G P S F O R
MAT 0 6 5 0

A Workbook of Problems for College Algebra

By

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"'Begin at the beginning', the king said, very gravely, 'and go till you come to the end: then stop'".—Lewis Carroll

"Where of one cannot speak, there of one must be silent."

PREFACE

Many years ago, a man in Australia made a bet with a friend that he could eat an entire Dodge Dart automobile in less than one year's time –this was excluding the rubber and glass parts, of course. When asked how he thought he could do it without getting sick and dying, the man replied that he would cut the car into very, very small pieces and eat it that way. The man was able to accomplish this task and won his wager.

In this textbook, we will follow the "Dodge Dart" approach. The mathematical material will be presented in very, very small pieces. It is hoped that in this way, you will be able to easily digest the mathematical material presented.

It is our objective that you obtain a great understanding of the elementary algebra presented herein. If you don't obtain a great understanding, it is hoped that you receive a small understanding of the material. If you don't receive a small understanding, it is hoped that at least it doesn't make you sick.

Enjoy

Section 1.1: Nomenclature--Terms, Constants, Monomials, Binomials, Trinomials, and Absolute Values

"Algebra is the use of symbols to represent math things: numbers, lines, unknowns; and it is the study of rules for combining/working with these symbols."

Identify the coefficients and variables in each of the following:
1) $8x^2$
2) $-2y^3$
3) $7x^2y$
4) yz
5) $12xyz$
6) $2x^2 + 4$

Classify each of the following as monomials, binomials, or trinomials:
7) $2x$
8) $6x^2 - 9$
9) $3x^2$
10) $x^8 + 45$
11) $4x^2 + 7x - 11$
12) $x^4 - 3x^2 + x$

Identify each term in the following algebraic expressions:
13) $4x^2 + 8x - 10$
14) $2x^4 - 9$
15) $-6x^3 + 7x^2 - 3x + 4$
16) $19x^4 - 12x^3 + 10x^2 - 5x + 1$

Identify the variable terms and the constant terms in the following
17) $10x^2 - 7x + 2$
18) $6x^3 + 10$
19) $-7x^4 + 3x^2 - 4x + 17$
20) $9 - 10x + 4x^2$

Identify the degree, number of terms, and constant terms for:
21) $3x^2 + 8x - 7$
22) $4x^5 + 2x + 3$
23) $9x^{16} - 4x^{12} - 5x - 21$
24) $4x^8$
24) $2x^7 - 4x^6 + 9x^5 + 6x^3 - 7x^2$
26) $2x - 24$

Evaluate each of the following
27) $|-4|$
28) $|9|$
29) $|-24|$
30) $|41|$
31) $\left|\dfrac{3}{8}\right|$
32) $\left|\dfrac{-4}{5}\right|$
33) $-|11|$
34) $-|-12|$

Section 1.2: Exponents

"The only way to learn mathematics is to do mathematics. The problem is not the problem. The problem is your attitude about the problem."

Simplify:

1) $3^2 \times 3^4$

2) $2^3 \times 2^4$

3) $(-4)^2$

4) $(-4)^3$

5) -4^2

6) -4^3

7) $x^2 \cdot x^6$

8) $y^4 \times y^8$

9) $m^5 \times m^6$

10) $(x^3 y^4)(x^2 y^6)$

11) $(a^7 b^9)(a^3 b^6)$

12) $(r^2 s^3 t) \times (r^3 s^4 t^2)$

13) $(5x^2 y^3)(-4x^5 y^2)$

14) $-6pq^2(3p^3 q)$

15) $-7df^2(-3d^2 f^3)$

16) $(2x^2)^3$

17) $2(x^2)^3$

18) $(5y^3)^2$

19) $(3z^4)^4$

20) $(m^5)^6$

21) $(2a^2 b^3)^4$

22) $(5a^4 b^6)^3$

23) $\dfrac{a^6}{a^4}$

24) $\dfrac{b^7}{b^2}$

25) $\dfrac{c^5}{c}$

26) $\dfrac{b^4}{b^7}$

27) $\dfrac{p^3}{p^9}$

28) $\dfrac{q^7}{q^{12}}$

29) r^{-2}

30) $\dfrac{s^{-3}}{s^4}$

31) $\dfrac{t^{-3}}{t^5}$

32) $\dfrac{v^5}{v^5}$

33) $\dfrac{(w^5)^3}{w^2}$

34) $\dfrac{(x^2)^6}{x^5}$

35) $\dfrac{y^4}{(y^3)^5}$

36) $\dfrac{z^{-5}}{(z^{-3})^4}$

37) $\left(3/4\right)^{-2}$

38) $\left(2/3\right)^2$

39) $\left(5/6\right)^{-2}$

40) 4^{-2}

41) $(-4)^{-2}$

42) -4^{-2}

43) $-(-4)^{-2}$

44) $a^{-4} \times a^{-6}$

45) $b^{-3} \times b^4$

46) $(a^3 b^{-5})^3$

47) $(4r^{-3})^2(2r^{-4})^3$

48) $(2p^2 q^{-4})^{-3}$

49) $(-5x^2)^4$

50) $-5(x^2)^4$

51) $(5x^2 y^{-4})^3$

52) $6x^3(4x^2)(-2)$

53) $2a^2(4a^2)(-2a)$

54) $7b(3b^2)(-1)$

Section 1.3: Scientific Notation

"Look not at the flask, but at what it contains."

Convert into Scientific Notation
1) 2,400
2) 3,600,000
3) 280
4) 410,000
5) .003
6) .05
7) .00000045
8) .000874

Convert into standard form
9) 4.8×10^5
10) 7.43×10^3
11) 8.14×10^9
12) 3.14×10^2
13) 9.4×10^{-2}
14) 1.44×10^{-5}
15) 3.56×10^{-1}
16) 6.18×10^{-8}

Multiply and leave answer in standard form
17) $(2 \times 10^4)(3 \times 10^3)$
18) $(6 \times 10^7)(4 \times 10^5)$
19) $(8.1 \times 10^{12})(5.2 \times 10^4)$
20) $(4.3 \times 10^3)(3.6 \times 10^8)$
21) $(4 \times 10^{-2})(2 \times 10^{-6})$
22) $(7 \times 10^4)(3 \times 10^{-10})$
23) $(6.9 \times 10^{-2})(3.4 \times 10^{-6})$
24) $(4 \times 10^3)(4 \times 10^{-3})$

Divide and leave answer in standard form
25) $\dfrac{(6 \times 10^4)}{(2 \times 10^2)}$
26) $\dfrac{(8 \times 10^5)}{(5 \times 10^{-6})}$

27) $\dfrac{(9 \times 10^{-6})}{(6 \times 10^{-3})}$
28) $\dfrac{(4 \times 10^{-7})}{(5 \times 10^2)}$

29) $\dfrac{(4.6 \times 10^3)}{(2.3 \times 10^{-4})}$
30) $\dfrac{(3.4 \times 10^4)}{(1.7 \times 10^9)}$

31) $\dfrac{(8.4 \times 10^6)(5.1 \times 10^4)}{(4.2 \times 10^5)}$
32) $\dfrac{6.4 \times 10^{15})(9 \times 10^4)}{(4.5 \times 10^8)}$

33) $\dfrac{(1.4 \times 10^9)}{(2.8 \times 10^4)(5 \times 10^{12})}$
34) $\dfrac{(4.8 \times 10^{-8})}{(6.1 \times 10^{-2})(2.4 \times 10^{-11})}$

Section 2.1: Operations Involving Addition, Subtraction,

Multiplication or Division

"There are three types of students: those who can count and those who can't."

Multiply:

1) $5(6)$
3) $-7(3)$
5) $(-2)(5)$
7) $5 \times (-9)$
9) $(-7)(-3)$
11) $-11 \times (-3)$
13) $3(-2)(6)$
15) $-8(-4)(-5)$

2) 4×3
4) -6×4
6) $3(-10)$
8) $(7)(-8)$
10) $-8(-4)$
12) $4(2)(5)$
14) $7(-3)(-2)$
16) $-3(-2)(-8)(-1)$

Divide:

17) $\dfrac{36}{6}$

18) $\dfrac{48}{12}$

19) $\dfrac{-24}{3}$

20) $\dfrac{-16}{8}$

21) $\dfrac{22}{-11}$

22) $\dfrac{50}{-5}$

23) $\dfrac{-12}{-6}$

24) $\dfrac{-18}{-9}$

25) $63 \div 7$

26) $-30 \div 15$

27) $28 \div (-14)$

28) $(-100) \div (-10)$

29) $\dfrac{0}{9}$

30) $\dfrac{7}{0}$

Combine (Add or Subtract):

31) $4 + 6$

32) $8 + 7$

33) $-9 + 14$

34) $-11 + 6$

35) $12 + (-5)$

36) $19 + (-8)$

37) $(-10) + (-11)$

38) $(-17) + (-7)$

39) $17 - 5$

40) $14 - 6$

41) $12 - (-8)$

42) $9 - (-6)$

43) $-3 - 4$

44) $-2 - 11$

45) $-10 - (-5)$

46) $-8 - (-7)$

47) $4 + 8 + 6$

48) $14 + 9 + (-5)$

49) $10 + (-6) + (-9)$

50) $-12 + (-7) + (-3)$

51) $-15 + 8 + 7$

52) $-19 + (-10) + 8$

53) $-9 + 12 + (-3)$

54) $2 + 6 - 4$

55) $7 + 10 - (-5)$

56) $18 - 7 + 6$

57) $22 - (-3) - (-7)$

58) $-13 - 9 - (-11)$

59) $4 + (-8) - (-7) + (-6)$

60) $10 - (-2) - (4) + (-10)$

61) $-12 + (10) - (-9) - (3)$

62) $-15 - (-7) - (-9) - (-5) + 9$

Section 2.2: Order of Operations

"Mathematics is not a spectator sport. You have to do it to appreciate it, and doing it requires patience and persistence."

Evaluate:

1) $4 + 5(6)$

2) $-2 + 3(5)$

3) $8 + 4(-2)$

4) $-8 - 5(-2)$

5) $7 - 4 \div 2$

6) $15 - 10 \div 5$

7) $(2 + 3)4$

8) $(10 - 8)6$

9) $5 \cdot 2^3$

10) $-4 \cdot 3^2$

11) $8 - 16 \div 2^3$

12) $18 - 32 \div 4^2$

13) $35 \div 5 + 4 \times 3$

14) $20 \div 2 - 3^2 - 4 \cdot 2$

15) $22 - 5 \times 2 + 2^4$

16) $24 + 14 \div 7 - 8$

17) $10 - {}^{6(5 - 2)}/_9$

18) $3(-4)^2 + {}^{25}/_{(8 - 3)^2}$

19) $\dfrac{(4^2 - 9)}{(-7 + 4(0) - 69 - 3)}$

20) $\dfrac{(2^5 + 6)}{(-2 + 4(2) - 6)}$

21) $\dfrac{(-4 - 8)}{(-5 - 1)}$

22) $\dfrac{(-14 + (-6))}{2(-5)}$

23) $\dfrac{(-3(-5) - (-6)(-4)}{-3(8 - 5)}$

24) $\dfrac{(4(-7) + 2(7 - 3))}{4(-5)}$

25) $\dfrac{(-5 - (-3)^2)}{-7}$

26) $\dfrac{(12 + 3)}{(4 + 1)} - \dfrac{(2 - 6)^2}{4}$

27) $\dfrac{(3^2-(7-8)^3)}{5(-2)+4(6-3)}$

28) $\dfrac{4^2-6}{-5-3(8-2)}$

29) $\dfrac{(-2)^3-3(-4)}{2(-2)}$

30) $\dfrac{-2(5-6)^2}{-6+4\cdot3}$

31) $-8(5-3)+\dfrac{4-3^2}{5}$

32) $10(9-4)+\dfrac{10-2^2}{2(-3)}$

33) $5(2-6)^2+7\times0-(4-5)^2$

34) $11-4(3+2)-6\cdot0-(-2)^3$

35) $20-2^4\div8+6$

36) $6-15\div3\times5$

37) $35\div7\times3-5$

38) $40\div2^3\times3-9$

39) $8(-7-5)$

40) $8-7(-5)$

Section 3.1: Evaluating Algebraic Expressions

"Algebra symbols are used when you don't know what you are talking about."

