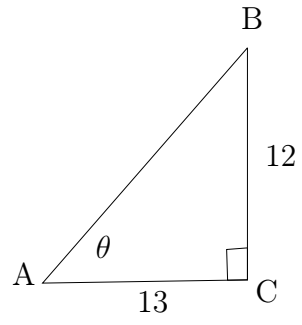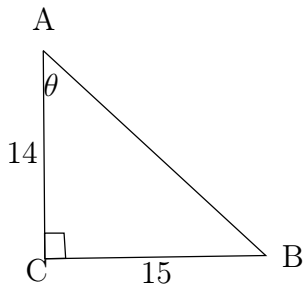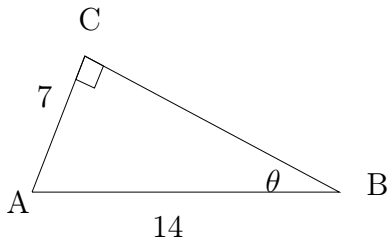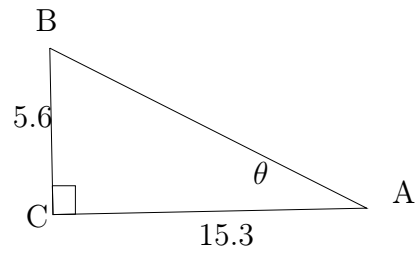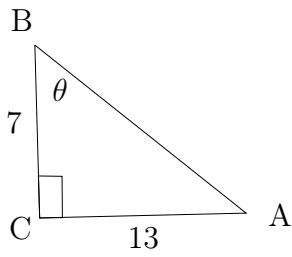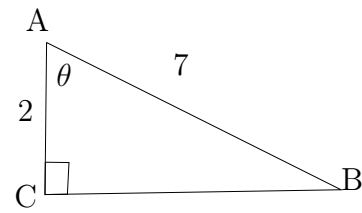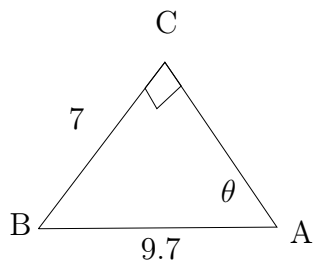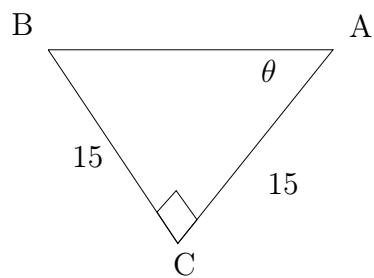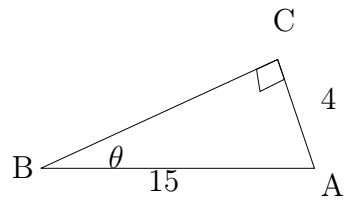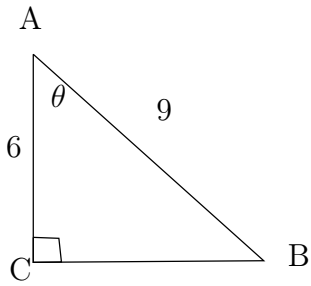
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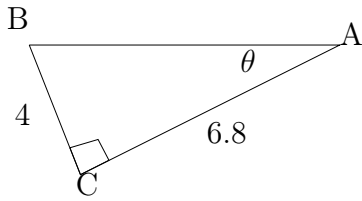
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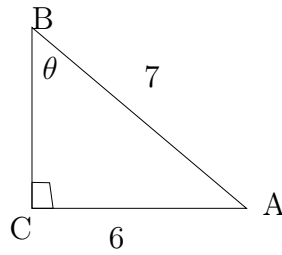
28)
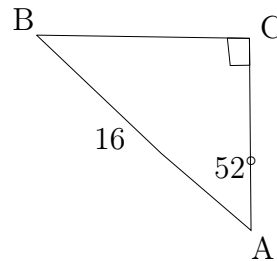
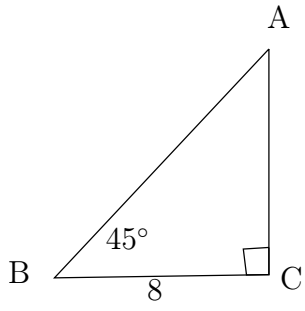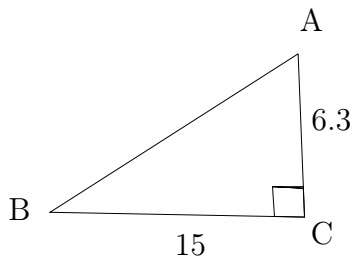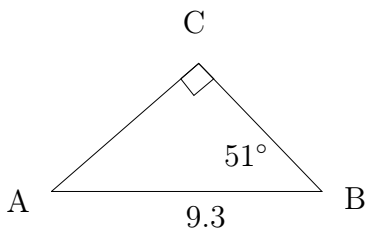**Solve each triangle. Round answers to the nearest tenth.**

31)

37)

33)

35)

39)

A

45°

B

8

C

36)

A

C

7

21°

B

32)

A

6.3

B

15

C

38)

A

48°

B

10.4

C

34)

C

51°

A

9.3

B

40)

B

14

C

6.8

A

125
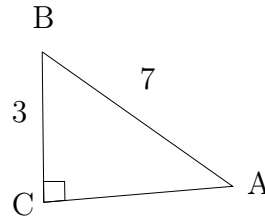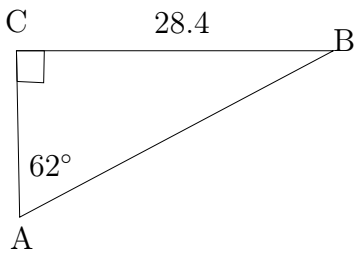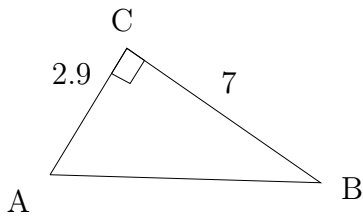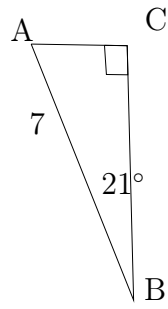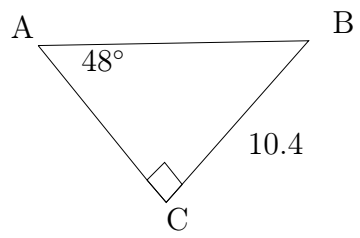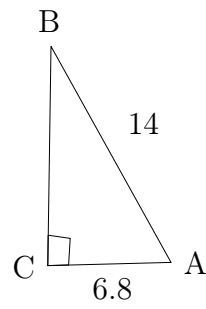
Answers

0.1

Answers - Integers

1) -2

2) 5

3) 2

4) 2

5) -6

6) -5

7) 8

8) 0

9) -2

10) -5

11) 4

12) -7

13) 3

14) -9

15) -2

16) -9

17) -1

18) -2

19) -3

20) 2

21) -7

22) 0

23) 11

24) 9

25) -3

26) -4

27) -3

28) 4

29) 0

30) -8

31) -4

32) -35

33) -80

34) 14

35) 8

36) 6

37) -56

38) -6

39) -36

40) 63

41) -10

42) 4

43) -20

44) 27

45) -24

46) -3

47) 7

48) 3

49) 2

50) 5

51) 2

52) 9

53) 7

54) -10

55) 4

56) 10

57) -8

58) 6

59) -6

60) -9

0.2

Answers - Fractions

1) $\frac{7}{2}$

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

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

4) $\frac{8}{3}$

5) $\frac{3}{2}$

6) $\frac{5}{4}$

7) $\frac{5}{4}$

8) $\frac{4}{3}$

9) $\frac{3}{2}$

10) $\frac{8}{3}$

11) $\frac{5}{2}$

12) $\frac{8}{7}$

13) $\frac{7}{2}$

14) $\frac{4}{3}$

15) $\frac{4}{3}$

16) $\frac{3}{2}$

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

18) $\frac{7}{6}$

19) $\frac{3}{2}$

20) $\frac{8}{7}$

21) 8

22) $\frac{5}{3}$

23) $-\frac{4}{9}$

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

25) $-\frac{13}{4}$

26) $\frac{3}{4}$

27) $\frac{33}{20}$

28) $\frac{33}{56}$

29) 4

30) $\frac{18}{7}$

31) $\frac{1}{2}$

32) $-\frac{19}{20}$

33) 3

34) $-\frac{17}{15}$

35) $-\frac{7}{10}$

36) $\frac{5}{14}$

37) $-\frac{8}{7}$

38) $\frac{20}{21}$

39) $\frac{2}{9}$

40) $\frac{4}{3}$

41) $-\frac{21}{26}$

42) $\frac{25}{21}$

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

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

45) $\frac{40}{9}$

46) $-\frac{1}{10}$

47) $-\frac{45}{7}$

48) $\frac{13}{15}$

49) $\frac{4}{27}$

50) $\frac{32}{65}$

51) $\frac{1}{15}$

52) 1

53) ·

54) ·

55) $\frac{2}{7}$

56) 2

57) 3

58) $-\frac{31}{8}$

59) $\frac{37}{20}$

60) $-\frac{5}{3}$

61) $\frac{33}{20}$

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

63) $\frac{47}{56}$

64) $-\frac{7}{6}$

65) $\frac{2}{3}$

66) $-\frac{4}{3}$

67) 1

68) $\frac{7}{8}$

69) $\frac{19}{20}$

70) $-\frac{2}{5}$

71) $-\frac{145}{56}$

72) $-\frac{29}{15}$

73) $\frac{34}{7}$

74) $-\frac{23}{3}$

75) $-\frac{3}{8}$

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

77) $-\frac{5}{24}$

78) $\frac{39}{14}$

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

80) $\frac{1}{10}$

81) 2

82) $\frac{62}{21}$

0.3

Answers - Order of Operation

1) 24
2) -1
3) 5
4) 180
5) 4
6) 8
7) 1
8) 8
9) 6

10) -6
11) -10
12) -9
13) 20
14) -16
15) 2
16) 26
17) -40
18) -15

19) 3
20) 0
21) -18
22) -3
23) -4
24) 3
25) 2

0.4

Answers - Properties of Algebra

1) 7
2) 29
3) 1
4) 3
5) 23
6) 14
7) 25
8) 46
9) 7
10) 8
11) 5
12) 10

13) 1
14) 6
15) 1
16) 2
17) 31
18) 54
19) 7
20) 38
21) $r+1$
22) $-4x-2$
23) $2n$
24) $11b+7$

25) $15v$
26) $7x$
27) $-9x$
28) $-7a-1$
29) $k+5$
30) $-3p$
31) $-5x-9$
32) $-9-10n$
33) $-m$
34) $-5-r$
35) $10n+3$

36) $5b$

37) $-8x + 32$

38) $24v + 27$

39) $8n^2 + 72n$

40) $5 - 9a$

41) $-7k^2 + 42k$

42) $10x + 20x^2$

43) $-6 - 36x$

44) $-2n - 2$

45) $40m - 9m^2$

46) $-18p^2 + 2p$

47) $-36x + 9x^2$

48) $32n - 8$

49) $-9b^2 + 90b$

50) $-4 - 28r$

51) $-40n - 80n^2$

52) $16x^2 - 20x$

53) $14b + 90$

54) $60v - 7$

55) $-3x + 8x^2$

56) $-89x + 81$

57) $-68k^2 - 8k$

58) $-19 - 90a$

59) $-34 - 49p$

60) $-10x + 17$

61) $10 - 4n$

62) $-30 + 9m$

63) $12x + 60$

64) $30r - 16r^2$

65) $-72n - 48 - 8n^2$

66) $-66b - 45 - 4b^2$

67) $79 - 79v$

68) $-8x + 22$

69) $-20n^2 + 80n - 42$

70) $-12 + 57a + 54a^2$

71) $-75 - 20k$

72) $-128x - 121$

73) $4n^2 - 3n - 5$

74) $2x^2 - 6x - 3$

75) $4p - 5$

76) $3x^2 + 7x - 7$

77) $-v^2 + 2v + 2$

78) $-7b^2 + 3b - 8$

79) $-4k^2 + 12$

80) $a^2 + 3a$

81) $3x^2 - 15$

82) $-n^2 + 6$

1.1

Answers to One-Step Equations

1) $\{7\}$

2) $\{11\}$

3) $\{-5\}$

4) $\{4\}$

5) $\{10\}$

6) $\{6\}$

7) $\{-19\}$

8) $\{-6\}$

9) $\{18\}$

10) $\{6\}$

11) $\{-20\}$

12) $\{-7\}$

13) $\{-108\}$

14) $\{5\}$

15) $\{-8\}$

16) $\{4\}$

17) $\{17\}$

18) $\{4\}$

19) $\{20\}$

20) $\{-208\}$

21) $\{3\}$

22) $\{16\}$

23) $\{-13\}$

24) $\{-9\}$

25) $\{15\}$

26) $\{8\}$

27) $\{-10\}$

28) $\{-204\}$

29) $\{5\}$

30) $\{2\}$

31) $\{-11\}$

32) $\{-14\}$

33) $\{14\}$

34) $\{1\}$

35) {−11}   38) {−135}

36) {−15}   39) {−16}

37) {−240}   40) {−380}

1.2

Answers to Two-Step Equations

1) {−4}   2) {7}   3) {−14}   4) {−2}

5) {10}   6) {−12}   7) {0}   8) {12}

9) {−10}   10) {−16}   11) {14}   12) {−7}

13) {4}   14) {−5}   15) {16}   16) {−15}

17) {7}   18) {12}   19) {9}   20) {0}

21) {11}   22) {−6}   23) {−10}   24) {13}

25) {1}   26) {4}   27) {−9}   28) {15}

29) {−6}   30) {6}   31) {−16}   32) {−4}

33) {8}   34) {−13}   35) {−2}   36) {10}

37) {−12}   38) {0}   39) {12}   40) {−9}

41

1.3

Answers to General Linear Equations

1) {−3}   4) {0}

2) {6}   5) {1}

3) {7}   6) {3}

130

7) $\{5\}$

8) $\{-4\}$

9) $\{0\}$

10) $\{3\}$

11) $\{1\}$

12) $\{\text{All real numbers}\}$

13) $\{8\}$

14) $\{1\}$

15) $\{-7\}$

16) $\{0\}$

17) $\{2\}$

18) $\{-3\}$

19) $\{-3\}$

20) $\{3\}$

21) $\{3\}$

22) $\{-1\}$

23) $\{-3\}$

24) $\{-1\}$

25) $\{8\}$

26) $\{0\}$

27) $\{-1\}$

28) $\{5\}$

29) $\{-1\}$

30) $\{1\}$

31) $\{-4\}$

32) $\{0\}$

33) $\{-3\}$

34) $\{0\}$

35) $\{0\}$

36) $\{-2\}$

37) $\{-6\}$

38) $\{-3\}$

39) $\{5\}$

40) $\{6\}$

41) $\{0\}$

42) $\{-2\}$

43) $\{\text{No Solution}\}$

44) $\{0\}$

45) $\{12\}$

46) $\{\text{All real numbers}\}$

47) $\{\text{No Solution}\}$

48) $\{1\}$

49) $\{-9\}$

50) $\{0\}$

1.4

Answers to Fractions

1) $\{\frac{3}{4}\}$

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

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

4) $\{\frac{1}{6}\}$

5) $\{-\frac{19}{6}\}$

6) $\{\frac{25}{8}\}$

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

8) $\{-\frac{1}{3}\}$

9) $\{-2\}$

10) $\{\frac{3}{2}\}$

11) $\{0\}$

12) $\{\frac{4}{3}\}$

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

14) $\{\frac{1}{2}\}$

15) $\{-\frac{4}{3}\}$

16) $\{1\}$

17) $\{0\}$

18) $\{-\frac{5}{3}\}$

19) $\{1\}$

20) $\{1\}$

21) $\{\frac{1}{2}\}$

22) $\{-1\}$

23) $\{-2\}$

24) $\{-\frac{9}{4}\}$

25) $\{-\frac{7}{2}\}$

26) $\{-\frac{1}{2}\}$

27) $\{-\frac{5}{3}\}$

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

29) $\{\frac{4}{3}\}$

30) $\{\frac{3}{2}\}$

1.5

Answers - Formulas

1. $b = \frac{c}{a}$

2. $h = gi$

3. $x = \frac{gb}{f}$

4. $y = \frac{pq}{3}$

5. $x = \frac{a}{3b}$

6. $y = \frac{cb}{2m}$

7. $m = \frac{E}{c^2}$

8. $D = \frac{ds}{S}$

9. $\pi = \frac{3V}{4r^3}$

10. $m = \frac{2E}{v_2}$

11. $c = b - a$

12. $x = g + f$

13. $y = \frac{cm + cn}{4}$

14. $r = \frac{k(a-3)}{5}$

15. $D = \frac{12V}{\pi n}$

16. $k = \frac{F}{R-L}$

17. $n = \frac{P}{p-c}$

18. $L = S - 2B$

19. $D = TL + d$

20. $E_a = IR + Eg$

21. $L_o = \frac{L}{1 + at}$

22. $x = \frac{c-b}{a}$

23. $m = \frac{p-q}{2}$

24. $L = \frac{q + 6p}{6}$

25. $k = qr + m$

26. $T = \frac{R-b}{a}$

27. $v = \frac{16t^2 + h}{t}$

28. $h = \frac{s - \pi r^2}{\pi r}$

29. $Q_2 = \frac{Q_1 + PQ_1}{P}$

30. $r_1 = \frac{L - 2d - \pi r^2}{\pi}$

31. $T_1 = \frac{Rd - kAT_2}{kA}$

32. $v_2 = \frac{Pg + V_1^2}{V_1}$

33. $a = \frac{c-b}{x}$

34. $r = \frac{d}{t}$

35. $m = \frac{V}{Ih}$

36. $h = \frac{3v}{\pi r^2}$

37. $a = \frac{c-1}{b}$

38. $b = \frac{c-1}{a}$

39. $b = \frac{b2 + s}{a}$

40. $w = \frac{at - s}{b}$

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

42. $x = 3 - 5y$

43. $y = \frac{3 - x}{5}$

44. $x = \frac{7 - 2y}{3}$

45. $y = \frac{7 - 3x}{2}$

46. $a = \frac{7b + 4}{5}$

47. $b = \frac{5a - 4}{7}$

48. $x = \frac{8 + 5y}{4}$

49. $y = \frac{4x - 8}{5}$

50. $f = \frac{9c + 160}{5}$

1.6

Answers to Absolute Value Equations

1) No solution. $\varnothing$

2) No solution. $\varnothing$

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

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

5) $\{7, -7\}$

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

7) $\{35, -35\}$

8) No solution. $\varnothing$

9) No solution. $\varnothing$

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

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

12) $\{8, -8\}$

13) No solution. $\varnothing$

14) $\{5, -5\}$

15) $\{1, -1\}$

16) $\{0, -8\}$

17) $\{10, -10\}$

18) $\{5, 1\}$

19) $\{-8, -12\}$

20) $\{-3, 21\}$

21) $\{4, -14\}$

22) $\{\frac{2}{3}, -\frac{2}{3}\}$

23) $\{1, -1\}$

24) $\{8, -8\}$

25) $\{2, -2\}$

26) $\{7, -7\}$

27) $\{8, 6\}$

28) $\{10, -26\}$

29) No solution. $\varnothing$

30) No solution. $\varnothing$

31) $\{-\frac{39}{5}, 5\}$

32) $\{-\frac{19}{3}, 3\}$

33) $\{9, -\frac{15}{2}\}$

34) $\{-4, 6\}$

35) $\{2, -9\}$

36) $\{-\frac{19}{3}, 3\}$

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

38) $\{6, -\frac{20}{3}\}$

39) No solution. $\varnothing$

40) $\{7, -17\}$

41) No solution. $\varnothing$

42) $\{\frac{23}{5}, -7\}$

43) No solution. $\varnothing$

44) $\{1, 0\}$

45) $\{-8, \frac{36}{5}\}$

46) $\{-\frac{4}{3}, -\frac{2}{7}\}$

47) $\{-6, \frac{2}{5}\}$

48) $\{7, \frac{1}{5}\}$

49) $\{-\frac{22}{5}, -\frac{2}{13}\}$

50) $\{-\frac{19}{22}, -\frac{11}{38}\}$

1.7

Answers - Variation

1) $\frac{c}{a} = k$

2) $\frac{x}{yz} = k$

3) $wx = k$

4) $\frac{r}{s^2} = k$

5) $\frac{f}{xy} = k$

6) $jm^3 = k$

7) $\frac{h}{m} = k$

8) $\frac{x}{a\sqrt[2]{b}} = k$

9) $ab = k$

10) $\frac{a}{b} = 3$

11) $\frac{P}{rq} = 0.5$

12) $cd = 28$

13) $\frac{t}{u^2} = 0.67$

14) $\frac{e}{fg} = 4$

15) $wx^3 = 1458$

16) $\frac{h}{j} = 1.5$

17) $\frac{a}{x^2\sqrt[3]{y}} = 0.33$

18) $mn = 3.78$

19) 6 k

20) 5.3 k

21) 33.3 cm

22) 160 kg/cm^3

23) 241,920,000 cans

24) 3.5 hours

25) 4.29 dollars

26) 450 m

27) 40 kg

28) 5.7 hr

29) 40 lb

30) 100 N

31) 27 min

32) 56.2 mph

33) r = 36

34) 66 mph

35) 7.5 m

36) V = 100.5 cm^3

37) 6.25 km

38) I = 0.25

39) 1600 km

1.8

Answer Set - Word Problems

1) 11

2) 5

3) -4

4) 32

5) -13

6) 62

7) 16

8) $\frac{17}{4}$

9) 35, 36, 37

10) $-43, -42, -41$

11) $-14, -13, -12$

12) 52, 54

13) 61, 63, 65

14) 83, 85, 87

15) 9, 11, 13

16) 56, 56, 68

17) 64, 64, 52

18) 36, 36, 108

19) 30, 120, 30

20) 30, 90, 60

21) 40, 80, 60

22) 28, 84, 68

23) 24, 120, 36

24) 32, 96, 52

25) 25, 100, 55

26) 45, 30

27) 96, 56

28) 27, 49

29) 57, 83

30) 17, 31

31) 6000, 24000

32) 1000, 4000

33) 40, 200

34) 60, 180

35) 20, 200

36) 30, 15

37) 76, 532

38) 110, 880

39) 2500, 5000

40) 4, 8

41) 2, 4

42) 3, 5

43) 14, 16

44) 1644

45) 325, 950

1.9

Answers - Age Problems

1) 6, 16

2) 10, 40

3) 18, 38

4) 17, 40

5) 27, 31

6) 12, 48

7) 31, 36

8) 16, 32

9) 12, 20

10) 40, 16

11) 16, 6

12) 12, 8

13) 26

14) 8

15) 4

16) 3

17) 10, 20

18) 14

19) 9, 18

20) 15, 20

21) 50, 22

22) 12

23) 72, 16

24) 6

25) 37, 46

26) 15

27) 45

28) 12, 52

29) 8, 4

30) 16, 32

31) 10, 28

32) 12,20

33) 141, 67

34) 16, 40

35) 84, 52

36) 14, 42

37) 10

38) 10, 6

39) 39, 42

40) 5

1.10

Answers - Distance, Rate, and Time Problems

1) $1\frac{1}{3}$

2) $25\frac{1}{2}, 20\frac{1}{2}$

3) 3

4) 10

5) 30, 45

6) 3

7) $\frac{300}{13}$

8) 10

9) 7

10) 30

11) 150

12) 360

13) 8

14) 10

15) 2

16) 3

17) 48

18) 600

19) 6

20) 120

21) 36

22) 2

23) 570

24) 24, 18

25) 300

26) 8, 6

27) 56

28) 95, 120

29) 180

30) 105, 130

31) 2:15 PM

32) 200

33) $\frac{1}{3}$

34) 15

35) $\frac{27}{4}$

36) $\frac{1}{2}$

37) 3, 2

38) 90

2.1

Answers - Points and Lines

1) B$(4, -3)$ C$(1, 2)$ D$(-1, 4)$
   E$(-5, 0)$ F$(2, -3)$ G$(1, 3)$
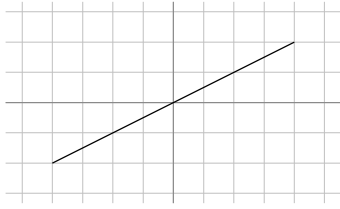   H$(-1, -4)$ I$(-2, -1)$ J$(0, 2)$
   K$(-4, 2)$

2)

3)

6)

9)

10)

8)

12)

13)

11)

15)

16)

14)

18)

19)

17)

21)

22)

20)

4)

7)

5)

2.2

136

Answers - Slope

1) $\frac{3}{2}$

2) 5

3) Undefined

4) $-\frac{1}{2}$

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

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

7) -1

8) $\frac{5}{4}$

9) -1

10) 0

11) Undefined

12) $\frac{16}{7}$

13) $-\frac{17}{31}$

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

15) $\frac{4}{3}$

16) $-\frac{7}{17}$

17) 0

18) $\frac{5}{11}$

19) $\frac{1}{2}$

20) $\frac{1}{16}$

21) $-\frac{11}{2}$

22) $-\frac{12}{31}$

23) Undefined

24) $\frac{24}{11}$

25) $-\frac{26}{27}$

26) $-\frac{19}{10}$

27) $-\frac{1}{3}$

28) $\frac{1}{16}$

29) $-\frac{7}{13}$

30) $\frac{2}{7}$

31) -5

32) 2

33) -8

34) 3

35) -5

36) 6

37) -4

38) 1

39) 2

40) 1

2.3

Answers - Slope-Intercept

1) $y = 2x + 5$

2) $y = -6x + 4$

3) $y = x - 4$

4) $y = -x - 2$

5) $y = -\frac{3}{4}x - 1$

6) $y = -\frac{1}{4}x + 3$

7) $y = \frac{1}{3}x + 1$

8) $y = \frac{2}{5}x + 5$

9) $y = -x + 5$

10) $y = -\frac{7}{2}x - 5$

11) $y = x - 1$

12) $y = -\frac{5}{3}x - 3$

13) $y = -4x$

14) $y = -\frac{3}{4}x + 2$

15) $y = -\frac{1}{10}x - \frac{37}{10}$

16) $y = \frac{1}{10}x - \frac{3}{10}$

17) $y = -2x - 1$

18) $y = \frac{6}{11}x + \frac{70}{11}$

19) $y = \frac{7}{3}x - 8$

20) $y = -\frac{4}{7}x + 4$

21) $x = -8$

22) $y = \frac{1}{7}x + 6$

23) $y = -x - 1$

24) $y = \frac{5}{2}x$

25) $y = 4x$

26) $y = -\frac{2}{3}x + 1$

27) $y = -4x + 3$

28) $x = 4$

29) $y = -\frac{1}{2}x + 1$

30) $y = \frac{6}{5}x + 4$

31)

32)

36)

40)

33)

37)

41)

34)

38)

42)

35)

39)

2.4

Answers - Point Slope

1) $0 = x - 2$

2) $0 = x - 1$

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

4) $y - 1 = -\frac{1}{2}(x - 2)$

5) $y + 5 = 9(x + 1)$

6) $y + 2 = -2(x - 2)$

7) $y - 1 = \frac{3}{4}(x + 4)$

8) $y + 3 = -2(x - 4)$

9) $y + 2 = -3x$

10) $y - 1 = 4(x + 1)$

11) $y + 5 = -\frac{1}{4}x$

12) $y - 2 = -\frac{5}{4}x$
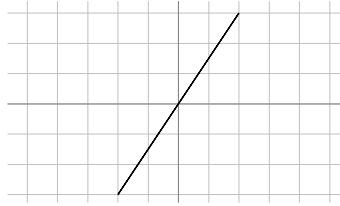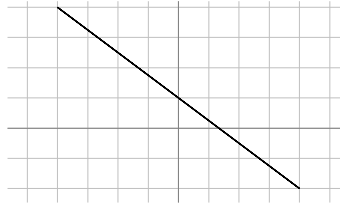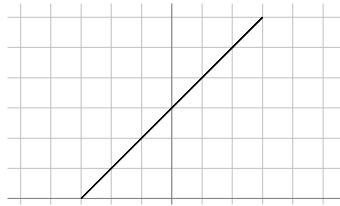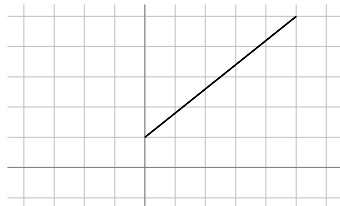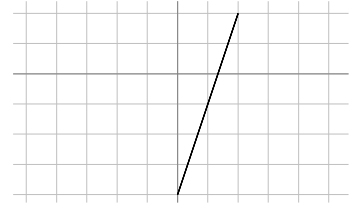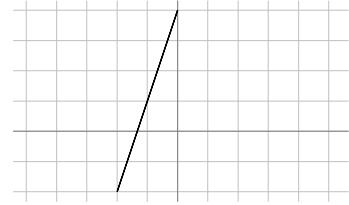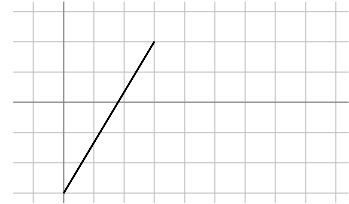
13) $y + 3 = \frac{1}{5}(x + 5)$

14) $y + 4 = -\frac{2}{3}(x + 1)$

15) $y - 4 = -\frac{5}{4}(x + 1)$

16) $y + 4 = -\frac{3}{2}x(x - 1)$

17) $y = 2x - 3$

18) $y = -2x + 2$

19) $y = -\frac{3}{5}x + 2$

20) $y = -\frac{2}{3}x - \frac{10}{3}$

21) $y = \frac{1}{2}x + 3$

22) $y = -\frac{7}{4}x + 4$

23) $y = -\frac{3}{2}x + 4$

24) $y = -\frac{5}{2}x - 5$

25) $y = -\frac{2}{5}x - 5$

26) $y = \frac{7}{3}x - 4$

27) $y = x - 4$

28) $y = -3$

29) $x = -3$

30) $y = 2x - 1$

31) $y = -\frac{1}{2}x$

32) $y = \frac{6}{5}x - 3$

33) $y - 3 = -2(x + 4)$

34) $y - 3 = 0$

35) $y - 1 = \frac{1}{8}(x - 5)$

36) $y - 5 = -2(x + 4)$

37) $y + 2 = \frac{3}{2}(x + 4)$

38) $y - 1 = \frac{3}{8}(x + 4)$

39) $y - 5 = \frac{1}{4}(x - 3)$

40) $y + 4 = -(x + 1)$

41) $y + 3 = -\frac{8}{7}(x - 3)$

42) $y + 5 = -\frac{1}{4}(x + 1)$

43) $y = -\frac{3}{4}x - \frac{11}{4}$

44) $y = -\frac{1}{10}x - \frac{3}{2}$

45) $y = -\frac{8}{7}x - \frac{5}{7}$

46) $y = \frac{1}{2}x - \frac{3}{2}$

47) $y = -x + 5$

48) $y = \frac{1}{3}x + 1$

49) $y = -x + 2$

50) $y = x + 2$

51) $y = 4x + 3$

52) $y = \frac{3}{7}x + \frac{6}{7}$

2.5

Answers - Parallel and Perpendicular Lines

1) 2

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

3) 4

4) $-\frac{10}{3}$

5) 1

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

7) -7

8) $-\frac{3}{4}$

9) 0

10) 2

11) 3

12) $-\frac{5}{4}$

13) -3

14) $-\frac{1}{3}$

15) 2

16) $-\frac{3}{8}$

17) $0 = x - 2$

18) $y - 2 = \frac{7}{5}(x - 5)$

19) $y - 4 = \frac{9}{2}(x - 3)$

20) $y + 1 = -\frac{3}{4}(x - 1)$

21) $y - 3 = \frac{7}{5}(x - 2)$

22) $y - 3 = -3(x + 1)$

23) $0 = x - 4$

24) $y - 4 = \frac{7}{5}(x - 1)$

25) $y + 5 = -(x - 1)$

26) $y + 2 = -2(x - 1)$

27) $y - 2 = \frac{1}{5}(x - 5)$

28) $y - 3 = -(x - 1)$

29) $y - 2 = -\frac{1}{4}(x - 4)$

30) $y + 5 = \frac{7}{3}(x + 3)$

31) $y + 2 = -3(x - 2)$

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

33) $y = -2x + 5$

34) $y = \frac{3}{5}x + 5$

35) $y = -\frac{4}{3}x - 3$

36) $y = -\frac{5}{4}x - 5$

37) $y = -\frac{1}{2}x - 3$

38) $y = \frac{5}{2}x - 2$

39) $y = -\frac{1}{2}x - 2$

40) $y = \frac{3}{5}x - 1$

41) $y = x - 1$

42) $y = 2x + 1$

43) $y = 2$

44) $y = -\frac{2}{5}x + 1$

45) $y = -x + 3$

46) $y = -\frac{5}{2}x + 2$

47) $y = -2x + 5$

48) $y = \frac{3}{4}x + 4$

3.1

Answers - Graphing and Solving Inequalities

1) $(-5, \infty)$

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

3) $(-\infty, 5]$

4) $(-\infty, 1]$

5) $(-\infty, 5]$

6) $(-5, \infty)$

7) $m < -2$

8) $m \leqslant 1$

9) $x \geqslant 5$

10) $a \leqslant -5$

11) $b > -2$

12) $x > 1$

13) $x \geqslant 110 : [110, \infty)$

14) $n \geqslant -26 : [-26, \infty)$

15) $r < 1 : (-\infty, 1)$

16) $m \leqslant -6 : (-\infty, -6]$

17) $n \geqslant -6 : [-6, \infty)$

18) $x < 6 : (-\infty, 6)$

19) $a < 12 : (-\infty, 12)$

20) $v \geqslant 1 : [1, \infty)$

21) $x \geqslant 11 : [11, \infty)$

22) $x \leqslant -18 : (-\infty, -18]$

23) $x > 19 : (19, \infty)$

24) $n \leqslant -10 : (-\infty, -10]$

25) $p < -1 : (-\infty, -1)$

26) $x \leqslant 20 : (-\infty, 20]$

27) $m \geqslant 2 : [2, \infty)$

28) $n \leqslant 5 : (-\infty, 5]$

29) $r > 8 : (8, \infty)$

30) $x \leqslant -3 : (-\infty, -3]$

31) $b > 1 : (1, \infty)$

32) $n \geqslant 0 : [0, \infty)$

33) $v < 0 : (-\infty, 0)$

34) $x > 2 : (2, \infty)$

35) No solution: $\oslash$

36) $n > 1 : (1, \infty)$

37) {All real numbers.} : $\mathbb{R}$

38) $p \leqslant 3 : (-\infty, 3]$

3.2

Answers - Compound Inequalities

1) $n \leqslant -9 \, \text{or} \, n \geqslant 2 : (-\infty, -9] \bigcup [2, \infty)$