Evaluate:

1) $4x$ when $x = 3$

2) $-2x$ when $x = 5$

3) $-6x$ when $x = -3$

4) $7x^2$ when $x = 2$

5) $3x^2$ when $x = -4$

6) $2x^2y$ when $x = 4, y = -2$

7) $4x^2y^2$ when $x = -3, y = -1$

8) $2x^3$ when $x = -2$

9) x^4 when $x = -1$

10) $4xyz$ when $x = 2, y = 3, z = -4$

11) $-2x^2yz$ when $x = 1, y = -2, z = 4$

12) $6x^2yz^2$ when $x = 2, y = 4, z = 1$

13) $3x + 4y$ when $x = 5, y = -6$

14) $5x - 2y$ when $x = 4, y = -3$

15) $2x - 3y + 7z$ when $x = 3, y = 2, z = -4$

16) $\dfrac{(x^2 - 2y^2)}{2x}$ when $x = 4, y = 3$

17) $\dfrac{(x^3 - 3y^2 + 2)}{3y}$ when $x = 4, y = 2$

18) $\dfrac{(4 - x^2)}{4y}$ when $x = 8, y = 5$

19) $2x^2 - 3xy + y^2$ when $x = 4, y = 2$

20) $4x^2 - 2xy - y^2$ when $x = -2, y = 3$

21) $2a^5 b^2$ when $a = -1, b = -2$

22) $\dfrac{(4 - x^2)}{4y}$ when $a = 5, b = 2$

23) $\dfrac{(2ab - b^2 + 1)}{2b}$ when $a = 4, b = 1$

24) $\dfrac{(4ab + a + 10)}{-a}$ when $a = 5, b = 2$

25) $2a^3 b^2 - 4a^3$ when $a = -1, b = -2$

26) $3x^2 + 4y^3 + 5z^4$ when $x = 3, y = 2, z = 1$

27) $2x - 3y + 4z^3$ when $x = 5, y = -2, z = -1$

28) $5a - 4b + 3c - 2d$ when $a = -8, b = -6, c = -4, d = -2$

"There's no such thing as talent; you just have to work hard enough."

Evaluate:

1) $f(5)$; $f(x) = 4x - 3$

2) $f(4)$; $f(x) = 6 - 8x$

3) $f(-2)$; $f(x) = 5 - x^2$

4) $g(3)$; $g(x) = x^2 - 2x + 6$

5) $g(-1)$; $g(x) = x^2 + 4x - 9$

6) $h(-2)$; $h(x) = 3x^2 - 4x - 5$

7) $F(-3)$; $F(x) = -2x^2 + 5x - 6$

8) $G(4)$; $G(x) = -x^2 - 7x + 2$

9) $H(3)$; $H(x) = -4x^2 + 3x - 7$

10) $h(2)$; $h(x) = x^3 + x^2 - 2x + 6$

11) $f(1)$; $f(x) = -5x^3 + 8x^2 - 3x + 4$

12) $f(-1)$; $f(x) = 2x^4 + 4x^3 - 6x^2 + 9x - 10$

13) $F\left(\frac{1}{2}\right)$; $F(x) = 10x + 4$

14) $F\left(\frac{1}{3}\right)$; $F(x) = 6x - 1$

15) $h(3)$; $h(x) = \frac{(x+3)}{(x-2)}$

16) $f(3)$; $f(x) = \dfrac{(x^2+1)}{x}$

17) $g(1)$; $g(x) = \dfrac{(x^2+2x+3)}{2x}$

18) $F(-2)$; $F(x) = (x+4)(x+7)$

19) $F(1)$; $F(x) = (x-1)(x+2)(x-3)(x+4)$

20) $f(2)$; $f(x) = x^4 - 1$

21) $G(1)$; $G(x) = x^3 + x^2 + 4x + 8$

22) $G(-1)$; $G(x) = x^3 - 2x^2 + 3x - 7$

23) $f(0)$; $f(x) = x^9 + 3x^7 - 5x^2 + 2$

24) $f(a)$; $f(x) = 6x + 2$

25) $f(a+h)$; $f(x) = 4x + 3$

26) $F(a)$; $F(x) = x^2 + 8x$

27) $F(a+h)$; $F(x) = x^2 + 4x + 6$

28) $G(a)$; $G(x) = 2x^2 - 3x - 6$

29) $f(a)$; $f(x) = -4x^2 + 2x - 6$

30) $f(a+h)$; $f(x) = -3x^2 - 6x + 8$

Section 4.1: Multiply Monomial·Monomial

"I will guard everything within the limits of my post and quit my post only when properly relieved."

Multiply:
1) $x^2 \cdot x^3$
2) $y^3 \cdot y^4$
3) $4a^2 \cdot 5a^6$
4) $(-4p^4)(8p^3)$
5) $(3s^5)(-6s^7)$
6) $(-2t^2)(-5t^3)$
7) $(3ab^2)(8a^2b)$
8) $(4c^2d^3)(-6cd^2)$
9) $(-2r^4s)(5r^2s^3)$
10) $(-6x^5y^3)(-8x^2y^4)$
11) $(3x^4y^5)^2$
12) $(-4a^4b^6)^2$
13) $4x^2(4x)^2$
14) $(xy^2)(xy)^2$
15) $(9xy^2)(2x^2y)(3xy)$
16) $(4ab^3)(2a^2b^4)(-3a^5b^2)$
17) $(6rs^5)(-3r^4s^3)(-5r^2s^4)$
18) $(-5xy^2)(-2x^3y^4)(-8x^6y^5)$
19) $(15x^2y^3z^4)(4xy^2z^5)$
20) $(-7x^2y^3z)(9x^3y^8z^{10})$
21) $(-8a^2b^6)(-3a^3b^8)$
22) $(4r^2s^3t^5)(4rs^2t^4)(3r^3st^6)$
23) $(-2x^2y^3z)(3xy^4z^2)(4x^2y^2z^5)$
24) $(8a^2b^2c^5)(-4a^3b^4c^7)(-3ab^5c^6)$
25) $(-2p^5q^4r^3)(-3p^4q^3r^6)(-5p^2q^5r^6)$
26) $3xy(4xy)^2$
27) $-2ab^2(3a^2b^3)^2$
28) $-4x(2x^2y^3)^2(5x^2y)$
29) $(2xy)(3x^2y)^2(10x^2y)$
30) $(3x^2y)^2(2x^3y^4)^2$
31) $(2x^3)(4x^2)(-5x)$

Section 4.2: Multiply Monomial·Binomial-The Distributive Law

"In theory, there's no difference between theory and practice, but in practice there is."

Multiply:

1) $8(2x + 6)$
2) $-5(4x + 10)$
3) $6x(3x^2 + 7)$
4) $x^2(x + 4)$
5) $-2y^2(y^2 + 3)$
6) $4y^3(2y^4 - 6y)$
7) $-9z^2(3z^2 - 5z)$
8) $-4z^3(8z^2 + 2z)$
9) $(2a + 5)a^3$
10) $-5a^2(3a - 1)$
11) $4b(11b - 2b^2)$
12) $6c(c^2 + 4c - 8)$
13) $-2r(r^2 - 10r + 9)$
14) $-6s^2(4s^2 + 2s - 3)$
15) $x^2y(3x^2y\text{-}4xy^2 + 9)$
16) $2a^2b^3(4a^2b - 5ab - a)$
17) $(x^2 + 5x - 6)(-2x^2)$
18) $2x(x^3 + 4x^2 - 10x + 7)$
19) $-4r^4s^3(5r^3s^2 + 6r^2s + 4r^2 - 1)$
20) $3x^3(5x^4 + 3x^3 - 2x^2 + 9x - 10)$

Section 4.3: Binomial·Binomial

"Be kind, for everyone you know is fighting a hard battle."

Multiply:
1) $(x + 1)(x + 3)$
2) $(x - 2)(x + 4)$
3) $(x + 7)(x - 5)$
4) $(x - 6)(x - 8)$
5) $(8 + y)(2 + y)$
6) $(4 + y)(9 - y)$
7) $(3 - y)(2 + y)$
8) $(10 - y)(4 - y)$
9) $(2a + 3)(a + 9)$
10) $(5a + 6)(2a - 3)$
11) $(4b - 3)(3b + 5)$
12) $(8 + 5b)(3 - 2b)$
13) $(6c - 5)(2c - 3)$
14) $2(x + 3)(x - 9)$
15) $5(3x - 2)(x - 1)$
16) $2x(7x + 1)(2x + 3)$
17) $3x^2(6x + 1)(x - 4)$
18) $(x + 1)^2$
19) $(x - 3)^2$
20) $(2x + 5)^2$
21) $(3x - 7)^2$
22) $(5 - 3x)^2$
23) $(x + 4)(x - 4)$
24) $(x + 9)(x - 9)$
25) $(6 + y)(6 - y)$
26) $(5 - z)(5 + z)$
27) $(4x + 5)(4x - 5)$
28) $3x(x + 2)^2$
29) $5x(2x + 1)^2$
30) $6x^2(x + 4)^2$

Section4.4: Multiply Binomial·Trinomial or Trinomial·Trinomial

"So much that happens, happens in small ways."

Multiply:

1) $(x + 1)(x^2 + 2x + 3)$

2) $(x + 2)(x^2 - 5x + 6)$

3) $(x - 3)(x^2 - 2x + 8)$

4) $(y + 8)(y^2 + 4y + 4)$

5) $(y - 4)(2y^2 + 5y - 12)$

6) $(3y - 5)(y^2 + 7y + 10)$

7) $(5z - 6)(z^2 + z + 8)$

8) $(7z + 3)(3z^2 - 13z - 5)$

9) $(z + 9)(4z^3 + 6z - 3)$

10) $(a + 10)(5a^3 - 4a^2 + 2a)$

11) $(a + 7)(a + 1)^2$

12) $(a - 3)(a + 2)^2$

13) $(b + 1)^3$

14) $(c + 2)^3$

15) $(2r + 1)^3$

16) $(3s - 2)^3$

17) $(x^2 + 1)(x^2 + 5x + 7)$

18) $(x^2 + 2x + 1)(x^2 - 4x + 4)$

19) $2x(x + 5)(x^2 + 4x - 12)$

20) $(x + 1)^2(x - 2)^2$

Section 5.1: Combining Like Terms

Combine Like Terms:
1) $4x - 6x - 7x$
2) $5xy + 8xy - 4xy$
3) $7x^2y - 2x^2y + 3x^2y$
4) $6(x + 4) - 5x$
5) $9(x + y) - 7(x - y)$
6) $8(2a + 3b) - 4(5a - 2b)$
7) $3(8p - 2) - 2(4p - 1) + 7(p - 4)$
8) $10pq + 5p^2q - 4pq$
9) $11rs^2 + 4 - 2rs^2 + 6$
10) $4rs^2 + 6r^2s - 2rs$
11) $2xy(3x + 5y) - 4x(xy + 2y)$
12) $6r^2s - 2r(rs^2 + 5rs) - 6rs^2$
13) $4a^3 - 5a(3a^2 + 2b) - 7a(2b + 1)$
14) $2(x + 4) - x(x - 3) + 10x^2$
15) $(2x^2 + 3x - 4) + (5x^2 - 8x - 2) - (3x^2 - 6x - 1)$
16) $(8y^2 - 5y + 3) + (2y^2 + 6y - 9) - (y^2 - 7y - 11)$
17) $3x^2(x - 4) - x(3x - 5) - 16$
18) $-5st(2s^2t^2 - 3st) + 10s^3t^3$
19) $5x(x + 4) - 2(x^2 - x) - 3(x + 9)$
20) $3y(y + 1) - 6(y^2 + y) - (y - 7) - 4$
21) $-3cd(2c^2 - 3cd + 4cd^2) + 5c^2d$
22) $5a - (3a - b) - b$
23) $9 - 7(2x - y) + 7y$
24) $(2x^2y + 5y) - (3x^2y - 2y)$
25) $(8x^2 - 3x - 9) - (4x^2 + 2x - 7)$
26) $4x^2(2x - 3) - 5x(x^2 + 6x)$
27) $-4rs(6r^2s^2 - 5rs) - 10r^2s^2(rs + 2) + 10rs$
28) $2ab^2 - 3a(ab^2 + 5a^2b) + 9a^2b^2$
29) $6p^2q - 2p(pq^2 - 5pq) - 7p^2q^2$
30) $8 - 2(5x^2 - 4) - 3(2x^2 - 1) - (x^2 - 5)$
31) $5x(2x^2y^2 - 4) - 2(x^3y + 3x) + 2x^2$
32) $2x^6(4x^3 - 3y) - 4x(x^8 - 2x^5y + 5(x^9 + y)$
33) $(8y^2 - 4y - 3) - (2y^2 - 3y - 7) - (6y^2 + y - 4)$
34) $3(4z^2 - 2z - 1) - 5(3z^2 - 4z - 2) + 2(z^2 - 2z - 9)$
35) $6 - 5(x^2 + 4x - 3) - 3(2x^2 - 5x - 2) - 9(3x^2 - 6x + 8)$

Section 6.1: Unique Prime Factorization of Integers

"So we beat on, boats against the current, borne back ceaselessly into the past."