2) $m \geqslant -4 \, \text{or} \, m < -5 : (-\infty, -5) \bigcup (-4, \infty)$

3) $x \geqslant 5 \, \text{or} \, x < -5 : (-\infty, -5) \bigcup [5, \infty)$

4) $r > 0 \, \text{or} \, r < -7 : (-\infty -7), \bigcup (0, \infty)$

5) $x < -7 : (-\infty, -7)$

6) $n < -7 \, \text{or} \, n > 8 : (-\infty -7), \bigcup (8, \infty)$

7) $-8 < v < 3 : (-8, 3)$

8) $-7 < x < 4 : (-7, 4)$

9) $b < 5 : (-\infty, 5)$

10) $-2 \leqslant n \leqslant 6 : [-2, 6]$

11) $-7 \leqslant a \leqslant 6 : [-7, 6]$

12) $v \geqslant 6 : [6, \infty)$

13) $-6 \leqslant x \leqslant -2 : [-6, -2]$

14) $-9 \leqslant x \leqslant 0 : [-9, 0]$

15) $3 < k \leqslant 4 : (3, 4]$

16) $-2 \leqslant n \leqslant 4 : [-2, 4]$

17) $-2 < x < 2 : (-2, 2)$

18) No solution : $\oslash$

19) $-1 \leqslant m < 4 : [-1, 4)$

20) $r > 8 \, \text{or} \, r < -6 :: (-\infty, -6) \bigcup (8, \infty)$

21) No solution : $\oslash$

22) $x \leqslant 0 \, \text{or} \, x > 8 : (-\infty, 0] \bigcup (8, \infty)$

23) No solution : $\oslash$

24) $n \geqslant 5 \, \text{or} \, n < 1 : (-\infty, 1(\bigcup [5, \infty)$

25) $5 \leqslant x < 19 : [5, 19)$

26) No solution : $\oslash$

27) $1 \leqslant v \leqslant 8 : [1, 8]$

28) $a \leqslant 1 \, \text{or} \, a \geqslant 19 : (-\infty, 1] \bigcup [19, \infty)$

29) $k \geqslant 2 \, \text{or} \, k \geqslant -20 : (-\infty, -20) \bigcup [2, \infty)$

30) $-15 \leqslant p < -1 : [-15, -1]$

31) $-1 < x \leqslant 1 : (-1, 1]$

32) $m > 4 \, \text{or} \, m \leqslant -1 : (-\infty, -1] \bigcup (4, \infty)$

33) $n < -14 \, \text{or} \, n \geqslant 17 : (-\infty, -14) \bigcup [17, \infty)$

34) {All real numbers.} : $\mathbb{R}$

3.3

Answers - Absolute Value Inequalities

1) No Solution: $\oslash$

2) No Solution: $\oslash$

3) No Solution: $\oslash$

4) $-2 \leqslant v \leqslant 2 : [-2, 2]$

5) $x > 5 \, \text{or} \, x < -5 : (-\infty, -5) \bigcup (5, \infty)$

6) $a \geqslant 3 \, \text{or} \, a \leqslant -3 : (-\infty, -3] \bigcup [3, \infty)$

7) $n > 3 \, \text{or} \, n < -3 : (-\infty, -3) \bigcup (3, \infty)$

8) No Solution: $\oslash$

9) {All real numbers.} : $\mathbb{R}$

10) $x \geqslant 4 \,\text{or}\, x \leqslant -4 : (-\infty, -4] \bigcup [4, \infty)$

11) {All real numbers.} : $\mathbb{R}$

12) $k \geqslant 3 \,\text{or}\, k \leqslant -3 : (-\infty, -3] \bigcup [3, \infty)$

13) No Solution : $\oslash$

14) $x \geqslant 4 \,\text{or}\, x \leqslant -4 : (-\infty, -4] \bigcup [4, \infty)$

15) $n \geqslant 5 \,\text{or}\, n \leqslant -5 : (-\infty, -5] \bigcup (5, \infty)$

16) $r > 10 \,\text{or}\, r < -10 : (-\infty, -10) \bigcup (10, \infty)$

17) {All real numbers.} : $\mathbb{R}$

18) $n > 17 \,\text{or}\, n < -5 : (-\infty, -5) \bigcup (17, \infty)$

19) {All real numbers.} : $\mathbb{R}$

20) $b \geqslant 1 \,\text{or}\, b, = -17 : (-\infty, -17] \bigcup [1, \infty)$

21) $v \geqslant 8 \,\text{or}\, v \leqslant -22 : (-\infty, -22] \bigcup [8, \infty)$

22) $x \geqslant 39 \,\text{or}\, x \leqslant -41 : (-\infty, -41] \bigcup [39, \infty)$

23) $x \geqslant -2 \,\text{or}\, x \geqslant 2 : (-\infty, -2] \bigcup [2, \infty)$

24) $a < -3 \,\text{or}\, a > 3 : (-\infty, -3) \bigcup (3, \infty)$

25) $k \geqslant -7 \,\text{or}\, k \geqslant 7 : (-\infty, -7] \bigcup [7, \infty)$

26) $p \geqslant 3 \,\text{or}\, p \leqslant -3 : (-\infty, -3] \bigcup [3, \infty)$

27) No Solution: $\oslash$

28) $n \geqslant 14 \,\text{or}\, n \leqslant -8 : (-\infty, -8] \bigcup [14, \infty)$

29) $m \geqslant 18 \,\text{or}\, m \leqslant 0 : (-\infty, 0] \bigcup [18, \infty)$

30) $1 \leqslant r \leqslant 5 : [1, 5]$

31) No Solution: $\oslash$

32) $-\frac{19}{3} \leqslant x \leqslant 3 : [-\frac{19}{3}, 3]$

33) $b > 6 \,\text{or}\, b < -8 : (-\infty, -8) \bigcup (6, \infty)$

34) $v \geqslant \frac{11}{4} \,\text{or}\, v \leqslant -3 : (-\infty, -3] \bigcup [\frac{11}{4}, \infty)$

35) $x \geqslant 18 \,\text{or}\, x \leqslant 2 : (-\infty, 2] \bigcup [18, \infty)$

36) {All real numbers.} : $\mathbb{R}$

37) $a \geqslant 20 \,\text{or}\, a \leqslant 0 : (-\infty, 0] \bigcup [20, \infty)$

38) $k > 4 \,\text{or}\, k < -8 : (-\infty, -8) \bigcup (4, \infty)$

39) $0 \leqslant x \leqslant \frac{2}{3} : [0, \frac{2}{3}]$

40) $-5 < x < \frac{21}{5} : (-5, \frac{21}{5})$

41) $-\frac{7}{4} \leqslant n \leqslant 2 : [-\frac{7}{4}, 2]$

42) No Solution: $\oslash$

43) No Solution: $\oslash$

44) $x \leqslant -12 \text{ or } x \geqslant -6 : (-\infty, -12] \bigcup [-6, \infty)$

45) $n < -1 \text{ or } n > \frac{7}{5} : (-\infty, -1) \bigcup (\frac{7}{5}, \infty)$