Factor into prime factors:

1) 12
2) 24
3) 96
4) 144
5) 18
6) 98
7) 20
8) 200
9) 72
10) 36
11) 99
12) 120
13) 48
14) 54
15) 80
16) 500
17) 108
18) 40
19) 42
20) 75
21) 27
22) 88
23) 480
24) 105
25) 250
26) 245
27) 720
28) 880

29) 360
30) 1440

Section 6.2: Greatest Common Monomial Factor (GCF)-Numerical or Algebraic

"As my pappy always used to say: there ain't no horse that can't be broken and there ain't no rider that can't be throwed."

Factor Completely:

1) $2x - 4$
2) $8y + 16$
3) $15z^2 + 8z$
4) $3x^2 + 6x + 12$
5) $4y^3 + 20y^2 - 8y$
6) $a^4 + a^3 - a^2 + 5a$
7) $7b^3 - 14b^2 + 21b$
8) $4a^2b^2 - 2ab + 6a^2b - 8ab^2$
9) $36x^2y^3 + 12xy^3$
10) $36a^3b^4 + 18a^2b^3 + 12ab^2 + 6ab$
11) $14r^3 - 28r^2 + 35r$
12) $s^6 + 2s^4 - s^2$
13) $20a^{10} + 10a^5 - 5a^3$
14) $2t^3 - 4t^2 + 8t$
15) $18x^3y^4z^5 - 27x^2y^3z^3 + 9x^2y^2z^2$
16) $12y^7 - 9y^5 + 3y^2$
17) $11a^2bc - 22a^2b^2c + 33a^2b^2c^2$
18) $2x^2 - 3y^2 - 4z^2$
19) $2xyz^2 - 3xyz + 4yz$
20) $4abc + 5ab - 6bc$
21) $4x^3 + 8$
22) $12c^4 + 48c^3 - 96c^2$
23) $15xy^2 + 30xy^3$
24) $10a^2b + 20ab^2 - 30ab$
25) $6x^2 + 16y^2 + 26z^2$
26) $36b^4 + 72c^4$
27) $8x^3y^4 + 16x^2y^3 + 4xy$
28) $24b^4 + 12b^3 + 6b^2$
29) $40\alpha + 20\alpha\beta + 10\alpha\beta\mu$
30) $9\theta^2 + 18\theta$

"I know it happens to everyone, but it never happened to me."

Factor Completely:

1) $x^2 - 9$
2) $x^2 - 36$
3) $y^2 - 64$
4) $y^2 - 81$
5) $100 - z^2$
6) $25 - a^2$
7) $b^2 + 16$
8) $x^2 + 49$
9) $r^2 - 10$
10) $x^2 - 19$
11) $x^4 - 1$
12) $x^4 - 16$
13) $y^8 - 144$
14) $16x^{16} - 49$
15) $36y^{16} - 121$
16) $b^{10} - a^2$
17) $16x^{16} - 49$
18) $c^2 - d^2$
19) $g^6 h^4 - m^2$
20) $1 - 4x^2$
21) $9 - 25y^2$
22) $16x^2 - 49y^2$
23) $81x^2 - 4z^2$
24) $64y^2 - 121w^2$
25) $z^4 - y^2$
26) $36r^2 s^4 - t^2$
27) $25a^6 b^8 - 4$
28) $x^{36} - 4$

30) $36\,g^4 h^{10} - 49$
31) $a^{16} b^{36} - 36$
32) $4x^2 - 9$
33) $m^4 - n^4$
34) $(rs)^2 - 25$
35) $g^6 h^4 - 25$

Difference of Two Squares

"My grandfather said that this reminded him of his grandfather, now this

Reminds me of my grandfather"

Factor Completely:
1) $2x^2 - 2$
2) $3y^2 - 27$
3) $6z - 24z^3$
4) $4a^2 - 36$
5) $2 - 8b^2$
6) $27 - 75c^2$
7) $4d^2 - 100$
8) $10x^4 - 10$
9) $2y^4 - 32$
10) $8z^2 - 18$
11) $72a^2 - 8$
12) $36b^{36} - 36$
13) $16 - 16c^{16}$
14) $r^4s^2 - s^2$
15) $x^4 - 121x^2$
16) $3y^3 - 75y$
17) $4a^2b^2 - a^4$
18) $6abc^2 - 24ab$
19) $18x^2y^3z^4 - 2x^2y^3z^2$
20) $4x^4y^2 - 36y^2$
21) $a^5 - a^3$
22) $4b^4 - b^2$
23) $25x^4 - 4x^2$
24) $5xy^2 - 125x$
25) $9x^2 - 81$
26) $4x^3 - 16x$
27) $a^3 - 144a$
28) $7b^3 - 63b$
29) $9c^3d^3 - 36cd$
30) $5 - 5r^2$

Section 6.5: Trinomial With Leading Coefficient One ($x^2 + bx + c$)

Factor Completely:

1) $x^2 + 3x + 2$

2) $x^2 - 3x + 2$

3) $x^2 + x - 2$

4) $x^2 - x - 2$

5) $y^2 + 5y + 6$

6) $y^2 + y - 6$

7) $y^2 - y - 6$

8) $y^2 - 5y - 6$

9) $z^2 + 4z + 3$

10) $z^2 - 4z + 3$

11) $z^2 - 2z - 3$

12) $z^2 + 2z - 3$

13) $a^2 + 10a + 24$

14) $b^2 + 7b - 30$

15) $c^2 - 6c + 8$

16) $r^2 - 13r + 30$

17) $s^2 - 9s + 18$

18) $t^2 - 4t - 12$

19) $w^2 + 2w - 15$

20) $d^2 - 11d + 28$

21) $x^2 - 2x - 48$

22) $y^2 - 3y - 54$

23) $z^2 - 17z + 30$

24) $a^2 + 4a - 60$

25) $b^2 + 10b + 25$

26) $c^2 + 5c - 14$

27) $d^2 - 16d + 28$

28) $x^2 - 8x - 20$

29) $y^2 + 5y - 66$

30) $v^2 + 6v - 55$

31) $u^2 + 6u + 5$

32) $a^2 - 3a - 10$

33) $b^2 - 6b - 16$

34) $c^2 + 7c - 18$

35) $d^2 + 9d + 20$

36) $x^2 - 5x - 36$

37) $y^2 + 14y + 40$

38) $z^2 + 6z + 5$

39) $a^2 + 14a + 48$

40) $b^2 + b - 72$

$$(ax^2 + bx + c)$$

Factor Completely:

1) $2x^2 + 5x + 2$
2) $2x^2 - 5x + 2$
3) $2x^2 - 3x - 2$
4) $2x^2 + 3x - 2$
5) $3y^2 - 7y + 2$
6) $3y^2 + 7y + 2$
7) $3y^2 - 5y + 2$
8) $3y^2 + 5y + 2$
9) $5z^2 - 14z - 3$
10) $5z^2 + 14z - 3$
11) $5z^2 - 16z + 3$
12) $5z^2 + 16z + 3$
13) $3a^2 - a - 2$
14) $5b^2 + 2b - 3$
15) $3c^2 - 7c + 4$
16) $4d^2 + 5d - 6$
17) $4g^2 + 10g - 24$
18) $6r^2 + 11r + 5$
19) $6s^2 - 7s - 5$
20) $8t^2 - 6t - 9$
21) $8u^2 + 18u + 9$
22) $9v^2 + 12v + 4$
23) $9w^2 + 6w - 8$
24) $10x^2 - 19x + 6$
25) $12y^2 + 8y - 15$
26) $14z^2 - 19z - 3$
27) $15a^2 + a - 6$
28) $16b^2 - 4b + 25$
29) $16c^2 + 8c + 1$
30) $20d^2 + 3d - 2$

Section 6.7: Combination of Greatest Common Monomial. Factor and Trinomial

Factor Completely:

1) $4x^2 - 4x - 8$

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

3) $z^5 - 2z^4 - 3z^3$

4) $5a^2 - 40a - 45$

5) $6b^2 - 6b - 120$

6) $2c^2 - 6c - 20$

7) $4b^2 + 20b + 24$

8) $3r^3 - 3r^2 - 18r$

9) $5s^4 - 30s^3 - 35s^2$

10) $2t^3 + 26t^2 - 60t$

11) $4u^4 + 12u^3 + 8u^2$

12) $4v^2 + 16v + 12$

13) $6x^2 + 30x + 36$

14) $8w^3 + 24w^2 + 16w$

15) $8y^2 + 32y + 24$

16) $10z^2 + 70z - 300$

17) $11a^2 - 66a + 88$

18) $12b^4 + 24b^3 - 180b^2$

19) $15c^2 - 45c - 150$

20) $20d^2 - 160d - 400$

Section 6.8: Factoring by Grouping

"The person who does the work is the only one who learns."

Factor by Grouping

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

2) $y(y - 6) + 5(y - 6)$

3) $z(z + 9) - 7(z + 9)$

4) $a(a - 3) - 8(a - 3)$

5) $4b(b + 7) + 3(b + 7)$

6) $5c(c + 11) - 8(c + 11)$

7) $7d(d - 8) - 5(d - 8)$

8) $12r(r - 1) - 17(r - 1)$

9) $x^3 - 6x^2 + 4x - 24$

10) $y^3 + 5y^2 - 6y - 30$

11) $z^3 - 4z^2 + 3z - 12$

12) $a^4 + 3a^3 - 6a - 18$

13) $2x^2 + 4x + 3x + 6$

14) $2y^2 - 3y - 14y + 21$

15) $4z^2 - z - 8z + 2$

16) $a^2 - 6a - 6a + 36$

17) $3x^3 + 9x^2y - 4x - 12y$

18) $4xy^2 + 20y^2z + 3x + 15z$

19) $5a^2b + 15a^2c - 6b - 18c$

20) $21rs - 35rt + 12sv - 20tv$

21) $63u^2v + 18u^2w + 35vx + 10wx$

22) $12xy + 15xz + 20xr + 25zr$

Factor Completely:
1) $36 - x^2$
2) $x^2 - 7x - 60$
3) $28a^2b^3 - 35a^2b^2 + 7ab$
4) $3y^2 - 12y - 15$
5) $x^4 - 1$
6) $8y^3z^3 - 32yz$
7) $16a^{16} - 25$
8) $3b^2 - 5b - 2$
9) $4xyz + 5xy + 6yz$
10) $9 - 25a^2$
11) $b^4c^2 - c^2$
12) $d^2 - 4d + 3$
13) $r^2 + 7r - 30$
14) $9s^2 + 12s + 4$
15) $t^2 + 12t + 10$
16) $9u^3 - 27u^2 - 90u$
17) $15v^3 + 12v^2$
18) $12x^4y - 8x^3y - 4x^2y + 4xy$
19) $4x^2 - 4x$
20) $42 - 13x + x^2$
21) $20x^2y - 25xy^2 + 30xy$
22) $6z^2 - 7z - 5$
23) $x^4 - 16$
24) $8y^2 - 18$
25) $2z^2 - 7z - 15$
26) $2a^3 - 20a^2 + 48a$
27) $21 + 10b + b^2$
28) $40a^3b^2 - 20a^2b + 10ab^2 + 5ab$
29) $x^2 - 25$
30) $6x^2 - 5x - 4$
31) $6x^2 + 6x - 5x - 5$
32) $4y^2 + 16y + 3y + 12$
33) $6xz^2 + 9yz^2 + 10x + 15y$
34) $15a^2b - 20a^2c - 21b + 28c$

Section 7.1: Is a Given Number a Solution to an Equation
"In mathematics, we never understand things, but just get used to them."