4.1

Answers - Graphing

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

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

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

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

5) No Solution

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

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

8) $\{4, 4\}$

9) $\{-3, -1\}$

10) No Solution

11) $\{3, -4\}$

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

13) $\{1, -3\}$

14) $\{-1, 3\}$

15) $\{3, -4\}$

16) No Solution

17) $\{2, -2\}$

18) $\{4, 1\}$

19) $\{-3, 4\}$

20) $\{2, -1\}$

21) $\{3, 2\}$

22) $\{-4, -4\}$

23) $\{-1, -1\}$

24) $\{2, 3\}$

25) $\{-1, -2\}$

26) $\{-4, -3\}$

27) No Solution

28) $\{-3, 1\}$

29) $\{4, -2\}$

30) $\{1, 4\}$

4.2

Answers - Solving with 2 Variables - Substitution

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

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

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

4) $\{0, 3\}$

5) $\{-1, -2\}$

6) $\{-7, -8\}$

7) $\{1, 5\}$

8) $\{-4, -1\}$

9) $\{3, 3\}$

10) $\{4, 4\}$

11) $\{2, 6\}$

12) $\{-3, 3\}$

13) $\{-2, -6\}$

14) $\{0, 2\}$

15) $\{1, -5\}$

16) $\{-1, 0\}$

17) $\{-1, 8\}$

18) $\{3, 7\}$

19) $\{2, 3\}$

20) $\{8, -8\}$

21) $\{1, 7\}$

22) $\{1, 7\}$

23) $\{-3, -2\}$

24) $\{1, -3\}$

25) $\{1, 3\}$

26) $\{2, 1\}$

27) $\{-2, 8\}$

28) $\{-4, 3\}$

29) $\{4, -3\}$

30) $\{-1, 5\}$

31) $\{0, 2\}$

32) $\{0, -7\}$

33) $\{0, 3\}$

34) $\{1, -4\}$

35) $\{4, -2\}$

36) $\{8, -3\}$

37) $\{2, 0\}$

38) $\{2, 5\}$

39) $\{-4, 8\}$ 　　　　 40) $\{2, 3\}$

4.3

Answers - Solving with 2 Variables - Elimination

1) $\{-2, 4\}$

2) $\{2, 4\}$

3) No solution

4) Infinite number of solutions

5) No solution

6) Infinite number of solutions

7) No solution

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

9) $\{-3, -5\}$

10) $\{-3, 6\}$

11) $\{-2, -9\}$

12) $\{1, -2\}$

13) $\{0, 4\}$

14) $\{-1, 0\}$

15) $\{8, 2\}$

16) $\{0, 3\}$

17) $\{4, 6\}$

18) $\{-6, -8\}$

19) $\{-2, 3\}$

20) $\{1, 2\}$

21) $\{0, -4\}$

22) $\{0, 1\}$

23) $\{-2, 0\}$

24) $\{2, -2\}$

25) $\{-1, -2\}$

26) $\{-3, 0\}$

27) $\{-1, -3\}$

28) $\{-3, 0\}$

29) $\{-8, 9\}$

30) $\{1, 2\}$

31) $\{-2, 1\}$

32) $\{-1, 1\}$

33) $\{0, 0\}$

34) Infinite number of solutions

4.4

Answers - Solving Equations with three Variables

1) $(1, -1, 2)$

2) $(5, -3, 2)$

3) $(2, 3, -2)$

4) $(3, -2, 1)$

5) $(-2, -1, 4)$

6) $(-3, 2, 1)$

7) $(1, 2, 3)$

8) $\propto$ solutions

9) $(0, 0, 0)$

10) $\propto$ solutions

11) $(19, 0, -13)$

12) $\propto$ solutions

13) $(0, 0, 0)$

14) $\propto$ solutions

15) $(2, \frac{1}{2}, -2)$

16) $\propto$ solutions

17) $(-1, 2-3)$

18) $(-1, 2, -2)$

19) $(0, 2, 1)$

20) no solution

21) $(10, 2, 3)$

22) no solution

23) $(2, 3, 1)$

24) $\propto$ solutions

25) no solutions

26) $(1, 2, 4)$

27) $(-25, 19, -25)$

28) $(\frac{2}{7}, \frac{3}{7}, \frac{2}{7})$

29) $(1, -3, -2, -1)$

30) $(7, 4, 5, 6)$

31) $(1, -2, 4, -1)$

32) $(-3, -1, 0, 4)$

4.5

Answers - Value Problems

1) 33Q, 70D

144

2) 26 h, 8 n

3) 236 adult, 342 child

4) 9d, 12q

5) 8, 19

6) 7q, 4h

7) 9, 18

8) 25, 20

9) 203 adults, 226 child

10) 130 adults, 70 students

11) 128 card, 75 no card

12) 73 hotdogs, 58 hamburgers

13) 135 students, 97 non-students

14) 12d, 15q

15) 13n, 5d

16) 8 20₵, 32 25₵

17) 6 15₵, 9 25₵

18) 5

19) 13 d, 10 q

20) 28 q

21) 15 n, 20 d

22) 20 $1, 6 $5

23) 8 $20, 4 $10

24) 27

25) $12500 @ 12% $14500 @ 13%

26) $20000 @ 5% $30000 @ 7.5%

27) $2500 @ 10% $6500 @ 12%

28) $12400 @ 6% $5600 @ 9%

29) $4100 @ 9.5% $5900 @ 11%

30) $7000 @ 4.5% $9000 @ 6.5%

31) $1600 @ 4%; $2400 @ 8%

32) $3000 @ 4.6% $4500 @ 6.6%

33) $3500 @ 6%; $5000 @ 3.5%

34) $7000 @ 9% $5000 @ 7.5%

35) $6500 @ 8%; $8500 @ 11%

36) $12000 @ 7.25% $5500 @ 6.5%

37) $3000 @ 4.25%; $3000 @ 5.75%

38) $10000 @ 5.5% $4000 @ 9%

39) $7500 @ 6.8%; $3500 @ 8.2%

40) $3000 @ 11%; $24000 @ 7%

41) $5000 @ 12% $11000 @ 8%

42) 12n, 13d, 10q

43) 18, 4, 8

44) 26n, 7d, 7q

4.6

Answers - Mixture Problems

1) $\{2666.7\}$

2) $\{2\}$

3) $\{30\}$

4) $\{1, 8\}$

5) $\{5\}$

6) $\{10\}$

7) $\{20\}$

8) $\{16\}$

9) $\{17.25\}$

10) $\{1.5\}$

11) $\{10\}$

12) $\{8\}$

13) $\{9.6\}$

14) $\{36\}$

15) $\{40, 60\}$

16) $\{30, 70\}$

17) $\{40, 20\}$

18) $\{40, 110\}$

19) $\{20, 30\}$

20) $\{100, 200\}$

21) $\{40, 20\}$

22) $\{10, 5\}$

23) $\{250, 250\}$

24) $\{21, 49\}$

25) $\{20, 40\}$

26) $\{2, 3\}$

27) $\{56, 144\}$

28) $\{1.5, 3.5\}$

29) $\{30\}$

30) $\{10\}$

31) $\{75, 25\}$

32) $\{55, 20\}$

33) $\{440, 160\}$

34) $\{20\}$

35) $\{37, 67\}$

36) $\{10\}$

37) $\{1, 2\}$

38) $\{150\}$

39) $\{10\}$

40) $\{30, 20\}$

41) $\{75\}$

42) $\{20, 60\}$

43) $\{25\}$

44) $\{3, 2\}$

5.1

Answers to Exponent Properties

1) 4^9

2) 4^6

3) 2^4

4) 3^6

5) $12m^2n$

6) $12x^3$

7) $8m^6n^3$

8) x^3y^6

9) 3^{12}

10) 4^{12}

11) 4^8

12) 3^6

13) $4u^6v^4$

14) x^3y^3

15) $16a^{16}$

16) $16x^4y^4$

17) $\frac{1}{4^2}$

18) $\frac{1}{3^2}$

19) 3

20) 3^3

21) m^2

22) $\frac{xy^3}{4}$

23) $\frac{4x^2}{3y}$

24) $\frac{y^2}{4}$

25) $4x^{10}y^{14}$

26) $8u^{18}v^6$

27) $2x^{17}y^{16}$

28) $\frac{3}{u^3v^3}$

29) $\frac{1}{6x^2y^5}$

30) $\frac{4}{3a^3}$

31) 64

32) $\frac{2}{a^6}$

33) $\frac{1}{512x^{24}y^{45}}$

34) $\frac{y^5x^2}{2}$

35) $\frac{1}{m^{12}n^{12}}$

36) $\frac{n^{10}}{2m}$

37) $\frac{2x^2}{y^2}$

38) $\frac{2}{y^2}$

39) $2q^7r^8p$

40) $\frac{4x^2}{y^2z^7}$

41) $\frac{y^{16}}{x^4z^4}$

42) $\frac{256r^8}{q^4}$

43) $\frac{4xy^4}{z^3}$

5.2

Answers to Negative Exponents

1) $32x^8y^{10}$

2) $\frac{32b^{13}}{a^2}$

3) $\frac{2a^{15}}{b^{11}}$

4) $2x^3y^2$

5) $16x^4y^8$

6) 1

7) $y^{16}x^5$

8) $\frac{32}{m^5n^{15}}$

9) $\frac{2}{9y}$

10) $\frac{y^5}{2x^7}$

11) $\frac{1}{y^2x^3}$

12) $\frac{y^8x^5}{4}$

13) $\frac{u}{4v^6}$

14) $\frac{x^7y^2}{2}$

15) $\frac{u^2}{12v^5}$

16) $\frac{y}{2x^4}$

17) $\frac{2}{y^2}$

18) $\frac{a^{16}}{2b}$

19) $16a^{12}b^{12}$

20) $\frac{y^8x^4}{4}$

21) $\frac{1}{2n^3}$

22) $2x^{16}y^2$

23) $16n^6m^4$

24) $\frac{2x}{y^3}$

25) $\frac{1}{x^{15}y}$

26) $4y^4$

27) $\frac{u}{2v}$

28) $4y^5$

29) 8

30) $\frac{1}{2u^3v^5}$

31) $2y^5x^4$

32) $\frac{a^3}{2b^3}$

33) $\frac{1}{x^2y^{11}z}$

34) $\frac{a^2}{8c^{10}b^{12}}$

35) $\frac{1}{h^3k j^6}$

36) $\frac{x^{30}z^6}{16y^4}$

37) $\frac{2b^{14}}{a^{12}c^7}$

38) $\frac{m^{14}q^8}{4p^4}$

39) $\frac{x^2}{y^4z^4}$

40) $\frac{mn^7}{p^5}$

5.3

Answers to Operations with Scientific Notation

1) 8.85×10^2

2) 7.44×10^{-4}

3) 8.1×10^{-2}

4) 1.09×10^0

5) 3.9×10^{-2}

6) 1.5×10^4

7) 870000

8) 256

9) 0.0009

10) 50000

11) 2

12) 0.00006

13) 1.4×10^{-3}

14) 1.76×10^{-10}

15) 1.662×10^{-6}

16) 5.018×10^6

17) 1.56×10^{-3}

18) 4.353×10^8

19) 1.815×10^4

20) 9.836×10^{-1}

21) 5.541×10^{-5}

22) 6.375×10^{-4}

23) 3.025×10^{-9}

24) 1.177×10^{-16}

25) 2.887×10^{-6}

26) 6.351×10^{-21}

27) 2.405×10^{-20}

28) 2.91×10^{-2}

29) 1.196×10^{-2}

30) 1.2×10^7

31) 2.196×10^{-2}

32) 2.52×10^3

33) 1.715×10^{14}

34) 8.404×10^1

35) 1.149×10^6

36) 3.939×10^9

37) 4.6×10^2

38) 7.474×10^3

39) 3.692×10^{-7}

40) 1.372×10^3

41) 1.034×10^6

42) 1.2×10^6

5.4

Answers to Add and Subtract Polynomials

1) 3

2) 7

3) -10

4) -6

5) -7

6) 8

7) 5

8) -1

9) 12

10) -1

11) $3p^4 - 3p$

12) $-m^3 + 12m^2$

13) $-n^3 + 10n^2$

14) $8x^3 + 8x^2$

15) $5n^4 + 5n$

16) $2v^4 + 6$

17) $13p^3$

18) $-3x$

19) $3n^3 + 8$

20) $x^4 + 9x^2 - 5$

21) $2b^4 + 2b + 10$

22) $-3r^4 + 12r^2 - 1$

23) $-5x^4 + 14x^3 - 1$

24) $5n^4 - 4n + 7$

25) $7a^4 - 3a^2 - 2a$

26) $12v^3 + 3v + 3$

27) $p^2 + 4p - 6$

28) $3m^4 - 2m + 6$

29) $5b^3 + 12b^2 + 5$

30) $-15n^4 + 4n - 6$

31) $n^3 - 5n^2 + 3$

32) $-6x^4 + 13x^3$

33) $-12n^4 + n^2 + 7$

34) $9x^2 + 10x^2$

35) $r^4 - 3r^3 + 7r^2 + 1$

36) $10x^3 - 6x^2 + 3x - 8$

37) $9n^4 + 2n^3 + 6n^2$

38) $2b^4 - b^3 + 4b^2 + 4b$

39) $-3b^4 + 13b^3 - 7b^2 - 11b + 19$

40) $12n^4 - n^3 - 6n^2 + 10$

41) $2x^4 - x^3 - 4x + 2$

42) $3x^4 + 9x^2 + 4x$

5.5

Answers to Multiply Polynomials

1) $6p - 42$

2) $32k^2 + 16k$

3) $12x + 6$

4) $18n^3 + 21n^2$

5) $20m^5 + 20m^4$

6) $12r - 21$

7) $32n^2 + 80n + 48$

8) $2x^2 - 7x - 4$

9) $56b^2 - 19b - 15$

10) $4r^2 + 40r + 64$

11) $8x^2 + 22x + 15$

12) $7n^2 + 43n - 42$

13) $15v^2 - 26v + 8$

14) $6a^2 - 44a - 32$

15) $24x^2 - 22x - 7$

16) $20x^2 - 29x + 6$

17) $30x^2 - 14xy - 4y^2$

18) $16u^2 + 10uv - 21v^2$

19) $3x^2 + 13xy + 12y^2$

20) $40u^2 - 34uv - 48v^2$

21) $56x^2 + 61xy + 15y^2$

22) $5a^2 - 7ab - 24b^2$

23) $6r^3 - 43r^2 - 12r - 35$

24) $16x^3 + 44x^2 + 44x + 40$

25) $12n^3 - 20n^2 + 38n - 20$

26) $8b^3 - 4b^2 - 4b - 12$

27) $36x^3 - 24x^2y + 3xy^2 + 12y^3$

28) $21m^3 + 4m^2n - 8n^3$

29) $48n^4 - 16n^3 + 64n^2 - 6n + 36$

30) $14a^4 + 30a^3 - 13a^2 - 12a + 3$

31) $15k^4 + 24k^3 + 48k^2 + 27k + 18$ 32) $42u^4 + 76u^3v + 17u^2v^2 - 18v^4$

5.6

Answers to Multiply Special Products

1) $x^2 - 64$

2) $a^2 - 16$

3) $1 - 9p^2$

4) $x^2 - 9$

5) $1 - 49n^2$

6) $64m^2 - 25$

7) $25n^2 - 64$

8) $4r^2 - 9$

9) $16x^2 - 64$

10) $b^2 - 49$

11) $16y^2 - x^2$

12) $49a^2 - 49b^2$

13) $16m^2 - 64n^2$

14) $9y^2 - 9x^2$

15) $36x^2 - 4y^2$

16) $1 + 10n + 25n^2$

17) $a^2 + 10a + 25$

18) $v^2 + 8v + 16$

19) $x^2 - 16x + 64$

20) $1 - 12n + 36n^2$

21) $p^2 + 14p + 49$

22) $49k^2 - 98k + 49$

23) $49 - 70n + 25n^2$

24) $16x^2 - 40x + 25$

25) $25m^2 - 80m + 64$

26) $9a^2 + 18ab + 9b^2$

27) $25x^2 + 70xy + 49y^2$

28) $16m^2 - 8mn + n^2$

29) $4x^2 + 8xy + 4y^2$

30) $64x^2 + 80xy + 25y^2$

31) $25 + 20r + 4r^2$

32) $m^2 - 14m + 49$

33) $4 + 20x + 25x^2$

34) $64n^2 - 49$

35) $16v^2 - 49$

36) $b^2 - 16$

37) $n^2 - 25$

38) $49x^2 + 98x + 49$

39) $16k^2 + 16k + 4$

40) $9a^2 - 64$

5.7

Answers to Dividing Polynomials

1) $5x + \frac{1}{4} + \frac{1}{2x}$

2) $\frac{5x^3}{9} + 5x^2 + \frac{4x}{9}$

3) $2n^3 + \frac{n^2}{10} + 4n$

4) $\frac{3k^2}{8} + \frac{k}{2} + \frac{1}{4}$

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

6) $\frac{5p^3}{4} + 4p^2 + 4p$

7) $n^2 + 5n + \frac{1}{5}$

8) $\frac{m^2}{3} + 2m + 3$

9) $x - 10 + \frac{9}{x+8}$

10) $r + 6 + \frac{1}{r-9}$

11) $n + 8 - \frac{8}{n+5}$