Determine whether or not the given number is a solution to the equation

1) $x = -1$, and $15x + 20 = 5$

2) $y = -2$, and $12 - 5y = 2$

3) $z = 3$, and $10 - 4z = 1 - z$

4) $a = 4$, and $8 - 4a + 2 = 3(2 - a)$

5) $b = 2$, and $3(b - 5) + 6 = 2(b + 1)$

6) $c = -3$, and $c - 4(c + 5) = 4 - 2(1 - c)$

7) $d = -1$, and $d^2 - 4d + 3 = 0$

8) $r = 6$, and $r^2 + 10r + 24 = 0$

9) $s = -2$, and $s^2 = s + 2$

10) $t = 2$, and $(t - 2)(t + 5) = 0$

11) $w = -3$, and $(w - 3)(w + 1) = 0$

12) $x = 8$, and $(x - 8)(x + 4)(x + 3)(x + 2) = 0$

13) $y = -1$, and $2y^3 - 4y^2 + y - 9 = 0$

14) $z = 1$, and $2z^4 - 3z^3 + 4z^2 + 5z - 6 = 0$

15) $a = -7$, and $9 - (a - 3) + 4a = 5a - 5(a + 2) + 6$

16) $b = 4$, and $3(2b - 3) - 4(3b - 1) + 5 = 6(4 - 2b)$

17) $c = 1$, and $9(2c + 3) - 8c = 5(3c + 1) + 16$

18) $x = -3$, and $2(1 - 2x) + 3(4x + 5) = 4 - (1 - 4x)$

Section 7.2: Linear (First Degree) Equations

"Touching the dull formulas with his wand, he turned them into poetry."

Solve each equation:
1) $4x = 36$
2) $6x = 72$
3) $-5x = 20$
4) $-8x = 48$
5) $-2y + 1 = 15$
6) $2y + 4y = 54$
7) $y + 3y + 5y = 81$
8) $4y + 6y + 2y = 60$
9) $3z + 4 = 31$
10) $5z - 9 = 41$
11) $2a + 7 = 3a - 9$
12) $3a + 7 = 8a - 18$
13) $5b + 11 = 7b - 3$
14) $2x + 3x - 9 = 4x + 5x + 3$
15) $5 + 3(x + 1) = 8$
16) $2(c + 4) = 3(c - 5)$
17) $-4(c + 3) = 5(c + 3)$
18) $8(d + 4) = 5d - 28$
19) $20 - 5d = -2(d - 1)$
20) $10 - 9r = 8 - 3(r + 2)$
21) $r - 6(r - 4) = 3 - (3 - 7r)$
22) $5 - 2(s + 3) + 20 = 5(2s - 1)$
23) $3s - 5(1 - s) = 3(s + 1) + 2$
24) $6 - 2(t - 5) = 12 + 3(2t - 4)$
25) $3(t - 2) - 2 = 5(t + 3) - 7(t - 1)$
26) $(u - 3) - 2(u - 4) = 5(u - 6) - u$
27) $2(v - 3) - (v - 4) = 4(3 - v)$
28) $2(x + 1) + 4(2x - 3) = 3 - (4x + 1)$
29) $40x + 60(x - 1) = 40 + 20(x - 1)$
30) $5 - (y - 3) + 3y = 4y - 5(y + 3) - 1$
31) $5 - 2(z + 3) + 20 = 5(2z - 1)$
32) $2(3x + 1) + 4(5x + 2) + 6(7x + 9) = 64$
33) $20(2z + 3) + 40(3z + 4) + 60(8z + 1) = 920$
34) $2(z + 3) + 5(z + 4) = 6(2z + 9) + 8(3z - 4)$

Section 7.3: Decimal Equations

"Whatever we invent in mathematics seems independent of our inventing."
"Mathematics lies in an enchanted world, somewhere between reality and imagination."

Solve for each variable:
1) $.4x = .8$
2) $.6x = 1.8$
3) $2.4x + 1.2x = 7.2$
4) $.3y + 2 = 1.2$
5) $2.4y + 3 = 7.8$
6) $y + .4 = 5$
7) $.02z = 4$
8) $.4z = .16$
9) $.02z = .7z + .68$
10) $7.4 = 1.8a - 16$
11) $.04a - 3.2 = .2a$
12) $.3a - 1.2 = .1a + .4$
13) $.48 - .09b = 1.88$
14) $1.5b + 2 = 1.7b - 4.6$
15) $.5(5c - 1) - .2(c + 4) = 1$
16) $.25(3c - 4) - .2 = .25c + .3$
17) $1.6r + 1.51 = .09r$
18) $.48 - .07r = .89r$
19) $1.2s - 4 = .4s + 28$
20) $3.5s - 1.5 = 3.14s + 2.10$
21) $3.6t + 1.73 = 2.86t - .49$
22) $.17w + 1.56 = .14w + 1.2$
23) $w + 0.24 = 1.6w - 0.84$
24) $0.02x + 0.4x + 2.1 = 0$
25) $.08(x + 1) - .4(x + 2) = .24$
26) $.04x(x + 2) + .2(x + 4) = .16$
27) $.002y = 6$
28) $.004y + 3.2 = .02y$
29) $.006z + .04z + .2z = .496$
30) $x + .3x + .03x + .003x = 3.9$

"On earth, the broken arcs; in heaven, a perfect round."

Solve each equation

1) $\dfrac{x}{5} = 4$

2) $\dfrac{3x}{7} = 9$

3) $\dfrac{-5x}{8} = 10$

4) $y - \dfrac{1}{4} = \dfrac{3}{2}$

5) $\dfrac{1}{9} + \dfrac{y}{27} = 2$

6) $\dfrac{y}{2} + \dfrac{y}{4} = \dfrac{3}{8}$

7) $\dfrac{1}{z} = \dfrac{5}{3z} - \dfrac{1}{6}$

8) $\dfrac{1}{a} + \dfrac{1}{15} = \dfrac{2}{3}$

9) $\dfrac{1}{5x} + \dfrac{4}{2} = \dfrac{3}{5} - \dfrac{4}{x}$

10) $\dfrac{x}{3} + \dfrac{7x}{12} = \dfrac{11}{6}$

11) $\dfrac{2b}{3} - \dfrac{1}{2} = b + \dfrac{7}{6}$

18) $\dfrac{7x}{6} - \dfrac{5x}{8} = \dfrac{x}{3} + \dfrac{5}{24}$

19) $\dfrac{1}{x} + \dfrac{3}{2x} + \dfrac{7}{8x} = \dfrac{27}{64}$

20) $\dfrac{1}{4x} + \dfrac{5}{12x} + \dfrac{4}{3x} = 1$

21) $\dfrac{2x}{3} = \dfrac{x-1}{4}$

22) $\dfrac{2}{x-4} = \dfrac{3}{x-5}$

23) $\dfrac{3x}{5} = \dfrac{x+1}{2}$

24) $\dfrac{x}{3} + \dfrac{x-2}{5} = 6$

25) $\dfrac{x+2}{3} + \dfrac{x-1}{6} = 5$

26) $\dfrac{x-1}{9} + \dfrac{2(x+2)}{3} = 9$

27) $\dfrac{x+1}{5} + \dfrac{4x-1}{15} = \dfrac{2}{15}$

28) $\dfrac{2(x-5)}{6} + \dfrac{3x}{5} = \dfrac{x+5}{10}$

34

12) $\dfrac{r}{3} + \dfrac{3r}{5} = \dfrac{16}{5}$

13) $\dfrac{s}{2} - \dfrac{5s}{9} = \dfrac{-1}{6}$

14) $\dfrac{t}{9} + \dfrac{2t}{5} = \dfrac{23}{15}$

15) $\dfrac{x}{12} + \dfrac{x}{6} + \dfrac{x}{4} = 12$

16) $\dfrac{12}{y} + \dfrac{3}{2y} = \dfrac{9}{4}$

17) $\dfrac{1}{2z} + \dfrac{3}{8} = \dfrac{2}{z}$

29) $\dfrac{x}{5} + \dfrac{2(x-1)}{9} - \dfrac{x+5}{10} = 1$

30) $\dfrac{x}{2} + \dfrac{x}{4} + \dfrac{x}{8} + \dfrac{x}{16} = 15$

Section 7.5: Literal Equations

"I'd rather listen to a tree than to a mathematician."

Solve for the indicated variable:

1) Solve for r: $d = rt$

2) Solve for l: $A = lw$

3) Solve for I: $V = IR$

4) Solve for r: $C = 2\pi r$

5) Solve for h: $A = \frac{1}{2}bh$

6) Solve for h: $V = lwh$

7) Solve for R: $PV = nRT$

8) Solve for r: $I = prt$

9) Solve for m: $K = \frac{1}{2}mv^2$

10) Solve for r: $a = v^2/r$

11) Solve for t: $v_2 = v_1 + at$

12) Solve for a: $P = 2a + 2b$

13) Solve for b: $P = a + b + c$

14) Solve for C: $F = \frac{9}{5}C + 32$

15) Solve for l: $S = 2\pi rl + 2\pi r^2$

16) Solve for w: $T = \dfrac{2\pi}{w}$

17) Solve for m_1: $F = \dfrac{Gm_1m_2}{r^2}$

18) Solve for b_1: $A = h(b_1 + b_2)$

19) Solve for r: $A = P(1 + rt)$

20) Solve for h: $V = \dfrac{\pi r^2 h}{3}$

21) Solve for x: $y^2 = 4px$

22) Solve for t: $V = K + gt$

23) Solve for r: $F = \dfrac{mv^2}{gr}$

24) Solve for R: $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$

25) Solve for V_2: $\dfrac{P_1 V_1}{T_1} = \dfrac{P_2 V_2}{T_2}$

26) Solve for y: $2x + 3y = 6$

27) Solve for y: $4x - 5y = 20$

28) Solve for F: $C = \dfrac{5}{9}(F - 32)$

29) Solve for z: $2x + 3y + 4z = 10$

30) Solve for y: $Ax + By = C$

Section 7.6: Quadratic (Second Degree) Equations

Solve for each variable:

1) $(x-2)(x-5)=0$
2) $(2x+1)(x-3)=0$
3) $y(y-6)=0$
4) $y(10-y)=0$
5) $4z(z-9)=0$
6) $8z(z+11)=0$
7) $(a+8)(a-8)=0$
8) $(6-a)(6+a)=0$
9) $x^2-x-12=0$
10) $x^2+2x-8=0$
11) $x^2-8x-20=0$
12) $x^2+2x-15=0$
13) $2y^2+11y+5=0$
14) $6y^2+13y+6=0$
15) $4y^2+5y-6=0$
16) $10y^2-19y+6=0$
17) $4z^2-4z-8=0$
18) $6z^2-6z-120=0$
19) $z^5-2z^4-3z^3=0$
20) $5z^4-30z^3-35z^2=0$
21) $a^2-4a=12$
22) $b^2+4b=60$
23) $c^2=c+2$
24) $d^2=d+6$
25) $r^2+8=6r$
26) $s^2-48=2s$
27) $t^2-4t=0$
28) $6u^2-3u=0$
29) $v^2-81=0$
30) $144-w^2=0$
31) $(x+1)(x+2)=0$
32) $(2x+3)((x+4)=0$
33) $(x+5)(x-4)+14=0$
34) $(x+6)(x-2)-9=0$
35) $y^2-4y+4=0$

36) $50x^2-25x=0$
37) $36y^2=24y$
38) $4z^2+12z+8=0$
39) $6a^2+11a+5=0$
40) $b^2+10b+25=0$

Section 7.7 Linear Inequalities

Solve the following inequalities and sketch the solution on the number line.
1) $2x > 10$
2) $4x < -12$
3) $5x \geq 20$
4) $8x \leq 32$
5) $-3x > 15$
6) $-6x \leq 12$
7) $-10x \geq 20$
8) $-15x \leq 30$
9) $8x \geq -16$
10) $9x \leq -18$
11) $-12x > -24$
12) $-5x < -15$
13) $\dfrac{x}{5} > 3$
14) $\dfrac{x}{9} \leq 5$
15) $\dfrac{-x}{7} \geq 4$

16) $\dfrac{-x}{3} < -2$

17) $\dfrac{2x}{3} \geq 8$

18) $\dfrac{4x}{5} \leq 12$

19) $\dfrac{-3x}{7} > 9$

20) $\dfrac{-4x}{11} < -8$

21) $x + 4 < 6$

22) $x - 5 > -3$

23) $x + 9 \leq 2$

24) $x - 7 \geq -4$

25) $4x - 6 \geq 10$

26) $5x + 10 < 15$

27) $8x - 7 > 9$

28) $6x + 8 \leq -4$

29) $3x \leq 5x + 8$

30) $7x - 10 < 2x$

31) $4x + 8 > 12x$

32) $6x + 10 \geq 8x$

33) $2x - 5 > 3x + 10$

34) $4 - 5x \leq x - 2$

35) $3x + 4 \geq 5x - 6$

36) $5x + 4 < 9x - 8$

37) $5x - (x + 4) > 12$

38) $3(x + 2) \leq 3 - 2(x + 3)$

39) $6 - 3(x + 1) \geq 6$

40) $4 - 5(x + 2) < 1 - 2(x - 1)$

Section 8.1: Simplifying Fractions (Rational Expressions)—
Monomial/Monomial; Polynomial/Monomial; Polynomial/Polynomial

"There is a thin line that separates a numerator and denominator."