12) $b - 3 - \frac{5}{b-7}$

13) $v + 8 - \frac{9}{v-10}$

14) $x - 3 - \frac{5}{x+7}$

15) $a + 4 - \frac{6}{a-8}$

16) $x - 6 - \frac{2}{x-4}$

17) $5p + 4 + \frac{3}{9p+4}$

18) $8k - 9 - \frac{1}{3k-1}$

19) $x - 3 + \frac{3}{10x-2}$

20) $n + 3 + \frac{3}{n+4}$

21) $r - 1 + \frac{2}{4x+3}$

22) $m + 4 + \frac{1}{m-1}$

23) $n + 2$

24) $x - 4 + \frac{4}{2x+3}$

25) $9b + 5 - \frac{5}{3b+8}$

26) $v + 3 - \frac{5}{3v-9}$

27) $x - 7 - \frac{7}{4x-5}$

28) $n - 7 - \frac{3}{4n+5}$

29) $a^2 + 8a - 7 - \frac{6}{a+7}$

30) $8k^2 - 2k - 4 + \frac{5}{k-8}$

31) $x^2 - 4x - 10 - \frac{1}{x+4}$

32) $x^2 - 8x + 7$

33) $3n^2 - 9n - 10 - \frac{8}{n+6}$

34) $k^2 - 3k - 9 - \frac{5}{k-1}$

35) $x^2 - 7x + 3 + \frac{1}{x+7}$

36) $n^2 + 9n - 1 + \frac{3}{2n+3}$

37) $p^2 + 4p - 1 + \frac{4}{9p+9}$

38) $m^2 - 8m + 7 - \frac{7}{8m+7}$

39) $r^2 + 3r - 4 - \frac{8}{r-4}$

40) $x^2 + 3x - 7 + \frac{5}{2x+6}$

41) $6n^2 - 3n - 3 + \frac{5}{2n+3}$

42) $6b^2 + b + 9 + \frac{3}{4b-7}$

43) $v^2 - 6v + 6 + \frac{1}{4v+3}$

6.1

Answers - Greatest Common Factor

1) $9 + 8b^2$

2) $x - 5$

3) $5(9x^2 - 5)$

4) $1 + 2n^2$

5) $7(8 - 5p)$

6) $10(5x - 8y)$

7) $7ab(1 - 5a)$

8) $9x^2y^2(3y^3 - 8x)$

9) $3a^2b(-1 + 2ab)$

10) $4x^3(2y^2 + 1)$

11) $-5x^2(1 + x + 3x^2)$

12) $8n^5(-4n^4 + 4n + 5)$

13) $10(2x^4 - 3x + 3)$

14) $3(7p^6 + 10p^2 + 9)$

15) $4(7m^4 + 10m^3 + 2)$

16) $2(-5x^4 + 10y^2 + 6x)$

17) $5(6b^9 + ab - 3a^2)$

18) $3y^2(9y^5 + 4x + 3)$

19) $-8a^2b(6b + 7a + 7a^3)$

20) $5(6m^6 + 3mn^2 - 5)$

21) $5x^3y^2z(4x^5z + 3x^2 + 7y)$

22) $3(p + 4q - 5q^2r^2)$

23) $10(5x^2y + y^2 + 7xz^2)$

24) $10y^4z^3(3x^5 + 5z^2 - x)$

25) $5q(6pr - p + 1)$

26) $7b(4 + 2b + 5b^2 + b^4)$

27) $3(-6n^5 + n^3 - 7n + 1)$

28) $3a^2(10a^6 + 2a^3 + 9a + 7)$

29) $10x^{11}(-4 - 2x + 5x^2 - 5x^3)$

30) $4x^2(-6x^4 - x^2 + 3x + 1)$

31) $4mn(-8n^7 + m^5 + 3n^3 + 4)$

32) $2y^7(-5 + 3y^3 - 2xy^3 - 4xy)$

6.2

Answers - Grouping

1) $(8r^2 - 5)(5r - 1)$

2) $(5x^2 - 8)(7x - 2)$

3) $(n^2 - 3)(3n - 2)$

4) $(2v^2 - 1)(7v + 5)$

5) $(3b^2 - 7)(5b + 7)$

6) $(6x^2 + 5)(x - 8)$

7) $(3x^2 + 2)(x + 5)$

8) $(7p^2 + 5)(4p + 3)$

9) $(7x^2 - 4)(5x - 4)$

10) $(7n^2 - 5)(n + 3)$

11) $(7x + 5)(y - 7)$

12) $(7r^2 + 3)(6r - 7)$

13) $(8x + 3)(4y + 5x)$

14) $(3a + b^2)(5b - 2)$

15) $(8x + 1)(2y - 7)$

16) $(m + 5)(3n - 8)$

17) $(2x + 7y^2)(y - 4x)$

18) $(m - 5)(5n + 2)$

19) $(5x - y)(8y + 7)$

20) $(8x - 1)(y + 7)$

21) $(4u + 3)(8v - 5)$

22) $2(u + 3)(2v + 7u)$

23) $(5x + 6)(2y + 5)$

24) $(4x - 5y^2)(6y - 5)$

25) $(3u - 7)(v - 2u)$

26) $(7a - 2)(8b - 7)$

27) $(2x + 1)(8y + 3x)$

6.3

Answers - Trinomials wehre a = 1

1) $(p + 9)(p + 8)$

2) $(x - 8)(x + 9)$

3) $(n - 8)(n - 1)$

4) $(x - 5)(x + 6)$

5) $(x + 1)(x - 10)$

6) $(x + 5)(x + 8)$

7) $(b + 8)(b + 4)$

8) $(b - 10)(b - 7)$

9) $(x - 7)(x + 10)$

10) $(x - 3)(x + 6)$

11) $(n - 5)(n - 3)$

12) $(a + 3)(a - 9)$

13) $(p + 6)(p + 9)$

14) $(p + 10)(p - 3)$

15) Not factorable

16) $(m - 5n)(m - 10n)$

17) $(u - 5v)(u - 3v)$

18) $(m + 5n)(m - 8n)$

19) Not factorable

20) $(x + 8y)(x + 2y)$

21) $(x - 9y)(x - 2y)$

22) $(u - 7v)(u - 2v)$

23) $(x - 3y)(x + 4y)$

24) $(x + 5y)(x + 9y)$

25) Not factorable

26) $4(x + 7)(x + 6)$

27) $5(a + 10)(a + 2)$

28) $5(n - 8)(n - 1)$

29) $6(a - 4)(a + 8)$

30) $5(v - 1)(v + 5)$

31) $6(x + 2y)(x + y)$

32) $5(m^2 + 6mn - 18n^2)$

33) $6(x + 9y)(x + 7y)$

34) $6(m - 9n)(m + 3n)$

6.4

Answers - Trinomials where a is not 1

1) $(7x - 6)(x - 6)$

2) $(7n - 2)(n - 6)$

3) $(7b + 1)(b + 2)$

4) $(7v + 4)(v - 4)$

5) $(5a + 7)(a - 4)$

6) Not factorable

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

8) $(3r+2)(r-2)$

9) $(2x+5)(x+7)$

10) $(7x-6)(x+5)$

11) $(2b-3)(b+1)$

12) $(5k-6)(k-4)$

13) $(5k+3)(k+2)$

14) $(3r+7)(r+3)$

15) $(3x-5)(x-4)$

16) $(3u-2v)(u+5v)$

17) $(3x+2y)(x+5y)$

18) $(7x+5y)(x-y)$

19) $(5x-7y)(x+7y)$

20) $(5u-4v)(u+7v)$

21) $3(2x+1)(x-7)$

22) $2(5a+3)(a-6)$

23) $3(7k+6)(k-5)$

24) $3(7n-6)(n+3)$

25) $2(7x-2)(x-4)$

26) Not factorable

27) $(x+4)(6x+5)$

28) $(3p+7)(2p-1)$

29) $(k-4)(4k-1)$

30) $(r-1)(4r+7)$

31) $(x+2y)(4x+y)$

32) Not factorable

33) $(m-3n)(4m+3n)$

34) Not factorable

35) $(x+3y)(4x+y)$

36) $3(3u+4v)(2u-3v)$

37) $2(2x+7y)(3x+5y)$

38) $4(x+3y)(4x+3y)$

39) $4(x-2y)(6x-y)$

40) $2(3x+2y)(2x+7y)$

6.5

Answers - Special Products

1) $(r+4)(r-4)$

2) $(x+3)(x-3)$

3) $(v+5)(v-5)$

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

5) $(p+2)(p-2)$

6) $(2v+1)(2v-1)$

7) $(3k+2)(3k-2)$

8) $(3a+1)(3a-1)$

9) $3(x+3)(x-3)$

10) $5(n+2)(n-2)$

11) $4(2x+3)(2x-3)$

12) $5(25x^2+9y^2)$

13) $2(3a+5b)(3a-5b)$

14) $4(m^2+16n^2)$

15) $(a-1)^2$

16) $(k+2)^2$

17) $(x+3)^2$

18) $(n-4)^2$

19) $(x+5)^2$

20) $(k-2)^2$

21) $(5p-1)^2$

22) $(x+1)^2$

23) $(5a+3b)^2$

24) $(x+4y)^2$

25) $(2a-5b)^2$

26) $2(3m-2n)^2$

27) $2(2x-3y)^2$

28) $5(2x+y)^2$

29) $(2-m)(4+2m+m^2)$

30) $(x+4)(x^2-4x+16)$

31) $(x-4)(x^2+4x+16)$

32) $(x+2)(x^2-2x+4)$

33) $(6-u)(36+6u+u^2)$

34) $(5x-6)(25x^2+30x+36)$

35) $(5a-4)(25a^2+20a+16)$

36) $(4x-3)(16x^2+12x+9)$

37) $(4x+3y)(16x^2-12xy+9y^2)$

38) $4(2m-3n)(4m^2+6mn+9n^2)$

39) $2(3x+5y)(9x^2-15xy+25y^2)$

40) $3(5m+6n)(25m^2-30mn+36n^2)$

6.6

Answers - Strategy

1) $3(2a+5y)(4z-3h)$

2) $(2x-5)(x-3)$

3) $(5u-4v)(u-v)$

4) $4(2x+3y)^2$

5) $2(-x+4y)(x^2+4xy+16y^2)$

6) $5(4u-x)(v-3u^2)$

7) $n(5n-3)(n+2)$

8) $x(2x+3y)(x+y)$

9) $2(3u-2)(9u^2+6u+4)$

10) $2(3-4x)(9+12x+16x^2)$

11) $n(n-1)$

12) $(5x+3)(x-5)$

13) $(x-3y)(x-y)$

14) $5(3u-5v)^2$

15) $(3x+5y)(3x-5y)$

16) $(x-3y)(x^2+3xy+9y^2)$

17) $(m+2n)(m-2n)$

18) $3(2a+n)(2b-3)$

19) $4(3b^2+2x)(3c-2d)$

20) $3m(m+2n)(m-4n)$

21) $2(4+3x)(16-12x+9x^2)$

22) $(4m+3n)(16m^2-12mn+9n^2)$

23) $2x(x+5y)(x-2y)$

24) $(3a+x^2)(c+5d^2)$

25) $n(n+2)(n+5)$

26) $(4m-n)(16m^2+4mn+n^2)$

27) $(3x-4)(9x^2+12x+16)$

28) $(4a+3b)(4a-3b)$

29) $x(5x+2)$

30) $2(x-2)(x-3)$

31) $3k(k-5)(k-4)$

32) $2(4x+3y)(4x-3y)$

33) $(m-4x)(n+3)$

34) $(2k+5)(k-2)$

35) $(4x-y)^2$

36) $v(v+1)$

37) $3(3m+4n)(3m-4n)$

38) $x^2(x+4)$

39) $3x(3x-5y)(x+4y)$

40) $3n^2(3n-1)$

41) $2(m-2n)(m+5n)$

42) $v^2(2u-5v)(u-3v)$

6.7

Answers - Solving Equations by Factoring

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

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

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

4) $\{-\frac{5}{2}, 7\}$

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

6) $\{4, -8\}$

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

8) $\{-5, 6\}$

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

10) $\{-\frac{7}{8}, 8\}$

11) $\{-\frac{1}{5}, 2\}$

12) $\{-\frac{1}{2}, 2\}$

13) $\{4, 0\}$

14) $\{8, 0\}$

15) $\{1, 4\}$

16) $\{4, 2\}$

17) $\{\frac{3}{7}, -8\}$

18) $\{-\frac{1}{7}, -8\}$

19) $\{\frac{4}{7}, -3\}$

20) $\{\frac{1}{4}, 3\}$

21) $\{-4, -3\}$

22) $\{8, -4\}$

23) $\{8, -2\}$

24) $\{4, 0\}$

25) $\{\frac{8}{3}, -5\}$

26) $\{-\frac{1}{2}, \frac{5}{3}\}$

27) $\{-\frac{3}{7}, -3\}$

28) $\{-\frac{4}{3}, -3\}$

29) $\{\frac{8}{3}, -5\}$

30) $\{2, -3\}$

31) $\{-7, 7\}$

32) $\{-4, -6\}$

33) $\{-\frac{5}{2}, -8\}$

34) $\{-\frac{6}{5}, -7\}$

35) $\{\frac{4}{5}, -6\}$

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

7.1

Answers - Reduce Rational Expressions

1) $\{-10\}$

2) $\{0, 2\}$

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

4) $\{0, -10\}$

5) $\{0\}$

6) $\{-\frac{10}{3}\}$

7) $\{-2\}$

8) $\{0, -\frac{1}{2}\}$

9) $\{-8, 4\}$

10) $\{0, \frac{1}{7}\}$

11) $\frac{7x}{6}$

12) $\frac{3}{n}$

13) $\frac{3}{5a}$

14) $\frac{7}{8k}$

15) $\frac{4}{x}$

16) $\frac{9x}{2}$

17) $\frac{3m-4}{10}$

18) $\frac{10}{9n^2(9n+4)}$

19) $\frac{10}{2p+1}$

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

21) $\frac{1}{x+7}$

22) $\frac{7m+3}{9}$

23) $\frac{8x}{7(x+1)}$

24) $\frac{7r+8}{8r}$

25) $\frac{n+6}{n+5}$

26) $\frac{b+6}{b+7}$

27) $\frac{9}{v-10}$

28) $\frac{3(x-3)}{5x+4}$

29) $\frac{2x-7}{5x-7}$

30) $\frac{k-4}{k+8}$

31) $\frac{3a-5}{5a+2}$

32) $\frac{9}{p+2}$

33) $\frac{2n-1}{9}$

34) $\frac{3x-5}{5(x+2)}$

35) $\frac{2(m+2)}{5m-3}$

36) $\frac{9r}{5(r+1)}$

37) $\frac{2(x-4)}{3x-4}$

38) $\frac{5b-8}{5b+2}$

39) $\frac{7n-4}{4}$

40) $\frac{5(v+1)}{3v+1}$

41) $\frac{(n-1)^2}{6(n+1)}$

42) $\frac{7x-6}{(3x+4)(x+1)}$

43) $\frac{7a+9}{2(3a-2)}$

44) $\frac{2(2k+1)}{9(k-1)}$

7.2

<div align="center">Answers - Multipy and Divide Rational Expressions</div>

1) $4x^2$

2) $\frac{14}{3}$

3) $\frac{63}{10n}$

4) $\frac{63}{10m}$

5) $\frac{3x^5}{2}$

6) $\frac{5p}{2}$

7) $5m$

8) $\frac{7}{10}$

9) $\frac{r-6}{r+10}$

10) $x+4$

11) $\frac{2}{3}$

12) $\frac{9}{b-5}$

13) $\frac{x-10}{7}$

14) $\frac{1}{v-10}$

15) $x+1$

16) $\frac{a+10}{a-6}$

17) 5

18) $\frac{p-10}{p-4}$

19) $\frac{3}{5}$

20) $\frac{x+10}{x+4}$

21) $\frac{4(m-5)}{5m^2}$

22) 7

23) $\frac{x+3}{4}$

24) $\frac{n-9}{n+7}$

25) $\frac{b+2}{8b}$

26) $\frac{v-9}{5}$

27) $-\frac{1}{n-6}$

28) $\frac{x+1}{x-3}$

29) $\frac{1}{a+7}$

30) $\frac{7}{8(k+3)}$

31) $\frac{x-4}{x+3}$

32) $\frac{9(x+6)}{10}$

33) $9m^2(m+10)$

34) $\frac{10}{9(n+6)}$

35) $\frac{p+3}{6(p+8)}$

36) $\frac{x-8}{x+7}$

37) $\frac{5b}{b+5}$

38) $n+3$

39) $r-8$

40) $\frac{18}{5}$

7.3

<div align="center">Answers - Least Common Denominators</div>

1) 18

2) a^2

3) ay

4) $20xy$

5) $6a^3c^3$

6) 12

7) $2x-8$

8) x^2-2x-3

9) x^2-x-12

10) $x^2 - 11x + 30$

11) $12a^4b^5$

12) $25x^3y^5z$

13) $x(x-3)$

14) $4(x-2)$

15) $(x+2)(x-4)$

16) $x(x-7)(x+1)$

17) $(x+5)(x-5)$

18) $(x-3)^2(x+3)$

19) $(x+1)(x+2)(x+3)$

20) $(x-2)(x-5)(x+3)$

21) $\frac{6a^4}{10a^3b^2}, \frac{2b}{10a^3b}$

22) $\frac{3x^2+6x}{(x-4)(x+2)}, \frac{2x-8}{(x-4)(x+2)}$

23) $\frac{x^2+4x+4}{(x-3)(x+2)}, \frac{2x^2-8x}{(x-4)(x+3)(x+1)}$

24) $\frac{5}{x(x-6)}, \frac{2x-12}{x(x-6)}, \frac{-3x}{x(x-6)}$

25) $\frac{x^2-4x}{(x-4)^2(x+4)}, \frac{3x^2+12x}{(x-4)^2(x+4)}$

26) $\frac{5x+1}{(x-5)(x+2)}, \frac{4x+8}{(x-5)(x+2)}$

27) $\frac{x^2+7x+6}{(x-6)(x+6)^2}, \frac{2x^2-9x-18}{(x-6)(x+6)^2}$

28) $\frac{3x^2+4x+1}{(x-4)(x+3)(x+1)}, \frac{2x^2-8x}{(x-4)(x+3)(x+1)}$

29) $\frac{4x}{(x-3)(x+2)}, \frac{x^2+4x+4}{(x-3)(x+2)}$

30) $\frac{3x^2+15x}{(x-4)(x-2)(x+5)}, \frac{x^2-4x+4}{(x-4)(x-2)(x+5)}, \frac{5x-20}{(x-4)(x-2)(x+5)}$

7.4

Answers - Adding Rational Expressions

1) $\frac{6}{a+3}$

2) $x-4$

3) $t+7$

4) $\frac{a+4}{a+6}$

5) $\frac{x+6}{x-5}$

6) $\frac{3x+4}{x^2}$

7) $\frac{5}{24r}$

8) $\frac{7x+3y}{x^2y^2}$

9) $\frac{16-15t}{18t^3}$

10) $\frac{5x+9}{24}$

11) $\frac{a+8}{4}$

12) $\frac{5a^2+7a-3}{9a^2}$

13) $\frac{-7x-13}{4x}$

14) $\frac{c^2+3cd-d^2}{c^2d^2}$

15) $\frac{3y^2-3xy-6x^2}{2x^2y^2}$

16) $\frac{4x}{x^2-1}$

17) $\frac{-z^2+5z}{z^2-1}$

18) $\frac{11x+15}{4x(x+5)}$

19) $\frac{14-3x}{x^2-4}$

20) $\frac{x^2-x}{x^2-25}$

21) $\frac{4t-5}{4(t-3)}$

22) $\frac{2x+10}{(x+3)^2}$

23) $\frac{6-20x}{15x(x+1)}$

24) $\frac{9a}{4(a-5)}$

25) $\frac{5t^2+2ty-y^2}{y^2-t^2}$

26) $\frac{2t^2-10t+25}{x(x-5)}$

27) $\frac{x-3}{(x+1)(x+4)}$

28) $\frac{2x+3}{(x-1)(x+4)}$

29) $\frac{x-8}{(x+8)(x+6)}$

30) $\frac{2x-5}{(x-3)(x-2)}$

31) $\frac{5x+12}{x^2+5x+6}$

32) $\frac{4x+1}{x^2-x-3}$

33) $\frac{2x+4}{x^2+4x+3}$

34) $\frac{2x+7}{x^2+5x+6}$

35) $\frac{2x-8}{x^2-5x-14}$

36) $\frac{-3x^2+7x+4}{3(x+2)(2-x)}$

37) $\frac{a-2}{a^2-9}$

38) $\frac{2}{y^2-y}$

39) $\frac{z-3}{2z-1}$

40) $\frac{2}{r+s}$

41) $\frac{5x-5}{x^2-5x-14}$

42) $\frac{5x+5}{x^2+2x-15}$

43) $\frac{29-x}{x^2+2x-14}$

44) $\frac{5x-10}{x^2+5x+4}$

7.5

Answers - Complex Fractions

1) $\frac{x}{x-1}$

2) $\frac{1-y}{y}$

3) $\frac{-a}{a+2}$

4) $\frac{5-a}{a}$

5) $-\frac{a-1}{a+1}$

6) $\frac{b}{2(2-b)}$

7) $\frac{2}{5}$

8) $\frac{4}{5}$

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

10) $-\frac{1}{2}$

11) $\frac{x^2-x-1}{x^2+x+1}$

12) $\frac{2a^2-3a+3}{3a-2}$

13) $\frac{x}{3}$

14) $3x+2$

15) $\frac{4b(a-b)}{a}$

16) $\frac{x+2}{x-1}$

17) $\frac{x-5}{x+9}$

18) $-\frac{(x-3)(x+5)}{4x^2-5x+4}$

19) $\frac{1}{3x+8}$

20) $\frac{1}{x+4}$

21) $\frac{x-2}{x+2}$

22) $\frac{x-7}{x+5}$

23) $\frac{x-3}{x+4}$

24) $-\frac{2(a+1)}{7a-4}$

25) $-\frac{b-2}{2b+3}$

26) $\frac{x+y}{x-y}$

27) $\frac{a-3b}{a+3b}$

28) $-\frac{2x}{x^2+1}$

29) $-\frac{2}{y}$

30) x^2-1

31) $\frac{y-x}{xy}$

32) $\frac{x^2-xy+y^2}{y-x}$

33) $\dfrac{x^2 + y^2}{xy}$

35) $\dfrac{1 - 3x}{1 + 3x}$

34) $\dfrac{2x - 1}{2x + 1}$

36) $\dfrac{x + y}{xy}$

7.6

Answers - Proportions

1) $\frac{40}{3} = a$

2) $n = \frac{14}{3}$

3) $k = \frac{12}{7}$

4) $x = 16$

5) $x = \frac{3}{2}$

6) $n = 34$

7) $m = \frac{17}{7}$

8) $x = \frac{79}{8}$

9) $p = 49$

10) $n = 25$

11) $b = -\frac{40}{3}$

12) $r = \frac{36}{5}$

13) $x = \frac{5}{2}$

14) $n = \frac{32}{5}$

15) $a = \frac{6}{7}$

16) $v = -\frac{16}{7}$

17) $v = \frac{69}{5}$

18) $n = \frac{61}{3}$

19) $x = \frac{38}{3}$

20) $k = \frac{73}{3}$

21) $x = -8, 5$

22) $x = -7, 5$

23) $m = -7, 8$

24) $x = -3, 9$

25) $p = -7, -2$

26) $n = -6, 9$

27) $n = -1$

28) $n = -4, -1$

29) $x = -7, 1$

30) $x = -1, 3$

31) \$9.31

32) 16

33) 2.5 in

34) 12.1 ft

35) 39.4 ft

36) 3.1 in

37) T: 38, V: 57

38) J: 4 hr, S: 14 hr

39) \$8

40) C: 36 min,
    K: 51 min

7.7

Answers - Rational Equations

1) $-\frac{1}{2}, \frac{2}{3}$

2) $-3, 1$

3) 3

4) $-1, 4$

5) 2

6) $\frac{1}{3}$

7) -1

8) $-\frac{1}{3}$

9) -5

10) $-\frac{7}{15}$

11) $-5, 0$

12) $5, 10$

13) $\frac{16}{3}, 5$

14) $2, 13$

15) -8

16) 2

17) $-\frac{1}{5}, 5$

18) $-\frac{9}{5}, 1$

19) $\frac{3}{2}$

20) 10

21) 0, 5

22) $-2, \frac{5}{3}$

23) 4, 7

24) -1

25) $\frac{2}{3}$

26) $\frac{1}{2}$

27) $\frac{3}{10}$

28) 1

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

30) -1

31) 1

32) $\frac{13}{4}$

33) -10

34) $\frac{7}{4}$

7.8

Answers - Dimensional Analysis

1) 12320 yd

2) 0.0073125 T

3) 0.0112 g

4) 135,000 cm

5) 6.1 mi

6) 0.5 yd^2

7) 0.435 km^2

8) 86,067,200 ft^2

9) 6,500,000 m^3

10) 2.3958 cm^3

11) 0.0072 yd^3

12) 5.13 ft/sec

13) 6.31 mph

14) 104.32 mi/hr

15) 111 m/s

16) 2,623,269,600 km/yr

17) 11.6 lb/in^2

18) 63,219.51 km/hr^2

19) 32.5 mph; 447 yd/oz

20) 6.608 mi/hr

21)17280 pages/day; 103.4 reams/month

22) 2,365,200,000 beats/lifetime

23) 1.28 g/L

24) \$3040

25) 56 mph; 25 m/s

26) 148.15 yd^3

27) 3630 ft^2

28) 350,000 pages

29) 15,603,840,000 ft^3/week

30) 621,200 mg; 1368 lb

8.1

Answers - Square Roots

1) $7\sqrt{5}$

2) $5\sqrt{5}$

3) 6

4) 14

5) $2\sqrt{3}$

6) $6\sqrt{2}$

7) $6\sqrt{3}$

8) $20\sqrt{2}$

9) $48\sqrt{2}$

10) $56\sqrt{2}$

11) $-112\sqrt{2}$

12) $-21\sqrt{7}$

13) $8\sqrt{3n}$

14) $7\sqrt{7b}$

15) $14v$

16) $10n\sqrt{n}$

17) $6x\sqrt{7}$

18) $10a\sqrt{2a}$

19) $-10k^2$

20) $-20p^2\sqrt{7}$

21) $-56x^2$

22) $-16\sqrt{2n}$

23) $-30\sqrt{m}$

24) $32p\sqrt{7}$

25) $3xy\sqrt{5}$

26) $6b^2a\sqrt{2a}$

27) $4xy\sqrt{xy}$

28) $16a^2b\sqrt{2}$

29) $8x^2y^2\sqrt{5}$

30) $16m^2n\sqrt{2n}$

31) $24y\sqrt{5x}$

32) $56\sqrt{2mn}$

33) $35xy\sqrt{5y}$

34) $12xy\sqrt{2}$

35) $-12u\sqrt{5uv}$

36) $-30y^2x\sqrt{2x}$

37) $-48x^2z^2y\sqrt{5}$

38) $30a^2c\sqrt{2b}$

39) $8j^2\sqrt{5hk}$

40) $-4yz\sqrt{2xz}$

41) $-12p\sqrt{6mn}$

42) $-32p^2m\sqrt{2q}$

8.2

<center>Answers - Higher Roots</center>

1) $5\sqrt[3]{5}$

2) $5\sqrt[3]{3}$

3) $5\sqrt[3]{6}$

4) $5\sqrt[3]{2}$

5) $5\sqrt[3]{7}$

6) $2\sqrt[3]{3}$

7) $-8\sqrt[4]{6}$

8) $-16\sqrt[4]{3}$

9) $12\sqrt[4]{7}$

10) $6\sqrt[4]{3}$

11) $-2\sqrt[4]{7}$

12) $15\sqrt[4]{3}$

13) $3\sqrt[4]{8a^2}$

14) $2\sqrt[4]{4n^3}$

15) $2\sqrt[5]{7n^3}$

16) $-2\sqrt[5]{3x^4}$

17) $2p\sqrt[5]{7}$

18) $2x\sqrt[6]{4}$

19) $-6\sqrt[7]{7r}$

20) $-16b\sqrt[7]{3b}$

21) $4v^2\sqrt[3]{6v}$

22) $20a^2\sqrt[3]{2}$

23) $-28n^2\sqrt[3]{5}$

24) $-8n^2$

25) $-3xy\sqrt[3]{5x^2}$

26) $4uv\sqrt[3]{u^2}$

27) $-2xy\sqrt[3]{4xy}$

28) $10ab\sqrt[3]{ab^2}$

29) $4xy^2\sqrt[3]{4x}$

30) $3xy^2\sqrt[3]{7}$

31) $-21xy^2\sqrt[3]{3y}$

32) $-8y^2\sqrt[3]{7x^2y^2}$

33) $10v^2\sqrt[3]{3u^2v^2}$

34) $-40\sqrt[3]{6xy}$

35) $-12\sqrt[3]{3ab^2}$

36) $9y\sqrt[3]{5x}$

37) $-18m^2np^2\sqrt[3]{2m^2p}$

38) $-12mpq\sqrt[4]{5p^3}$

39) $18xy\sqrt[4]{8xy^3z^2}$

40) $-18b^2a\sqrt[4]{5ac}$

41) $14j^2k^2h\sqrt[4]{8h^2}$

42) $-18xz\sqrt[4]{4x^3yz^3}$

8.3

<center>Answers - Add and Subtract Radicals</center>

1) $6\sqrt{5}$

2) $-3\sqrt{6}-5\sqrt{3}$

3) $-3\sqrt{2}+6\sqrt{5}$

4) $-5\sqrt{6}-\sqrt{3}$

5) $-5\sqrt{6}$

6) $-3\sqrt{3}$

7) $3\sqrt{6} + 5\sqrt{5}$

8) $-\sqrt{5} + \sqrt{3}$

9) $-8\sqrt{2}$

10) $-6\sqrt{6} + 9\sqrt{3}$

11) $-3\sqrt{6} + \sqrt{3}$

12) $-2\sqrt{5} - 6\sqrt{6}$

13) $-2\sqrt{2}$

14) $8\sqrt{5} - \sqrt{3}$

15) $5\sqrt{2}$

16) $-9\sqrt{3}$

17) $-3\sqrt{6} - \sqrt{3}$

18) $3\sqrt{2} + 3\sqrt{6}$

19) $-12\sqrt{2} + 2\sqrt{5}$

20) $-3\sqrt{2}$

21) $-4\sqrt{6} + 4\sqrt{5}$

22) $-\sqrt{5} - 3\sqrt{6}$

23) $8\sqrt{6} - 9\sqrt{3} + 4\sqrt{2}$

24) $-\sqrt{6} - 10\sqrt{3}$

25) $2\sqrt[3]{2}$

26) $6\sqrt[3]{5} - 3\sqrt[3]{3}$

27) $-\sqrt[4]{3}$

28) $10\sqrt[4]{4}$

29) $\sqrt[4]{2} - 3\sqrt[4]{3}$

30) $5\sqrt[4]{6} + 2\sqrt[4]{4}$

31) $3\sqrt[4]{4}$

32) $-6\sqrt[4]{3} + 2\sqrt[4]{6}$

33) $2\sqrt[4]{2} + \sqrt[4]{3} + 6\sqrt[4]{4}$

34) $-2\sqrt[4]{3} - 9\sqrt[4]{5} - 3\sqrt[4]{2}$

35) $\sqrt[5]{6} - 6\sqrt[5]{2}$

36) $10\sqrt[5]{6} - 9\sqrt[5]{5}$

37) $4\sqrt[5]{5} - 4\sqrt[5]{6}$

38) $-11\sqrt[7]{2} - 2\sqrt[7]{5}$

39) $-4\sqrt[6]{4} - 6\sqrt[6]{5} - 4\sqrt[6]{2}$

40) $\sqrt[7]{3} - 6\sqrt[7]{6} + 3\sqrt[7]{5}$

8.4

Answers - Multiply and Divide Radicals

1) $-48\sqrt{5}$

2) $-25\sqrt{6}$

3) $6m\sqrt{5}$

4) $-25r^2\sqrt{2r}$

5) $2x^2\sqrt[3]{x}$

6) $6a^2\sqrt[3]{5a}$

7) $2\sqrt{3} + 2\sqrt{6}$

8) $5\sqrt{2} + 2\sqrt{5}$

9) $-45\sqrt{5} - 10\sqrt{15}$

10) $25\sqrt{6r} + 20r^2\sqrt{15}$

11) $25n\sqrt{10} + 10\sqrt{5}$

12) $5\sqrt{3} - 9\sqrt{5}$

13) $-2 - 4\sqrt{2}$

14) $16 - 9\sqrt{3}$

15) $15 - 11\sqrt{5}$

16) $30 + 8\sqrt{3} + 5\sqrt{15} + 4\sqrt{5}$

17) $6a + a\sqrt{10} + 6a\sqrt{6} + 2a\sqrt{15}$

18) $-4p\sqrt{10} + 50\sqrt{p}$

19) $63 + 32\sqrt{3}$

20) $-10\sqrt{m} + 25\sqrt{2} + \sqrt{2m} - 5$

21) $\frac{\sqrt{3}}{25}$

22) $\frac{\sqrt{15}}{4}$

23) $\frac{1}{20}$

24) 2

25) $\frac{\sqrt{15}}{3}$

26) $\frac{\sqrt{10}}{15}$

27) $\frac{4\sqrt{3}}{9}$

28) $\frac{4\sqrt{5}}{5}$

29) $\frac{5\sqrt{3xy}}{12y^2}$

30) $\frac{4\sqrt{3x}}{15y^2x}$

31) $\frac{\sqrt{6p}}{3}$

32) $\frac{2\sqrt{5n}}{5}$

33) $\frac{\sqrt[3]{10}}{5}$

34) $\frac{\sqrt[3]{15}}{4}$

35) $\frac{\sqrt[3]{10}}{8}$

36) $\frac{\sqrt[4]{8}}{8}$

37) $\frac{5\sqrt[4]{10r^2}}{2}$

38) $\frac{\sqrt[4]{4n^2}}{mn}$

8.5

Answers - Rationalize Denominators

1) $\frac{4+2\sqrt{3}}{3}$

2) $\frac{-4+\sqrt{3}}{12}$

3) $\frac{2+\sqrt{3}}{5}$

4) $\frac{\sqrt{3}-1}{4}$

5) $\frac{2\sqrt{13}-5\sqrt{65}}{52}$

6) $\frac{\sqrt{85}+4\sqrt{17}}{68}$

7) $\frac{\sqrt{6}-9}{3}$

8) $\frac{\sqrt{30}-2\sqrt{3}}{18}$

9) $\frac{2\sqrt{5}+15p}{50}$

10) $\frac{5\sqrt{19}-x\sqrt{57}}{38}$

11) $\frac{3-4m\sqrt{6}}{30m}$

12) $\frac{6\sqrt{7r}-\sqrt{42r}}{14}$

13) $\frac{15\sqrt{5}-5\sqrt{2}}{43}$

14) $\frac{-5\sqrt{3}+20\sqrt{5}}{77}$

15) $\frac{10-2\sqrt{2}}{23}$

16) $\frac{2\sqrt{3}+\sqrt{2}}{2}$

17) $\frac{-12-9\sqrt{3}}{11}$

18) $-2\sqrt{2}-4$

19) $3-\sqrt{5}$

20) $\frac{\sqrt{5}-\sqrt{3}}{2}$

21) $1-\sqrt{2}$

22) $\frac{16\sqrt{3}+4\sqrt{5}}{43}$

23) $\frac{5}{n^2-5}$

24) $\frac{-5n\sqrt{3n}+n^3\sqrt{6n}}{25-2n^4}$

25) $\frac{4p}{3-5p^2}$

26) $\frac{5x^2+3x^2\sqrt{5x}}{5-9x}$

27) $\frac{20-4x\sqrt{5}}{25-5x^2}$

28) $\frac{2b}{-2b^2-1}$

29) $\frac{10-5r\sqrt{5r}}{4-5r^3}$

162

30) $\dfrac{5a\sqrt{3}-20}{3a^3-16a}$

31) $\dfrac{-25v+15\sqrt{v}}{25v^2-9v}$

32) $\dfrac{8\sqrt{2}-4\sqrt{n}}{8n-n^2}$

33) $\dfrac{24-4\sqrt{6}+9\sqrt{2}-3\sqrt{3}}{15}$

34) $\dfrac{5+5\sqrt{3}+4\sqrt{5}+4\sqrt{15}}{10}$

35) $\dfrac{-1+\sqrt{5}}{4}$

36) $\dfrac{2\sqrt{5}-5\sqrt{2}-10+5\sqrt{10}}{30}$

37) $\dfrac{-5\sqrt{2}+10-\sqrt{3}+\sqrt{6}}{5}$

38) $\dfrac{-4\sqrt{10}-16\sqrt{2}-2\sqrt{15}-8\sqrt{3}}{11}$

39) $\dfrac{8+3\sqrt{6}}{10}$

40) $\dfrac{4\sqrt{3}+\sqrt{6}-4\sqrt{5}-\sqrt{10}}{14}$

41) $\dfrac{4\sqrt{3}-\sqrt{15}-4\sqrt{2}+\sqrt{10}}{11}$

42) $\dfrac{-2\sqrt{10}+6\sqrt{6}+\sqrt{15}-9}{22}$

43) $\dfrac{20-8x\sqrt{5x}+10x\sqrt{2}-4x^2\sqrt{10x}}{25-20x^3}$

44) $\dfrac{12p^2+3p^4\sqrt{2}+4p\sqrt{5p}+p^3\sqrt{10p}}{16-2p^4}$

45) $\dfrac{10m\sqrt{3}+6m^2-5m^2\sqrt{2}-m^3\sqrt{6}}{25-3m^2}$

46) $\dfrac{-16v+20v\sqrt{v}+8v\sqrt{2}-10v\sqrt{2v}}{16-25v}$

47) $\dfrac{-2b-2b^3\sqrt{2}+5\sqrt{2b}+10b^2\sqrt{b}}{1-2b^4}$

48) $\dfrac{-4n-n\sqrt{3}}{-3-n^2}$

49) $\dfrac{8+10\sqrt{3x}-4\sqrt{2x}-5x\sqrt{6}}{16x-75x^2}$

50) $\dfrac{9a+15a^2\sqrt{3}+6a\sqrt{2}+10a^2\sqrt{6}}{9-75a^2}$

51) $\dfrac{3p-4p\sqrt{p}+\sqrt{p}}{p-p^2}$

52) $\dfrac{-8+4\sqrt{3}+2\sqrt{5x}-\sqrt{15x}}{x}$

8.6

Answers - Rational Exponents

1) $\left(\sqrt[5]{m}\right)^3$

2) $\dfrac{1}{\left(\sqrt[4]{10r}\right)^3}$

3) $\left(\sqrt{7x}\right)^3$

4) $\dfrac{1}{\left(\sqrt[3]{6v}\right)^4}$

5) $(6x)^{-\frac{3}{2}}$

6) $v^{\frac{1}{2}}$

7) $n^{-\frac{7}{4}}$

8) $(5a)^{\frac{1}{2}}$

9) 4

10) 2

11) 8

12) $\dfrac{1}{1000}$

13) $x^{\frac{4}{3}}y^{\frac{5}{2}}$

14) $\dfrac{4}{v^{\frac{1}{3}}}$

15) $\dfrac{1}{a^{\frac{1}{2}}b^{\frac{1}{2}}}$

16) 1

17) $\dfrac{1}{3a^2}$

18) $\dfrac{y^{\frac{25}{12}}}{x^{\frac{5}{6}}}$

19) $u^2v^{\frac{11}{2}}$

20) 1

21) $y^{\frac{1}{2}}$

22) $\dfrac{v^2}{u^{\frac{7}{2}}}$

23) $\dfrac{b^{\frac{7}{4}}a^{\frac{3}{4}}}{3}$

24) $\dfrac{2y^{\frac{17}{6}}}{x^{\frac{7}{4}}}$

25) $\dfrac{3y^{\frac{1}{12}}}{2}$

26) $\dfrac{a^{\frac{3}{2}}}{2b^{\frac{1}{4}}}$

27) $\dfrac{m^{\frac{35}{8}}}{n^{\frac{7}{6}}}$

28) $\dfrac{1}{y^{\frac{5}{4}}x^{\frac{3}{2}}}$