Simplify:

1) $\dfrac{12}{4}$

2) $\dfrac{-9}{36}$

3) $\dfrac{x^3}{x}$

4) $\dfrac{-24y^5}{3y^2}$

5) $\dfrac{-18x^2y}{-9xy}$

6) $\dfrac{48a^4b^3}{-16a^2b^2}$

7) $\dfrac{-13p^4q^2}{39p^6q^3}$

8) $\dfrac{-30r^4s}{-6r^3s}$

9) $\dfrac{-66a^3b^7c^9}{11a^2b^3c^4}$

10) $\dfrac{-45r^6s^3t^2}{-9r^2st^4}$

11) $\dfrac{8x^3-4x^2+2x}{2x}$

12) $\dfrac{8yz^2-4y^2z+2yz}{-2yz}$

13) $\dfrac{12a^3b^2-6a^2b+3ab}{3ab}$

14) $\dfrac{24y^{12}+12y^6-6y^3}{-6y^3}$

15) $\dfrac{25c^{25}+16c^{16}-9c^9}{-c^6}$

16) $\dfrac{12d^7-9d^5-3d^4}{-3d^4}$

17) $\dfrac{x-3}{3-x}$

18) $\dfrac{7-y}{y-7}$

19) $\dfrac{4x-4}{x^2-1}$

20) $\dfrac{y^2-9}{3y-9}$

21) $\dfrac{6z^2-12z}{z^2-4}$

22) $\dfrac{a^2-a-6}{a^2-9}$

23) $\dfrac{b^2-b-12}{b^2-16}$

24) $\dfrac{6c^2-6}{c^3-c}$

25) $\dfrac{3r^2-3r}{r^2+5r-6}$

26) $\dfrac{s^2-s-2}{s^2-2s}$

27) $\dfrac{t^2-t-12}{t^2+5t+6}$

28) $\dfrac{x^2-9x+20}{x^2-3x-10}$

29) $\dfrac{z^2-6z+8}{2z-8}$

30) $\dfrac{9x}{z^2-6z+8}$

31) $\dfrac{72\,x^4y^6z^3}{12\,x^2y^3z^4}$

32) $\dfrac{6y^2+12y}{y^2+4y+4}$

Section 8.2: Multiplying Fractions (Rational Expressions)

"The winners joke and the losers say deal."

Multiply:

1) $\dfrac{4}{6} \cdot \dfrac{12}{8}$

2) $\dfrac{-3}{7} \cdot \dfrac{14}{6}$

3) $\dfrac{-25}{2} \cdot \dfrac{-4}{5}$

4) $\dfrac{2}{3} \cdot \dfrac{3}{4} \cdot \dfrac{4}{5} \cdot \dfrac{5}{6} \cdot \dfrac{6}{7}$

5) $14 \cdot \dfrac{3}{7}$

6) $\dfrac{2x^2}{y} \cdot \dfrac{y}{4x}$

7) $\dfrac{a^3}{b^4} \cdot \dfrac{b^2}{a^2}$

8) $\dfrac{-4p^2}{15q} \cdot \dfrac{-5q^2}{12p}$

9) $\dfrac{30a^2}{18b} \cdot \dfrac{6b^2}{5a}$

10) $\dfrac{-6abc}{5x^2y} \cdot \dfrac{10xy^2}{3abc^2}$

11) $\dfrac{-21x^2y}{8z} \cdot \dfrac{-16z^2}{3xy}$

12) $\dfrac{-2x}{3y} \cdot \dfrac{6z}{7a} \cdot \dfrac{14a}{18x}$

13) $\dfrac{-7x}{3y^2} \cdot \dfrac{-9y}{14x^2} \cdot \dfrac{2y}{x}$

14) $\dfrac{-44a^3}{5bc} \cdot \dfrac{-10b^2}{4a} \cdot \dfrac{-2c^2}{11a}$

15) $\dfrac{3abc}{4xy} \cdot \dfrac{-8y^2z}{9ab} \cdot \dfrac{6x^2}{15c}$

16) $25p^2q \cdot \dfrac{(-3q)}{10p^2}$

17) $\dfrac{-7r^2st^3}{6s^2} \cdot \dfrac{-12s^3}{14rt^2} \cdot \dfrac{-4r^3}{t}$

18) $\dfrac{24a^2b^3}{25a} \cdot \dfrac{10ab}{8ac^2} \cdot \dfrac{-c^3}{9b^2}$

19) $\dfrac{-6x^4y^7z^9}{5x^2y} \cdot \dfrac{30x^2y^3}{13xy^2} \cdot \dfrac{39y^2}{36xyz^4}$

20) $\dfrac{-2pqr^2}{3q^3r} \cdot \dfrac{-5r^3}{4pq^2} \cdot \dfrac{-6p^4}{35r^2}$

21) $\dfrac{x+1}{2x-6} \cdot \dfrac{x^2-9}{x^2+4x+3}$

22) $\dfrac{4y^3-4y}{27} \cdot \dfrac{9}{y^2-1}$

Section 8.3: Dividing Fractions (Rational Expressions)

"I was so much older then; I'm younger than that now."

Divide:

1) $\dfrac{2}{3} \div \dfrac{4}{9}$

2) $\dfrac{-5}{6} \div \dfrac{10}{3}$

3) $\dfrac{-9}{11} \div \dfrac{-3}{22}$

4) $\dfrac{x^2}{y} \div \dfrac{x^2}{y}$

5) $\dfrac{a^4}{b^3} \div \dfrac{a^2}{b}$

6) $\dfrac{5a}{7b} \div \dfrac{a^4}{21b^2}$

7) $\dfrac{4xy^2}{3ab^2} \div \dfrac{4xy^2}{6ab}$

8) $\dfrac{9pq^2}{10rs^2} \div \dfrac{12p^4q^3}{rs}$

9) $\dfrac{27cd^2}{10ab} \div \dfrac{3cd}{5ab}$

10) $\dfrac{60s^2t}{7uv} \div \dfrac{10st}{u^2}$

11) $\dfrac{8a^2b}{27ab} \div \dfrac{-24ab}{9}$

12) $\dfrac{-15x^2y^2}{36ab} \div \dfrac{-5xy^2}{12ab}$

13) $\dfrac{p^5q^4r^2}{ab} \div \dfrac{p^2q^3r^4}{a^4b}$

14) $\dfrac{-24a^6b^8c^{10}}{5ab^2} \div \dfrac{-12b^4c^6}{ac}$

15) $\dfrac{4x^2y^3z^4}{5abc} \div \dfrac{-2xy^2z^4}{15ab}$

16) $\dfrac{25x^2y}{21a^4b^3} \div \dfrac{-5xy}{a^3b^2}$

17) $\dfrac{-72r^8s^7}{5pq} \div \dfrac{9r^4s^5}{10p^2q^2}$

18) $\dfrac{14x^2yz^3}{11a^2b^3c^4} \div \dfrac{-28xyz}{22ab^2c^3}$

19) $25xy \div \dfrac{5x}{3y}$

20) $\dfrac{10a^2b}{7xy} \div 5abc$

21) $\dfrac{-36xy^4}{11ab} \div \dfrac{-9xy}{22a}$

22) $\dfrac{15rs^2}{7pq} \div \dfrac{5rs}{14}$

23) $\dfrac{-16pq}{9a^2b} \div \dfrac{-4pq^2}{3ab}$

24) $\dfrac{2}{3x} \div \dfrac{4}{6x}$

25) $\dfrac{x+1}{x} \div \dfrac{x^2-1}{x^2}$

26) $\dfrac{3x-21}{5} \div \dfrac{x-7}{15}$

27) $\dfrac{xy^2}{x^2-x-12} \div \dfrac{xy}{x^2-9}$

28) $\dfrac{6a^2}{7b^3} \cdot \dfrac{3ab}{5} \div \dfrac{10a^3b^2}{14a}$

Section 8.4: Adding or Subtracting Fractions (Rational Expressions)

"Three out of two people have trouble with fractions."

Combine:

1) $\dfrac{2}{5} + \dfrac{3}{5}$

2) $\dfrac{4}{3} + \dfrac{2}{3}$

3) $\dfrac{3}{10} - \dfrac{1}{10}$

4) $\dfrac{7}{9} - \dfrac{2}{9} - \dfrac{1}{9}$

5) $\dfrac{1}{2} + \dfrac{1}{3}$

6) $\dfrac{1}{2} + \dfrac{1}{4}$

7) $\dfrac{1}{2} + \dfrac{1}{4} + \dfrac{1}{8}$

8) $\dfrac{1}{4} + \dfrac{5}{6}$

9) $\dfrac{5}{6} + \dfrac{7}{12}$

10) $\dfrac{3x}{4} + \dfrac{x}{12}$

11) $\dfrac{8y}{3} + \dfrac{4y}{7}$

12) $\dfrac{5}{6z} - \dfrac{7}{4z}$

13) $\dfrac{2}{a} - \dfrac{3}{b}$

14) $\dfrac{4}{a^2} - \dfrac{5}{a}$

15) $\dfrac{6}{x} - \dfrac{5}{3x}$

16) $\dfrac{7}{3b^2} + \dfrac{1}{6b}$

17) $\dfrac{4}{9y} + \dfrac{5}{12y}$

18) $\dfrac{1}{2} + \dfrac{1}{3}$

19) $\dfrac{3}{x^2} - \dfrac{2}{x} - \dfrac{1}{2x}$

20) $\dfrac{5}{6a} - \dfrac{3}{8a}$

21) $\dfrac{9}{3c} - \dfrac{1}{9c^2}$

22) $\dfrac{1}{12r} - \dfrac{5}{6r}$

23) $\dfrac{11}{8s} + \dfrac{5}{6s^2}$

24) $\dfrac{x}{10} + \dfrac{2x}{5} - \dfrac{3x}{2}$

25) $\dfrac{p}{10} + \dfrac{2p}{15} - \dfrac{5p}{3}$

26) $\dfrac{q}{3} - \dfrac{5q}{12} - \dfrac{q}{6}$

27) $\dfrac{7}{5t} - \dfrac{3}{t^2}$

28) $\dfrac{1}{w} + \dfrac{8}{5w} - \dfrac{1}{10w}$

29) $\dfrac{v}{10} - \dfrac{v}{5} - 1$

30) $\dfrac{5}{12d} + \dfrac{3}{4d} - 3$

31) $\dfrac{7}{10x} + \dfrac{2}{15} - \dfrac{1}{5x}$

32) $\dfrac{3y}{4} + \dfrac{2}{5y} - \dfrac{3y}{2}$

"Euclid alone has looked on beauty bare."
"Geometry is the art of reasoning well from ill-drawn figures."

Given right triangle ABC with leg AC (also called leg b), leg BC (also called leg a)
And hypotenuse AB (also called side c), find the missing side in each problem.
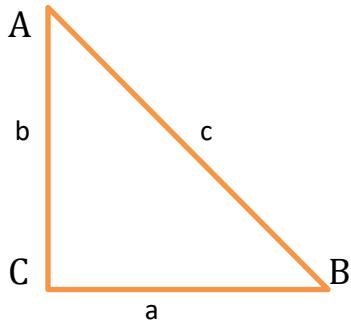
1) Leg AC =3, Leg BC =4, find hypotenuse AB

2) Leg AC =5, Leg BC =12, find hypotenuse AB

3) Leg a=8, leg b=15, find hypotenuse c

4) Leg a=7, leg b=24, find hypotenuse c

5) Leg a=24, hypotenuse c=26, find leg b

6) Leg a=30, hypotenuse c=34, find leg b

7) Leg BC=40, hypotenuse AB=41, find leg AC

8) Leg BC=48, hypotenuse AB=50, find leg AC

9) Hypotenuse c=37, leg b=35, find leg a

10) Hypotenuse c=61, leg b=60, find leg a

11) Side AC=6, side BC=8, find hypotenuse AB

12) Side AC=9, side BC=12, find hypotenuse AB

13) Side a=1, side b=1, find hypotenuse c

14) Side a=3, side b=3, find hypotenuse c

15) Side AC=2, side BC=3, find hypotenuse AB

16) Side AC=4, side BC=5 find hypotenuse AB

17) Hypotenuse AB=6, leg AC=4, find leg BC

18) Hypotenuse AB=6, leg AC=5, find leg BC

19) Hypotenuse c=6, leg a=4, find leg b

20) Hypotenuse c=6, leg a=3, find leg b

21) Side b=4, side a=8, find hypotenuse c

22) Side a=2, side b=6, find hypotenuse c

23) Side a=2, hypotenuse c=6, find side b

24) Side a=5, hypotenuse c=10, find side b

25) Side AC=5, side BC=10, find hypotenuse AB

26) Side AC= 3, side BC=6, find hypotenuse AB

Section 9.2: Simplifying Radicals--Numerical; Variable

"Whether you think you can or you think you can't—you're right."

Simplify:

1) $\sqrt{25}$

2) $\sqrt{49}$

3) $-\sqrt{144}$

4) $-\sqrt{81}$

5) $\sqrt{12}$

6) $\sqrt{20}$

7) $-\sqrt{32}$

8) $-\sqrt{50}$

9) $2\sqrt{48}$

10) $4\sqrt{27}$

11) $-6\sqrt{8}$

12) $-10\sqrt{24}$

13) $5\sqrt{80}$

14) $-15\sqrt{50}$

15) $\sqrt{x^6}$

16) $\sqrt{y^8}$

17) $-\sqrt{z^{10}}$

18) $-\sqrt{a^{12}}$

19) $\sqrt{b^7}$

20) $\sqrt{c^{13}}$

21) $\sqrt{d^9}$

22) $\sqrt{f^{25}}$

23) $-\sqrt{r^{16}}$

24) $\sqrt{s^{36}}$

25) $2x\sqrt{x^3}$

26) $3y\sqrt{y^5}$

27) $-4z\sqrt{z^7}$

28) $-9a^2\sqrt{a^{11}}$

29) $\sqrt{x^2y^4}$

30) $\sqrt{a^3b^4}$

31) $-\sqrt{c^{10}d^{12}}$

32) $\sqrt{r^2s^{15}}$

33) $\sqrt{12x^2}$

34) $\sqrt{75y^3}$

35) $\sqrt{27c^4}$

36) $\sqrt{72r^5}$

37) $\sqrt{8x^2y^7}$

38) $\sqrt{50a^4b^8}$

39) $\sqrt{54c^3d^{11}}$

40) $\sqrt{200r^9s^{19}}$

41) $4\sqrt{32x^2y^3z^4}$

42) $6\sqrt{72a^4b^5c^6}$

43) $-10\sqrt{18r^{16}s^9t^{25}}$

44) $-14x\sqrt{27x^6y^{10}z^{12}}$

45) $-2a\sqrt{144a^{14}b^{20}c^{40}}$

46) $-5\sqrt{80u^7v^3w^{13}}$

47) $7xy\sqrt{20x^2y^5z^8}$

48) $12a^2bc^3\sqrt{50a^2b^7c^4}$

49) $-24rs^2t^5\sqrt{18r^2s^{10}t^{12}}$

50) $-20u^5v^9w\sqrt{72u^7v^3w^5}$

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Section 9.2: Simplifying Radicals--Numerical; Variable

"Whether you think you can or you think you can't—you're right."

Simplify:

1) $\sqrt{25}$

2) $\sqrt{49}$

3) $-\sqrt{144}$

4) $-\sqrt{81}$

5) $\sqrt{12}$

6) $\sqrt{20}$

7) $-\sqrt{32}$

8) $-\sqrt{50}$

9) $2\sqrt{48}$

10) $4\sqrt{27}$

11) $-6\sqrt{8}$

12) $-10\sqrt{24}$

13) $5\sqrt{80}$

14) $-15\sqrt{50}$

15) $\sqrt{x^6}$

16) $\sqrt{y^8}$

17) $-\sqrt{z^{10}}$

18) $-\sqrt{a^{12}}$

19) $\sqrt{b^7}$

20) $\sqrt{c^{13}}$

21) $\sqrt{d^9}$

22) $\sqrt{f^{25}}$

23) $-\sqrt{r^{16}}$

24) $\sqrt{s^{36}}$

25) $2x\sqrt{x^3}$

26) $3y\sqrt{y^5}$

27) $-4z\sqrt{z^7}$

28) $-9a^2\sqrt{a^{11}}$

29) $\sqrt{x^2y^4}$

30) $\sqrt{a^3b^4}$

31) $-\sqrt{c^{10}d^{12}}$

32) $\sqrt{r^2s^{15}}$

33) $\sqrt{12x^2}$

34) $\sqrt{75y^3}$

35) $\sqrt{27c^4}$

36) $\sqrt{72r^5}$

37) $\sqrt{8x^2y^7}$

38) $\sqrt{50a^4b^8}$

39) $\sqrt{54c^3d^{11}}$

40) $\sqrt{200r^9s^{19}}$

41) $4\sqrt{32x^2y^3z^4}$

42) $6\sqrt{72a^4b^5c^6}$

43) $-10\sqrt{18r^{16}s^9t^{25}}$

44) $-14x\sqrt{27x^6y^{10}z^{12}}$

45) $-2a\sqrt{144a^{14}b^{20}c^{40}}$

46) $-5\sqrt{80u^7v^3w^{13}}$

47) $7xy\sqrt{20x^2y^5z^8}$

48) $12a^2bc^3\sqrt{50a^2b^7c^4}$

49) $-24rs^2t^5\sqrt{18r^2s^{10}t^{12}}$

50) $-20u^5v^9w\sqrt{72u^7v^3w^5}$

Section 9.3 Multiplying Radicals

"You have a greater claim to the throne if you pull the sword from the stone than if you say 'I'm the king' ".

Multiply:

1) $\sqrt{3} \times \sqrt{5}$

2) $\sqrt{2} \times \sqrt{7}$

3) $\sqrt{6} \cdot \sqrt{30}$

4) $\sqrt{2} \cdot \sqrt{8}$

5) $\sqrt{5} \times \sqrt{40}$

6) $\sqrt{3} \times \sqrt{30}$

7) $2\sqrt{3} \cdot 4\sqrt{5}$

8) $6\sqrt{7} \cdot 8\sqrt{11}$

9) $6\sqrt{5} \times 3\sqrt{15}$

10) $-2\sqrt{3} \times 4\sqrt{27}$

11) $2x\sqrt{3x^3} \cdot 4x\sqrt{6x^2}$

12) $-3y\sqrt{6y^7} \cdot 2y\sqrt{5y^4}$

13) $5z^2\sqrt{2z} \cdot 6z^4\sqrt{8z}$

14) $4a\sqrt{10a^8} \cdot 3a\sqrt{2a^5}$

15) $-4b\sqrt{3b} \cdot 8b\sqrt{3b}$

16) $5xy\sqrt{3x^2y} \cdot 4xy\sqrt{6xy}$

17) $2x\sqrt{5xyz} \cdot 6x\sqrt{10x^2y^3z^5}$

18) $-2ab^2\sqrt{8ab^5c} \cdot 4a^2b\sqrt{6abc^2}$

19) $-8x\sqrt{2xyz} \cdot 4x\sqrt{6x^2yz^3}$

20) $-7rst^2\sqrt{6r^3st^5} \cdot 10\sqrt{3rst^5}$

21) $3(\sqrt{7} - 8)$

22) $4(\sqrt{6} - 5)$

23) $\sqrt{5}(\sqrt{5} + 2)$

24) $\sqrt{3}(\sqrt{3} + 6)$

25) $\sqrt{5}(\sqrt{15} - \sqrt{5})$

26) $\sqrt{2}(5\sqrt{2} - 4\sqrt{8})$

27) $3\sqrt{2}(4\sqrt{2} - 6\sqrt{12})$

28) $5\sqrt{3}(16\sqrt{6} - 3\sqrt{27})$

29) $(\sqrt{3} + 5)(\sqrt{6} + 4)$

30) $(\sqrt{2} + 3)(\sqrt{6} - 8)$

31) $(\sqrt{7} + 5)(\sqrt{7} - 5)$

32) $(\sqrt{3} + 6)(\sqrt{3} - 6)$

33) $(10 + \sqrt{6})(10 - \sqrt{6})$

34) $(12 - \sqrt{8})(12 + \sqrt{8})$

35) $(\sqrt{5} + 4)^2$

36) $(\sqrt{6} + 3)^2$

37) $(\sqrt{7} - 5)^2$

38) $(\sqrt{8} - 9)^2$

39) $(\sqrt{2} + \sqrt{3})^2$

40) $(\sqrt{5} + \sqrt{6})^2$

Section 9.4: Dividing Radicals

"I wish I didn't know now what I didn't know then."

Divide:

1) $\sqrt{\dfrac{25}{36}}$

2) $\sqrt{\dfrac{49}{81}}$

3) $\dfrac{\sqrt{200}}{\sqrt{2}}$

4) $\dfrac{\sqrt{48}}{\sqrt{3}}$

5) $\dfrac{\sqrt{40}}{\sqrt{5}}$

6) $\dfrac{\sqrt{200}}{\sqrt{10}}$

7) $\dfrac{14\sqrt{15}}{2\sqrt{5}}$

8) $\dfrac{9\sqrt{24}}{3\sqrt{12}}$

9) $\dfrac{6\sqrt{20}}{3\sqrt{2}}$

10) $\dfrac{24\sqrt{12}}{6\sqrt{3}}$

11) $\dfrac{\sqrt{18x^3}}{\sqrt{2x}}$

12) $\dfrac{\sqrt{24r^3s^6}}{\sqrt{2rs^2}}$

13) $\dfrac{\sqrt{32a^5b^7}}{\sqrt{8a^3b^5}}$

14) $\dfrac{\sqrt{40x^3y^4}}{\sqrt{10xy^2}}$

15) $\dfrac{\sqrt{5}}{\sqrt{3}}$

16) $\dfrac{\sqrt{8}}{\sqrt{7}}$

17) $\dfrac{\sqrt{12}}{\sqrt{50}}$

18) $\dfrac{\sqrt{9}}{\sqrt{6}}$

19) $\sqrt{\dfrac{7}{3}}$

20) $\sqrt{\dfrac{10}{7}}$

21) $\sqrt{\dfrac{x}{24}}$

22) $\sqrt{\dfrac{y^2}{5}}$

23 $\sqrt{\dfrac{x^8}{y^6}}$

24) $\sqrt{\dfrac{20z^5}{25}}$

25) $\dfrac{5}{\sqrt{5}}$

26) $\dfrac{7}{\sqrt{7}}$

27) $\dfrac{4\sqrt{8}\cdot\sqrt{12}}{2\sqrt{3}}$

28) $\dfrac{2\sqrt{6}\cdot15\sqrt{12}}{5\sqrt{2}}$

29) $\dfrac{8\sqrt{15}\cdot2\sqrt{5}}{4\sqrt{3}}$

30) $\dfrac{7\sqrt{3}\cdot4\sqrt{20}}{15\sqrt{5}}$

31) $\dfrac{4x^5\sqrt{2x^7}\cdot6x^3\sqrt{45x^3}}{8x^2\sqrt{5x}}$

32) $\dfrac{2y^3\sqrt{3y^5}\cdot4y^2\sqrt{27y^7}}{8y\sqrt{3y}}$

33) $\dfrac{4\sqrt{8}\cdot5\sqrt{6}}{2\sqrt{2}}$

34) $\dfrac{27\sqrt{5}\cdot3\sqrt{10}}{9\sqrt{2}}$

35) $\dfrac{24\sqrt{x^9}}{\sqrt{6x}}$

36) $\dfrac{50\sqrt{y^{21}}}{\sqrt{5y}}$

37) $\dfrac{10}{\sqrt{2}}$

38) $\sqrt{\dfrac{10}{2}}$

39) $\dfrac{4}{\sqrt{5}+1}$

40) $\dfrac{6}{\sqrt{2}-1}$

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Section 9.5 Combining Radicals

"Experience is what you get when you don't get what you want."