29) $\dfrac{1}{n^{\frac{3}{4}}}$

30) $\dfrac{y^{\frac{1}{3}}}{x^{\frac{1}{4}}}$

31) $xy\frac{4}{3}$

32) $\dfrac{x^{\frac{4}{3}}}{y^{\frac{10}{3}}}$

33) $\dfrac{u^{\frac{1}{2}}}{v^{\frac{3}{4}}}$

34) $x^{\frac{15}{4}}y^{\frac{17}{4}}$

8.7

Answers - Mixed Index

1) $\sqrt[4]{4x^2y^3}$

2) $\sqrt{3xy^3}$

3) $\sqrt[6]{8x^2y^3z^4}$

4) $\sqrt{\dfrac{5}{4x}}$

5) $\dfrac{\sqrt[3]{36xy}}{3y}$

6) $\sqrt[5]{x^3y^4z^2}$

7) $\sqrt[4]{x^2y^3}$

8) $\sqrt[5]{8x^4y^2}$

9) $\sqrt[4]{x^3y^2z}$

10) $\sqrt{5y}$

11) $\sqrt[3]{2xy^2}$

12) $\sqrt[4]{3x^2y^3}$

13) $\sqrt[6]{5400}$

14) $\sqrt[12]{300125}$

15) $\sqrt[6]{49x^3y^2}$

16) $\sqrt[15]{27y^5z^5}$

17) $\sqrt[6]{x^3(x-2)^2}$

18) $\sqrt[4]{3x(y+4)^2}$

19) $\sqrt[10]{x^9y^7}$

20) $\sqrt[10]{4a^9b^9}$

21) $\sqrt[12]{x^{11}y^{10}}$

22) $\sqrt[20]{a^{18}b^{17}}$

23) $\sqrt[20]{a^{18}b^{17}c^{14}}$

24) $\sqrt[30]{x^{22}y^{11}z^{27}}$

25) $a\sqrt[4]{a}$

26) $x\sqrt{x}$

27) $b\sqrt[10]{b^9}$

28) $a\sqrt[12]{a^5}$

29) $xy\sqrt[6]{xy^5}$

30) $a\sqrt[10]{ab^7}$

31) $3a^2b\sqrt[4]{ab}$

32) $2xy^2\sqrt[6]{2x^5y}$

33) $3xy\sqrt[4]{xy}$

34) $a^2b^2c^2\sqrt[6]{a^2b\,c^2}$

35) $9a^2(b+1)\sqrt[6]{243a^5(b+1)^5}$

36) $4x(y+z)^3\sqrt[6]{2x(y+z)}$

37) $\sqrt[12]{a^5}$

38) $\sqrt[15]{x^7}$

39) $\sqrt[12]{x^2y^5}$

40) $\dfrac{\sqrt[15]{a^7 b^{11}}}{b}$

43) $\sqrt[20]{(3x-1)^3}$

41) $\sqrt[10]{ab^9 c^7}$

44) $\sqrt[12]{(2+5x)^5}$

42) $yz \sqrt[10]{xy^8 z^3}$

45) $\sqrt[15]{(2x+1)^4}$

8.8

Answers - Complex Numbers

1) $11 - 4i$

2) $-4i$

3) $-3 + 9i$

4) $-1 - 6i$

5) $-3 - 13i$

6) $5 - 12i$

7) $-4 - 11i$

8) $-3 - 6i$

9) $-8 - 2i$

10) $13 - 8i$

11) 48

12) 24

13) 40

14) 32

15) -49

16) $28 - 21i$

17) $11 + 60i$

18) $-32 - 128i$

19) $80 - 10i$

20) $36 - 36i$

21) $27 + 38i$

22) $-28 + 76i$

23) $44 + 8i$

24) $16 - 18i$

25) $-3 + 11i$

26) $-1 + 13i$

27) $9i + 5$

28) $\dfrac{-3i - 2}{3}$

29) $\dfrac{10i - 9}{6}$

30) $\dfrac{4i + 2}{3}$

31) $\dfrac{3i - 6}{4}$

32) $\dfrac{5i + 9}{9}$

33) $10i + 1$

34) $-2i$

35) $\dfrac{-40i + 4}{101}$

36) $\dfrac{9i - 45}{26}$

37) $\dfrac{56 + 48i}{85}$

38) $\dfrac{4 - 6i}{13}$

39) $\dfrac{70 + 49i}{149}$

40) $\dfrac{-36 + 27i}{50}$

41) $\dfrac{-30i - 5}{37}$

42) $\dfrac{48i - 56}{85}$

9.1

Answers - Solving with Radicals

1) 3

2) 3

3) $1, 5$

4) no solution

5) ± 2

6) 3

7) $\frac{1}{4}$

8) no solution

9) 5

10) 7

11) 6

12) 46

13) 5

14) 21

15) $-\frac{3}{2}$ 16) $-\frac{7}{3}$

9.2

<div align="center">Answers - Solving with Exponents</div>

1) $\pm 5\sqrt{3}$

2) -2

3) $\pm 2\sqrt{2}$

4) 3

5) $\pm 2\sqrt{6}$

6) $-3, 11$

7) -5

8) $\frac{1}{5}, -\frac{3}{5}$

9) -1

10) $\frac{-1 \pm 3\sqrt{2}}{2}$

11) $65, -63$

12) 5

13) -7

14) $-\frac{11}{2}, \frac{5}{2}$

15) $\frac{11}{2}, \frac{5}{2}$

16) $-\frac{191}{64}$

17) $-\frac{3}{8}, -\frac{5}{8}$

18) $\frac{9}{8}$

19) $\frac{5}{4}$

20) No Solution

21) $-\frac{34}{3}, -3$

22) 3

23) $-\frac{17}{2}$

24) No Solutoin

9.3

<div align="center">Answers - Complete the Square</div>

1) $225; (x-15)^2$

2) $144; (a-12)^2$

3) $324; (m-18)^2$

4) $289; (x-17)^2$

5) $\frac{225}{4}; (x-\frac{15}{2})^2$

6) $\frac{1}{324}; (r-\frac{1}{18})^2$

7) $\frac{1}{4}; (y-\frac{1}{2})^2$

8) $\frac{289}{4}; (p-\frac{17}{2})^2$

9) $\{11, 5\}$

10) $\{4+2\sqrt{7}, 4-2\sqrt{7}\}$

11) $\{4+i\sqrt{29}, 4-i\sqrt{29}\}$

12) $\{-1+I\sqrt{42}, -1-I\sqrt{42}\}$

13) $\{\frac{-2+I\sqrt{38}}{2}, \frac{-2-I\sqrt{38}}{2}\}$

14) $\{\frac{3+2i\sqrt{33}}{3}, \frac{3-3i\sqrt{33}}{3}\}$

15) $\{\frac{5+i\sqrt{215}}{5}, \frac{5-i\sqrt{215}}{5}\}$

16) $\{\frac{-4+3\sqrt{2}}{4}, \frac{-4-3\sqrt{2}}{4}\}$

17) $\{-5+\sqrt{86}, -5-\sqrt{86}\}$

18) $\{8+2\sqrt{30}, 8-2\sqrt{30}\}$

19) $\{9, 7\}$

20) $\{9, -1\}$

21) $\{-1+i\sqrt{21}, -1-i\sqrt{21}\}$

22) $\{1, -3\}$

23) $\{\frac{3}{2}, -\frac{7}{2}\}$

24) $\{3, -1\}$

25) $\{-5+2i, -5-2i\}$

26) $\{7+\sqrt{85}, 7-\sqrt{85}\}$

27) $\{7, 3\}$

28) $\{4, -14\}$

29) $\{1+i\sqrt{2}, 1-i\sqrt{2}\}$

30) $\{\frac{5+i\sqrt{105}}{5}, \frac{5-i\sqrt{105}}{5}\}$

31) $\{\frac{4+i\sqrt{110}}{2}, \frac{4-i\sqrt{110}}{2}\}$

32) $\{1, -3\}$

33) $\{4 + i\sqrt{39}, 4 - i\sqrt{39}\}$

34) $\{-1. -7\}$

35) $\{7, 1\}$

36) $\{2, -6\}$

37) $\{\frac{-6 + i\sqrt{258}}{6}, \frac{-6 - i\sqrt{258}}{6}\}$

38) $\{\frac{-6 + i\sqrt{111}}{3}, \frac{-6 - i\sqrt{111}}{3}\}$

39) $\{\frac{5 + i\sqrt{130}}{5}, \frac{5 - i\sqrt{130}}{5}\}$

40) $\{2, -4\}$

41) $\{\frac{-5 + i\sqrt{87}}{2}, \frac{-5 - i\sqrt{87}}{2}\}$

42) $\{\frac{-7 + \sqrt{181}}{2}, \frac{-7 - \sqrt{181}}{2}\}$

43) $\{\frac{3 + i\sqrt{271}}{7}, \frac{3 - i\sqrt{271}}{7}\}$

44) $\{\frac{-1 + 2i\sqrt{6}}{2}, \frac{-1 - 2i\sqrt{6}}{2}\}$

45) $\{\frac{7 + i\sqrt{139}}{2}, \frac{7 - i\sqrt{139}}{2}\}$

46) $\{\frac{5 + i\sqrt{67}}{2}, \frac{5 - i\sqrt{67}}{2}\}$

47) $\{\frac{12}{5}, -4\}$

48) $\{\frac{1 + i\sqrt{511}}{4}, \frac{1 - i\sqrt{511}}{4}\}$

49) $\{\frac{9 + \sqrt{21}}{2}, \frac{9 - \sqrt{21}}{2}\}$

50) $\{\frac{1 + i\sqrt{163}}{2}, \frac{1 - i163}{2}\}$

51) $\{\frac{-5 + i\sqrt{415}}{8}, \frac{-5 - i\sqrt{415}}{8}\}$

52) $\{\frac{11 + i\sqrt{95}}{6}, \frac{11 - i\sqrt{95}}{6}\}$

53) $\{\frac{5 + i\sqrt{191}}{2}, \frac{5 - i\sqrt{191}}{2}\}$

54) $\{\frac{15 + i\sqrt{3}}{2}, \frac{15 - i\sqrt{3}}{2}\}$

55) $\{1, -\frac{5}{2}\}$

56) $\{3, -\frac{3}{2}\}$

9.4

Answers - Quadratic Formula

1) $\{\frac{i\sqrt{6}}{2}, -\frac{i\sqrt{6}}{2}\}$

2) $\{\frac{i\sqrt{6}}{3}, -\frac{i\sqrt{6}}{3}\}$

3) $\{2 + \sqrt{5}, 2 - \sqrt{5}\}$

4) $\{\frac{\sqrt{6}}{6}, -\frac{\sqrt{6}}{6}\}$

5) $\{\frac{\sqrt{6}}{2}, -\frac{\sqrt{6}}{2}\}$

6) $\{\frac{-1 + i\sqrt{29}}{5}, \frac{-1 - i\sqrt{29}}{5}\}$

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

8) $\{\frac{1 + \sqrt{31}}{2}, \frac{1 - \sqrt{31}}{2}\}$

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

10) $\{i\sqrt{2}, -i\sqrt{2}\}$

11) $\{3, 1\}$

12) $\{-1 + i, -1 - i\}$

13) $\{\frac{-3 + i\sqrt{55}}{4}, \frac{-3 - i\sqrt{55}}{4}\}$

14) $\{\frac{-3 + i\sqrt{159}}{12}, \frac{-3 - i\sqrt{159}}{12}\}$

15) $\{\frac{-3 + \sqrt{141}}{6}, \frac{-3 - \sqrt{141}}{6}\}$

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

17) $\{\frac{-3 + \sqrt{401}}{14}, \frac{-3 - \sqrt{401}}{14}\}$

18) $\{\frac{-5 + \sqrt{137}}{8}, \frac{-5 - \sqrt{137}}{8}\}$

19) $\{2, -5\}$

20) $\{5, -9\}$

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

22) $\{3, -\frac{1}{3}\}$

23) $\{\frac{7}{2}, -7\}$

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

25) $\{\frac{7 + 3\sqrt{21}}{10}, \frac{7 - 3\sqrt{21}}{10}\}$

26) $\{\frac{-5 + \sqrt{337}}{12}, \frac{-5 - \sqrt{337}}{12}\}$

167

27) $\{\frac{-3+i\sqrt{247}}{16}, \frac{-3-i\sqrt{247}}{16}\}$

28) $\{\frac{3+\sqrt{33}}{6}, \frac{3-\sqrt{33}}{6}\}$

29) $\{-1, -\frac{3}{2}\}$

30) $\{2\sqrt{2}, -2\sqrt{2}\}$

31) $\{4, -4\}$

32) $\{2, -4\}$

33) $\{4, -9\}$

34) $\{\frac{2+3i\sqrt{5}}{7}, \frac{2-3i\sqrt{5}}{7}\}$

35) $\{6, -\frac{9}{2}\}$

36) $\{\frac{5+i\sqrt{143}}{14}, \frac{5-i\sqrt{143}}{14}\}$

37) $\{\frac{-3+\sqrt{345}}{14}, \frac{-3-\sqrt{345}}{14}\}$

38) $\{\frac{\sqrt{6}}{2}, -\frac{\sqrt{6}}{2}\}$

39) $\{\frac{\sqrt{26}}{2}, -\frac{\sqrt{26}}{2}\}$

40) $\{\frac{-1+\sqrt{141}}{10}, \frac{-1-\sqrt{141}}{10}\}$

9.5

Answers - Quadratics from Roots

NOTE: There are multiple answers for each problem. Try checking your answers because your answer may also be correct.

1) $x^2 - 7x + 10$

2) $x^2 - 9x + 18 = 0$

3) $x^2 - 22x + 40 = 0$

4) $x^2 - 14x + 13 = 0$

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

6) $x^2 - 9x = 0$

7) $x^2 = 0$

8) $x^2 + 7x + 10 = 0$

9) $x^2 - 7x - 44 = 0$

10) $x^2 - 2x - 3 = 0$

11) $16x^2 - 16x + 3 = 0$

12) $56x^2 - 75x - 40 = 0$

13) $6x^2 - 7x + 2 = 0$

14) $6x^2 - 7x + 2 = 0$

15) $7x^2 - 40x + 12 = 0$

16) $9x^2 - 2x + 4 = 0$

17) $18x^2 - 9x - 5 = 0$

18) $6x^2 - 7x - 5 = 0$

19) $9x^2 + 53x - 6 = 0$

20) $5x^2 + 2x = 0$

21) $x^2 - 25 = 0$

22) $x^2 - 1 = 0$

23) $25x^2 - 1 = 0$

24) $x^2 - 7 = 0$

25) $x^2 - 11 = 0$

26) $x^2 - 12 = 0$

27) $16x^2 - 3 = 0$

28) $x^2 + 121 = 0$

29) $x^2 + 13 = 0$

30) $x^2 + 50 = 0$

31) $x^2 - 4x - 2 = 0$

32) $x^2 + 6x + 7 = 0$

33) $x^2 - 2x + 10 = 0$

34) $x^2 + 4x + 20 = 0$

35) $x^2 - 12x + 39 = 0$

36) $x^2 + 18x + 86 = 0$

37) $4x^2 + 4x - 5 = 0$

38) $9x^2 - 6x + 29 = 0$

39) $64x^2 - 96x + 38 = 0$

40) $4x^2 + 8x + 19 = 0$

9.6

Answers - Equations with Quadratics

1) $\pm 1, \pm 2$

2) $\pm 2, \pm \sqrt{5}$

3) $\pm i, \pm 2\sqrt{2}$

4) $\pm 5, \pm 2$

5) $\pm 1, \pm 7$

6) $\pm 3, \pm 1$

7) $\pm 3, \pm 4$

8) $\pm 6, \pm 2$

9) $\pm 2, \pm 4$

10) $2, 3, -1 \pm i\sqrt{3}, \frac{-3 \pm i\sqrt{3}}{2}$

11) $-2, 3, 1 \pm i\sqrt{3}, \frac{-3 \pm i\sqrt{3}}{2}$

12) $\pm \sqrt{6}, \pm 2i$

13) $\frac{\pm 2i\sqrt{3}}{3}, \frac{\pm \sqrt{6}}{2}$

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

15) $-125, 343$

16) $-\frac{5}{4}, \frac{1}{5}$

17) $1, -\frac{1}{2}, \frac{1 \pm i\sqrt{3}}{4}, \frac{1 \pm i\sqrt{3}}{2}$

18) $\pm 2, \pm \sqrt{3}$

19) $\pm i, \pm \sqrt{3}$

20) $\pm \sqrt{5}, \pm \sqrt{2}$

21) $\pm \sqrt{2}, \pm \frac{\sqrt{2}}{2}$

22) $\pm i, \frac{\pm 6}{2}$

23) $\pm 1, \pm 2\sqrt{2}$

24) $2, \sqrt[3]{2}, -1 \pm i\sqrt{3}, \frac{-\sqrt[3]{2} \pm i\sqrt[6]{108}}{2}$

25) $1, \frac{1}{2}, \frac{-1 \pm i\sqrt{3}}{4}, \frac{-1 \pm i\sqrt{3}}{2}$

26) $\frac{1}{2}, -1, \frac{-1 \pm i\sqrt{3}}{4}, \frac{1 \pm i\sqrt{3}}{2}$

27) $\pm 1, \pm i, \pm 2, \pm 2i$

28) $4, 0$

29) $-(b+3), 7-b$

30) -4

31) $-4, 6$

32) $8, -1$

33) $-2, 10$

34) $2, -6$

35) $-1, 11$

36) $\frac{5}{2}, 0$

37) $4, -\frac{4}{3}$

38) $\pm \sqrt{6}, \pm \sqrt{2}$

39) $\pm 1, \pm i, \pm 2, \pm 2i$

40) $0, \pm 1, -2$

41) $\frac{511}{3}, -\frac{1339}{24}$

42) $-3, \pm 2, 1$

43) $\pm 1, -3$

44) $-3, -1, \frac{3}{2}, -\frac{1}{2}$

45) $\pm 1, -\frac{1}{2}, \frac{3}{2}$

46) $1, 2, \frac{1}{3}, -\frac{2}{3}$

9.7

Answers - Rectangles

1) 6 m x 10 m

2) 5

3) 40 yd x 60 yd

4) 10 ft x 18 ft

5) 6 x 10

6) 20 ft x 35 ft

7) 6" x 6"

8) 6 yd x 7 yd

9) 4 ft x 12 ft

10) 1.54 in

11) 3 in

12) 10 ft

13) 1.5 yd

14) 7 x 9

15) 1 in

16) 10 rods

17) 2 in

18) 15 ft

19) 60 ft

20) 20 ft

21) 1.25 in

22) 23.16 ft

23) 17.5 ft

24) 25 ft

26) 1.145 in

25) 3 ft

27) 6 m x 8 m

9.8

<div align="center">Answers - Teamwork</div>

1) 4 and 6

2) 6 hours

3) 2 and 3

4) 2.4

5) C = 4, J = 12

6) 1.28 days

7) $1\frac{1}{3}$ days

8) 12 min

9) 8 days

10) 15 days

11) 2 days

12) $4\frac{4}{9}$ days

13) 9 hours

14) 12 hours

15) 16 hours

16) $7\frac{1}{2}$ min

17) 15 hours

18) 18 min

19) $5\frac{1}{4}$ min

20) 3.6 hours

21) 24 min

22) 180 min or 3 hrs

23) Su = 6, Sa = 12

24) 3 hrs and 12 hrs

25) P = 7, S = $17\frac{1}{2}$

26) 15 and 22.5 min

27) A = 21, B = 15

28) 12 and 36 min

9.9

<div align="center">Answers - Simultaneous Product Equations</div>

1) $(2, 36), (-18, -4)$

2) $(-9, -20), (-40, -\frac{9}{5})$

3) $(10, 15), (-90, -\frac{5}{3})$

4) $(8, 15), (-10, -12)$

5) $(5, 9), (18, 2.5)$

6) $(13, 5), (-20, -\frac{13}{4})$

7) $(45, 2), (-10, -9)$

8) $(16, 3), (-6, -8)$

9) $(1, 12), (-3, -4)$

10) $(20, 3), (5, 12)$

11) $(45, 1), (-\frac{5}{3}, -27)$

12) $(8, 10), (-10, -8)$

9.10

<div align="center">Answers - Revenue and Distance</div>

1) 12

2) $5

3) 24

4) 55

5) 20

6) 30

7) 25 @ $18

8) 12 @ $6

9) 60 mph, 80 mph

10) 60, 80

11) 6 km/hr

12) 200 km/hr 48.