Combine:

1) $2\sqrt{7} + 3\sqrt{7}$

2) $11\sqrt{3} - 5\sqrt{3}$

3) $8\sqrt{5} + 4\sqrt{5} - 6\sqrt{5}$

4) $12\sqrt{2} - 9\sqrt{2} - 10\sqrt{2}$

5) $10\sqrt{3x} - 7\sqrt{3x} - 5\sqrt{3x}$

6) $14\sqrt{6x} + 2\sqrt{6x} - 3\sqrt{6x}$

7) $7\sqrt{5abc} - 4\sqrt{5abc} - 6\sqrt{5abc}$

8) $17\sqrt{7rst} + 4\sqrt{7rst} - 8\sqrt{7rst}$

9) $4\sqrt{3} - 2\sqrt{27}$

10) $7\sqrt{2} + 4\sqrt{8}$

11) $5\sqrt{12} - 6\sqrt{75}$

12) $8\sqrt{72} - 10\sqrt{18}$

13) $9\sqrt{20} - 2\sqrt{45}$

14) $3\sqrt{50} - 5\sqrt{8}$

15) $6\sqrt{32} + 8\sqrt{200} - 5\sqrt{98}$

16) $5\sqrt{48} - 9\sqrt{75} - 3\sqrt{300}$

17) $2\sqrt{80} + 11\sqrt{125} - 5\sqrt{45}$

18) $3\sqrt{8} + 6\sqrt{72} - 9\sqrt{50}$

19) $8\sqrt{20x^3} - 6x\sqrt{5x}$

20) $6\sqrt{12x^5} - 8x^2\sqrt{3x}$

21) $5\sqrt{a^2b} + 6\sqrt{4a^2b} - 5a\sqrt{16b}$

22) $7\sqrt{rs^3} + 9s\sqrt{rs} - 2s\sqrt{16rs}$

23) $2\sqrt{12xy} + 4\sqrt{27xy} - 5\sqrt{75xy}$

24) $3\sqrt{5yz} - 4\sqrt{45yz} - 9\sqrt{20yz}$

25) $5\sqrt{8} + 3\sqrt{50} - 9\sqrt{125}$

26) $2\sqrt{18} + 4\sqrt{27} - 6\sqrt{12}$

Define the following terms
1) Horizontal Axis (X-Axis)
2) Vertical Axis (Y-Axis)
3) Origin
4) Quadrant I, Quadrant II, Quadrant III, Quadrant IV
5) Ordered Pair
6) Abscissa, Ordinate

Plot (Graph) the following points (Ordered Pairs)
7) A(2,4); B(1,6)
8) C(6,-1); D(8,-3)
9) E(-2,5); F(-5,3)
10) G(-1,-6); H(-3,-7)
11) K(0,4); L(0,-3)
12) M(1,0); N(-5,0)
13) P(4 ,$\frac{1}{2}$); Q(2, -2 $\frac{1}{2}$)
14) R(-1$\frac{1}{3}$, 7); S(3$\frac{2}{3}$, 6)

Plot the following points on one coordinate axis
15) A(0,1); B(1,3); C(2,5); D(3,7); E(-1,-1)

Plot the following points on one coordinate axis
16) R(0,-1); S(1,2); T(2,5); U(3,8); V(-1,-4)

Find the coordinates for each of the following points (ordered pairs)
17) A; B
18) C; D
19) E; F
20) G; H
21) J; K
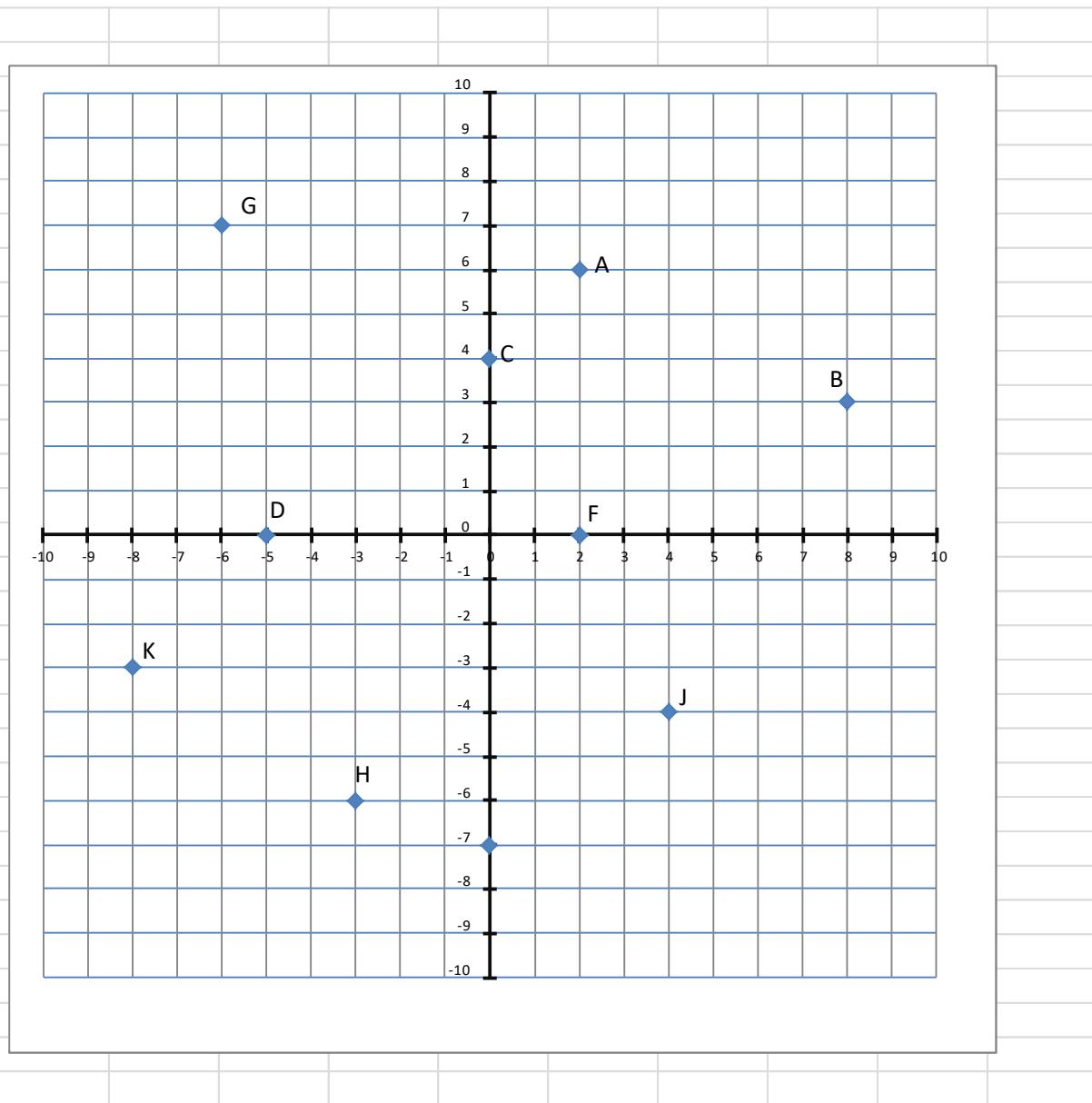
Section 10.2: Graphing By Use of the Table Method

Complete the given table and sketch the graph for:

1) $y = x + 3$

x	y
0	
2	
4	

2) $y = x - 2$

x	y
0	
2	
4	

3) $y = 3x + 2$

x	y
0	
1	
2	

4) $y = 4x - 3$

x	y
0	
1	
2	

5) $x + y = 6$

x	y
0	
2	
4	

x	y

6) $x - y = 4$

0	
2	
4	

7) $2x + 3y = 12$

x	y
0	
3	
6	

8) $3x - 4y = 12$

x	y
0	
4	
6	

9) $6x + 3y - 18 = 0$

x	y
-2	
0	
3	

10) $2x - 5y - 10 = 0$

x	y
-5	
0	
5	

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

x	y
0	
4	
8	

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

x	y
0	
6	
12	

Section 10.3: Graphing by Use of the Intercepts Method

Identify a) the Y-intercept and b) the X-intercept in each of the following equations.

1) $2x + 3y = 6$ 2) $3x + 4y = 12$
3) $5x - 6y = 30$ 4) $7x - 3y = 21$
5) $3x + 2y = 7$ 6) $4x + 6y = 9$
7) $5x - 3y + 11 = 0$ 8) $8x - 5y - 12 = 0$
9) $y = 2x - 3$ 10) $y = 5x - 8$

Complete the given table and sketch the graph for each of the following equations.

11) $x + y = 5$

x	y
0	
	0
2	

19) $2x - 3y = 9$

x	y
0	
	0
2	

12) $x - y = 7$

x	y
0	
	0
4	

20) $3x - 4y = 8$

x	y
0	
	0
2	

13) $2x + 5y = 10$

x	y
0	
	0
3	

14) $9x + 2y = 18$

x	y
0	
	0
1	

21) $y = 2x + 3$

x	y
0	
	0
-1	

15) $3x - 4y = 12$

x	y
0	
	0
2	

22) $3x - 4y = 8$

x	y
0	
	0
2	

16) $3x - 5y = 15$

x	y
0	
	0
3	

17) $x + 2y = 7$

x	y
0	
	0
5	

18) $2x + 3y = 11$

x	y
0	
	0
3	

Section 10.4: Graphing by Use of the Slope-Y Intercept Method

Find the slope, y-intercept, and sketch the graph for each of the following equations.

1) $y = 2x + 3$ 2) $y = 4x + 6$
3) $y = 5x - 2$ 4) $y = 7x - 9$
5) $y = \frac{1}{2}x + 3$ 6) $y = \frac{-1}{4}x + 6$
7) $y = 2x$ 8) $y = x$
9) $y = 4$ 10) $y = -2$
11) $2x + 3y = 6$ 12) $4x + 5y = 20$
13) $3x - 4y = 12$ 14) $5x - 2y = 10$
15) $x + 4y = 24$ 16) $3x - 5y = 15$

Write the equation of the line passing through the two given points in each of the following problems.

17) A(1,2); B(3,4)   18) C(2,1); D(-1,4)
19) E(3,5); F(6,8)   20) G(4,7); H(8,9)
21) K(-3,1); L(2,6)   22) M(-2,4); N(6,2)
23) P(-1,-3); Q(-2,-6)   24) R(-4,-7); S(-2,-5)

Write the equation of the vertical line passing through the given points.

25) S(2,5)   26) T(4,-6)
27) U(-8,9)   28) V(-7,-3)

Write the equation of the horizontal line passing through the given points.