13) 56, 76

14) 3.033 km/hr

15) 12 mph, 24 mph

16) 30 mph, 40 mph
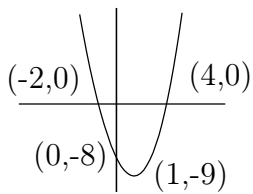
17) r = 5

18) 36 mph

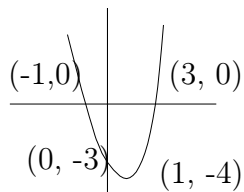19) 45 mph

20) 40 mph, 60 mph

21) 20 mph   22) 4 mph
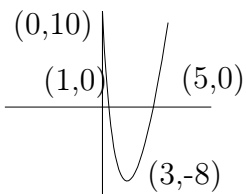
9.11

Answers - Graphing Quadratic Functions
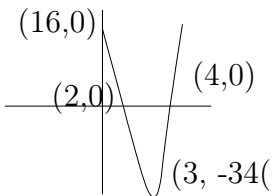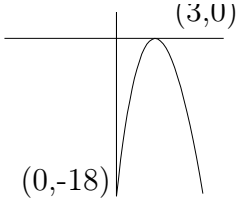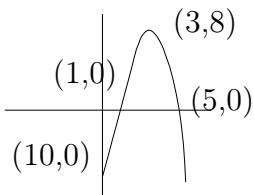
1)

(-2,0) (4,0)
(0,-8) (1,-9)

(3,0) (4,3) (5,0)
(0,-45)

(4,8)
(2,0) (6,0)
(0,-24)

2)

(-1,0) (3, 0)
(0, -3) (1, -4)

8)

(1,0) (2,3) (3,0)
(-9,0)

14)

(-3,1) (1,0)
(0,-6)
(-1,-8)

3)

(0,10)
(1,0) (5,0)
(3,-8)

9)

(0,5) (2,9)
(-1,0) (5,0)

15)

(-3,0) (-1,0) (0,9)
(-2,-3)

4)

(16,0)
(2,0) (4,0)
(3, -34(

10)

(1,0) (2,1)
(-3,0) (3,0)

16)

(0,45)
(-3,0)

5)

(3,0)
(0,-18)

11)

(1,0) (3,4)
(5,0)
(0,-5)

17)

(0,75) (3,0) (5,0)
(4,-5)

6)

(3,8)
(1,0) (5,0)
(10,0)

12)

(3,0) (4,2) (5,0)
(-30,0)

18)

(-3,0) (0,15)
(-1,0)
(-2,-5)

7)

13)

171

19)

(-6,5)
(-7,0) (-5,0)
(0,-175)

20)
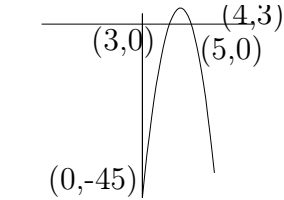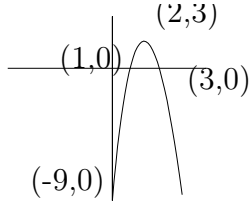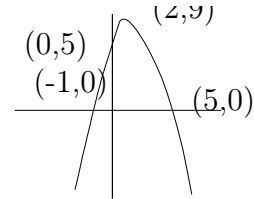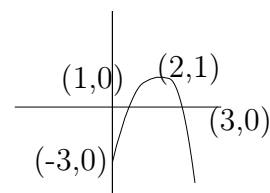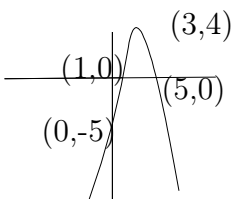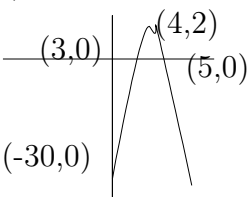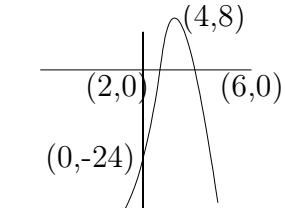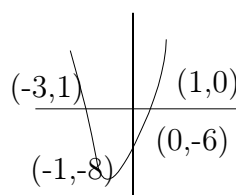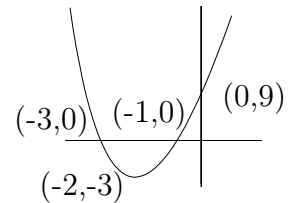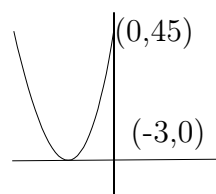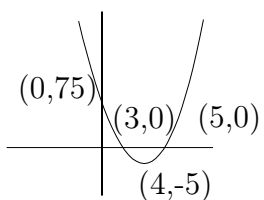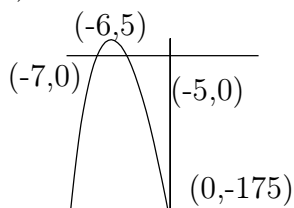
(2,5)
(1,0) (3,0)
(-15,0)
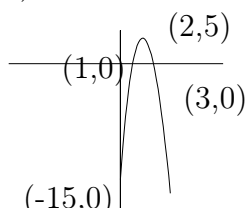
10.1

Answers - Function Notation

1) a. yes b. yes c. no
   d. no e. yes f. no
   g. yes h. no

2) all x

3) $x \leqslant \frac{5}{4}$

4) $t \neq 0$

5) all x

6) all t

7) $x \geqslant 16$

8) $x \neq -1, 4$

9) $x \geqslant 4, x \neq 5$

10) $x \neq \pm 5$

11) -4

12) $-\frac{3}{25}$

13) 2

14) 85

15) -6

16) 7

17) $-\frac{17}{9}$

18) -6

19) 13

20) 5

21) 11

22) -21

23) $\frac{1}{16}$

24) -4

25) -21

26) 2

27) -60

28) -32

29) 2
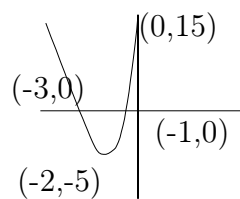
30) $\frac{31}{32}$

31) $-64x^3 + 2$

32) $4x + 10$

33) $-1 + 3x$

34) $-3 \cdot 2^{\frac{12+a}{4}}$

35) $2\left| -3n^2 - 1 \right| + 2$

36) $1 + \frac{1}{16}x^2$

37) $3x + 1$

38) $t^4 + t^2$

39) 5^{-3-x}

40) $5^{\frac{-2+n}{2}} + 1$

10.2

Answers - Algebra of Functions

1) 82

2) 20

3) 46

4) 2

5) 5

6) -30

7) -3

8) 140

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

10) -43

11) 100

12) -74

13) $\frac{1}{5}$

14) 27

15) $-\frac{9}{26}$

16) $n^2 - 2n$

17) $-x^3 - 4x - 2$

18) $-x^3 + 2x^2 - 3$

19) $-x^2 - 8x + 2$

20) $2t^2 - 8t$

21) $4x^3 + 25x^2 + 25x$

22) $-2t^3 - 15t^2 - 25t$

23) $x^2 - 4x + 5$

24) $3x^2 + 4x - 9$

25) $\frac{n^2 + 5}{3n + 5}$

26) $-2x + 9$

27) $\frac{-2a + 5}{3a + 5}$

28) $t^3 + 3t^2 - 3t + 5$

29) $n^3 + 8n + 5$

30) $\frac{4x + 2}{x^2 + 2x}$

31) $n^6 - 9n^4 + 20n^2$

32) $18n^2 - 15n - 25$

33) $x + 3$

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

35) $t^4 + 8t^2 + 2$

36) $\frac{3n - 6}{-n^2 - 4n}$

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

38) $x^4 - 4x^2 - 3$

39) $\frac{-n^2 - 2n}{3}$

40) $\frac{32 + 32n - n^3}{8}$

41) -155

42) 5

43) 21

44) 4

45) 103

46) 12

47) 050

48) 112

49) 176

50) 147

51) $16x^2 + 12x - 4$

52) $-8a + 14$

53) $-8a + 2$

54) t

55) $4x^3$

56) $-2n^2 - 12n - 16$

57) $-2x + 8$

58) $27t^3 - 108t^2 + 141t - 60$

59) $-16t - 5$

60) $3x^3 + 6x^2 - 4$

10.3

Answers - Inverse Functions

1) Yes

2) No

3) Yes

4) Yes

5) No

6) Yes

7) No

8) Yes

9) Yes

10) No

11) $f^{-1}(x) = \sqrt[5]{x-3} - 2$

12) $g^{-1}(x) = -1 + (x - 2)^3$

13) $g^{-1}(x) = \frac{4-2x}{x}$

14) $f^{-1}(x) = \frac{-3+3x}{x}$

15) $f^{-1}(x) = \frac{-2x-2}{x+2}$

16) $g^{-1}(x) = 3x - 9$

17) $f^{-1}(x) = -5x + 10$

18) $f^{-1}(x) = \frac{15+2x}{5}$

19) $g^{-1}(x) = -\sqrt[3]{x} + 1$

20) $f^{-1}(x) = \frac{-4x+12}{3}$

21) $f^{-1}(x) = \sqrt[3]{x} = 3$

22) $g^{-1}(x) = -2x^5 + 2$

23) $g^{-1}(x) = \frac{x}{x-1}$

24) $f^{-1}(x) = \frac{-3x-3}{x+2}$

25) $f^{-1}(x) = \frac{-x-1}{x-1}$

26) $h^{-1}(x) = \frac{-2x}{x-1}$

27) $g^{-1}(x) = \frac{-4x+8}{5}$

28) $g^{-1}(x) = -3x + 2$

29) $g^{-1}(x) = \frac{-x+1}{5}$

30) $f^{-1}(x) = \frac{5+4x}{5}$

31) $g^{-1}(x) = \sqrt[3]{x+1}$

32) $f^{-1}(x) = \sqrt[5]{\frac{-x+3}{2}}$

33) $h^{-1}(x) = -2(x-2)^3$

34) $g^{-1}(x) = \sqrt[3]{x-2} + 1$

35) $f^{-1}(x) = \frac{-2x+1}{x-1}$

36) $f^{-1}(x) = \frac{-1-x}{x}$

37) $f^{-1}(x) = \frac{2x+7}{x+3}$

38) $f^{-1}(x) = -\frac{4x}{3}$

39) $g^{-1}(x) = -x$

40) $g^{-1}(x) = \frac{-3x+1}{2}$

10.4

Answers - Exponential Functions

1) $\{0\}$

2) $\{-1\}$

3) $\{0\}$

4) $\{0\}$

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

6) $\{-\frac{5}{4}\}$

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

8) $\{0\}$

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

10) $\{0\}$

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

12) $\{0\}$

13) $\{-2\}$

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

15) $\{1\}$

16) $\{-1\}$

17) No solution

18) $\{-\frac{4}{3}\}$

19) $\{-\frac{1}{4}\}$

20) $\{-\frac{3}{4}\}$

21) No solution

22) $\{0\}$

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

24) $\{\frac{2}{5}\}$

25) $\{-1\}$

26) $\{\frac{1}{4}\}$

27) $\{-\frac{1}{2}\}$

28) $\{\frac{1}{3}\}$

29) $\{0\}$

30) No solution

31) $\{1\}$

32) $\{2\}$

33) $\{\frac{1}{3}\}$

34) $\{\frac{2}{3}\}$

35) $\{0\}$

36) $\{0\}$

37) $\{\frac{3}{8}\}$

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

39) $\{-3\}$

40) No solution

10.5

Answers - Logarithmic Functions

1) $9^2 = 81$

2) $b^{-16} = a$

3) $7^{-2} = \frac{1}{49}$

4) $16^2 = 256$

5) $13^2 = 169$

6) $11^0 = 1$

7) $\log_8 1 = 0$

8) $\log_{17} \frac{1}{289} = -2$

9) $\log_{15} 225 = 2$

10) $\log_{144} 12 = \frac{1}{2}$

11) $\log_{64} 2 = \frac{1}{6}$

12) $\log_{19} 361 = 2$

13) $\frac{1}{3}$

14) 3

15) $-\frac{1}{3}$

16) 0

17) 2

18) -3

19) 2

20) $\frac{1}{2}$

21) 6

22) 6

23) $\{5\}$

24) $\{512\}$

25) $\{\frac{1}{4}\}$

26) $\{1000\}$

27) $\{121\}$

28) $\{256\}$

29) $\{6552\}$

30) $\{\frac{45}{11}\}$

31) $\{-\frac{125}{3}\}$

32) $\{-\frac{1}{4}\}$

33) $\{-\frac{54}{11}\}$

34) $\{-\frac{2401}{3}\}$

35) $\{-\frac{1}{2}\}$

36) $\{-\frac{1}{11}\}$

37) $\{-\frac{621}{10}\}$

38) $\{\frac{283}{243}\}$

39) $\{\frac{2}{45}\}$

40) $\{3\}$

10.6

Answers - Interest Rate Problems

1)

a. 740.12; 745.91

b. 804.06; 809.92

c. 950.08; 953.44

d. 1979.22; 1984.69

e. 1209.52; 1214.87

f. 1528.02; 1535.27

g. 2694.70; 2699.72

h. 3219.23; 3224.99

i. 7152.17; 7190.52

2) 1640.70

3) 2868.41

4) 2227.41

5) 1726.16

6) 1507.08

7) 2001.60

8) 2009.66

9) 2288.98

10) 6386.12

11) 13742.19

12) 28240.43

13) 12.02; 3.96

14) 3823.98

15) 101.68

10.7

Answers - Trigonometry

1) 0.3256

2) 0.9205

3) 0.9659

4) 0.7660

5) $\frac{7}{25}$

6) $\frac{8}{15}$

7) $\frac{7}{16}$

8) $\frac{3}{5}$

9) $\frac{\sqrt{2}}{2}$

10) $\frac{4}{5}$

11) 16.1

12) 2.8

13) 32

14) 8.2

15) 26.1

16) 16.8

17) 2.2

18) 9.8

19) 17.8

20) 10.3

21) 3.9

22) 10.6

23) 10.2

24) 8.9

25) 9.5

26) 24.4

27) 4.7

28) 14.6

29) 1

30) 8

31) 1.5

32) 7.2

33) 5.5

34) 2

35) 41.1

36) 3.2

37) 18.2

38) 3.3

39) 17.1

40) 22.2

10.8

Answers - Inverse Trigonometry

1) 29°

2) 39°

3) 41°

4) 52°

5) 24°

6) 32°

7) 15°

8) 18°

9) 27°

10) 35°

11) 36°

12) 61.7°

13) 54°

14) 46.2°

15) 55.2°

16) 42.7°

17) 58°

18) 20.1°

19) 45.2°

20) 73.4°

21) 51.3°

22) 45°

23) 56.4°

24) 48.2°

25) 55°

26) 30.5°

27) 47°

28) 15.5°

29) 30°

30) 59°

31) $m\angle B = 28°, b = 141, c = 32.2$

32) $m\angle B = 22.8°$, $m\angle A = 67.2°$, $c = 16.3$

33) $m\angle B = 22.5°, m\angle A = 67.5°, c = 7.6$

34) $m\angle A = 39°, b = 7.2, a = 5.9$

35) $m\angle B = 64.6°, m\angle A = 25.4°, b = 6.3$

36) $m\angle A = 69°, b = 2.5, a = 6.5$

37) $m\angle B = 38°, b = 9.9, a = 12.6$

38) $m\angle B = 42°, b = 9.4, c = 14$

39) $m\angle A = 45°, b = 8, c = 11.3$

40) $m\angle B = 29.1°$, $m\angle A = 60.9°$, $a = 12.2$