29) S(2,5)   30) T(4,-6)
31) U(-8,9)   32) V(-7,-3)

Given the following graphs, write the equation of the line in slope and y-intercept form $(y = mx + b)$

33)

64
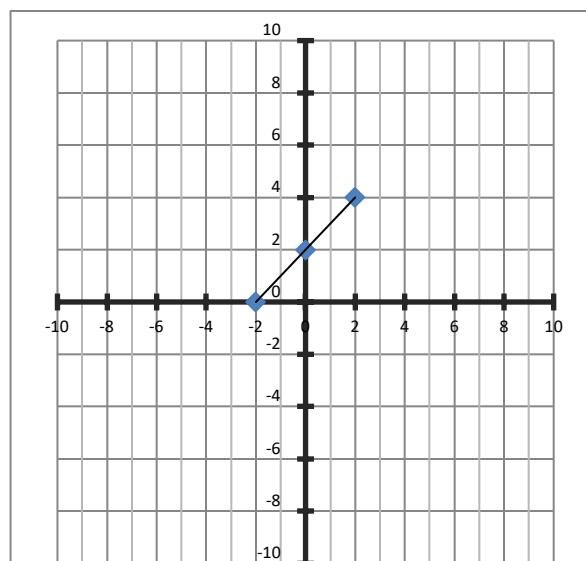
34)
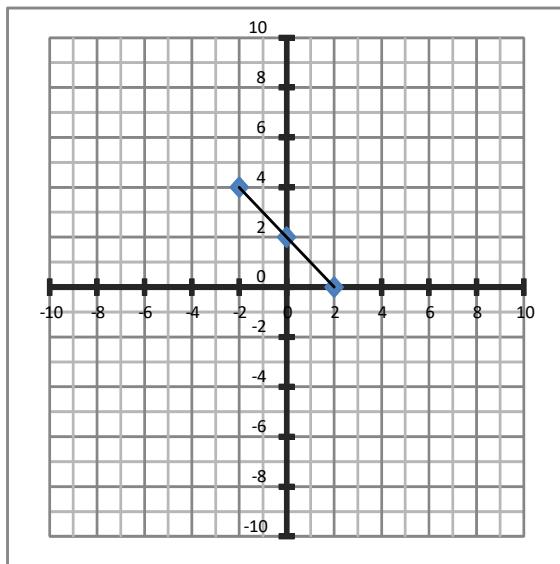
35)
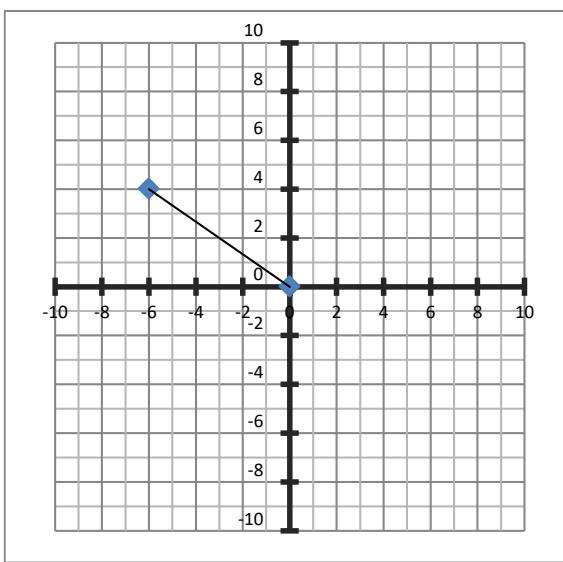
36)
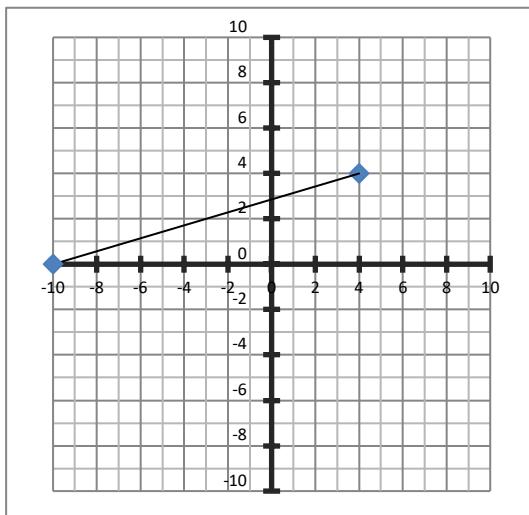
37)
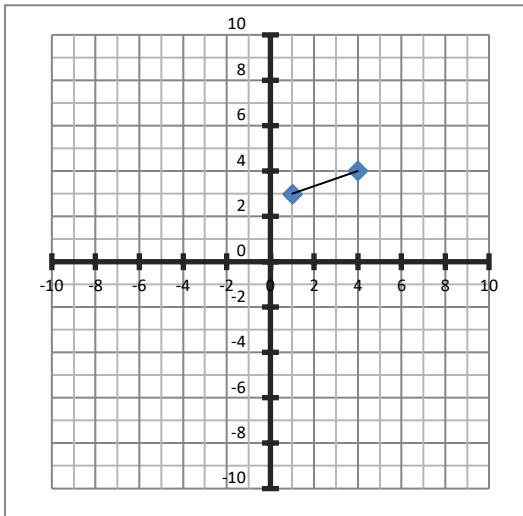
Section 11.1: Solving a System of 2 Equations in 2 Unknowns Graphically

Solve the following systems of 2 equations in 2 unknowns graphically. If a system does not have a unique solution, identify the system as either dependent or inconsistent.

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

2) $x + y = 6$
    $2x - y = 6$

3) $3x + y = 6$
    $x + y = 4$

4) $x - y = 1$
    $3x - 2y = 6$

5) $y = 2x$
    $y = x + 2$

6) $y = 3x$
    $y = 2x + 1$

7) $x + y = 4$
    $y = 2x - 5$

8) $x - 3y = -2$
    $y = x + 2$

9) $2x + 3y = 8$
    $4x + y = 6$

10) $3x + 4y = 10$
    $4x - 3y = 5$

11) $2x + 3y = 6$
    $y = 4$

12) $4x + 3y = 10$
    $x = 1$

13) $3x + 5y = 15$
    $x + 2y = 5$

14) $5x - 2y = 10$
    $2x - y = 3$

15) $5x - 3y = 15$
    $2x - y = 7$

16) $3x - 4y = 12$
    $x - 2y = 2$

17) $x + y = 2$
    $x + y = 4$

18) $x - y = 3$
    $y = x - 4$

19) $x + y = 3$
    $2x + 2y = 6$

20) $3x + 4y = 12$
    $6x + 8y = 24$

Section 11.2: Solving a System of 2 Equations in 2 Unknowns by Use of the Substitution Method

Solve the following systems of equations by use of the Substitution Method.

1) $3x + y = 15$
   $y = 3$

2) $5x - 2y = 7$
   $y = 4$

3) $2x - 3y = 4$
   $x = 5$

4) $6x + 4y = 14$
   $x = 1$

5) $y = x + 2$
   $x + y = 4$

6) $y = x - 3$
   $x + 2y = 6$

7) $x = y + 5$
   $2x - y = 12$

8) $x = y - 1$
   $3x + 2y = 17$

9) $x + y = 6$
   $4x - 3y = 10$

10) $x + y = 5$
    $5x - 4y = -2$

11) $2x + y = 5$
    $6x - y = 3$

12) $3x + y = 10$
    $7x - 3y = 2$

13) $5x + 3y = 6$
    $4x + 2y = 6$

14) $3x - 2y = 2$
    $2x + 4y = 28$

15) $x - y = -1$
    $8x - 5y = 13$

16) $2x - y = 2$
    $9x - 10y = 5$

17) $3a - 2b = 4$
    $11a - 20b = 2$

18) $5a - 3b = 1$
    $10a - 7b = -1$

19) $4r + s - 10 = 0$
    $5r + 2s - 14 = 0$

20) $2r - s - 5 = 0$
    $4r - s - 1 = 0$

Section 11.3: Solving a System of 2 Equations in 2 Unknowns by Use of the Elimination Method (Adding or Subtracting)

Solve the following systems of equations by the Elimination Method.

1) $x + y = 3$
   $x - y = 1$

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

3) $-x + 2y = 2$
   $x + 3y = 13$

4) $-x + y = 1$
   $x + 2y = 11$

5) $2x + 3y = 3$
   $4x - 3y = 15$

6) $3x + 4y = 5$
   $x - 4y = -9$

7) $x + 2y = 1$
   $2x + 3y = -1$

8) $x - 3y = 7$
   $3x + 2y = 10$

9) $4x + 3y = -2$
   $3x + y = -4$

10) $5x - 4y = -3$
    $6x - 2y = -12$

11) $5x + 4y = 13$
    $6x - 3y = 39$

12) $6x + 3y = 6$
    $9x - 5y = -48$

13) $2a + 3b = 6$
    $3a - 2b = -17$

14) $3a - 4b = 23$
    $2a + 5b = 0$

15) $7r - 4s = 22$
    $5r + 6s = 60$

16) $8r + 3s = -2$
    $3r - 4s = -11$

17) $6u + 7v = 3$
    $4u - 3v = 25$

18) $2w - 5z = 16$
    $3w + 4z = 7$

19) $x - 3y + 15 = 0$

    $5x - 2y + 23 = 0$

20) $\dfrac{x}{2} - \dfrac{y}{6} = 1$

    $\dfrac{x}{3} - \dfrac{y}{4} = 5$

Section 12.1: Ratio and Proportion

"I was good at math before they decided to mix the alphabet into it."

1)   A car's gas tank holds 20 gallons of fuel. If it can travel 500 miles on one tank full of gas, how many gallons of gas will it need to travel 120 miles?

2)   A car uses 4 gallons of gas to go 120 miles. At that rate of usage, how many gallons will it take to travel: a) 480 miles; b) 360 miles; c) 200 miles?

3)   If 64 cups of coffee can be made using 1 pound of coffee, about how many pounds of coffee will be needed to make 200 cups?

4)   If a town in New York State assesses a real estate tax of $2.50 per $100 of assessed valuation, what will the real estate tax be on a house with assessed valuation of $11,000?

5)   If 4 ounces of oil is needed to be added to 1 quart of gasoline to operate a chain saw, how much oil will be needed for 1 gallon of gasoline (4 quarts)?

6)   If a six foot tall man cast a four foot long shadow, how long will the shadow be for a person of height of five feet?

7)   If 6 ears of corn sells for $2.00, what will the cost be for a) 18 ears; b) 27 ears; c) 36 ears?

8)   If a machine can produce 400 items in 8 hours, how long will it take to make: a) 1000 items; b) 1600 items; c) 2600 items?

9)   If on average, 6 students receive A's in a class of 30 students, how many calculus students are expected to get A's in a semester if there are: a) 450 students; b) 750 students; c) 1000 students?

10) If an instructor can grade 30 exam papers in one hour, how long will it take her to grade: a) 100 papers; b) 150 papers; c) 175 papers?

Section 12.2: Percent Problems

"I meant what I said and I said what I meant...An Elephant's faithful one hundred percent!"

1) What is 6% of 200?

2) What is 9% of 400?

3) Five percent of what number is 300?

4) Eight percent of what number is 500?

5) Ninety percent of the students in a statistics class of 30 students passed their first exam,   if so, how many students actually passed this examination?

6) If 20% of a calculus class of 40 students received A's as a final grade, how many students received A's?

7) Sixty percent of eligible voters voted in the most recent election. If there were 120 million eligible voters, how many voted?

8) A car can travel 500 miles on a full tank of gas. If it has travelled 350 miles, a) what percent of its fuel has been used and b) what percent remains?

9) A new laptop computer has a list price of $800. If the price were reduced by 20%, a) what is the amount of the reduction and b) what is the new price?

10) A new car has a Manufacturer's Suggested Retail Price (MSRP) of $25,000. If the cat can be purchased for 12% less than the MSRP, what is the new selling price?

11) A restaurant bill comes to $45.00. If one wants to leave a 20% tip, a) what is the amount of the tip and b) what is the total cost of the meal?

12) An employee starts working at a new job at the rate of $12.00 per hour. If after 3 months, his salary is increase by 10%, what will his new salary be?

13) A light bulb manufacturing company found that 40 out of 1000 bulbs that it produced were defective. What was the percent of defective bulbs produced?

14) Thirty years ago, the cost to cross the Henry Hudson Bridge was 10 cents. Today the cost is $2.50. A) What is the percent increase over the past 30 years? B) At this rate, what will the cost to cross the bridge be 30 years from now?

15) A new car cost $20,000. If it depreciates (reduces in value) by 9% once you drive it out of the showroom, how much will it be worth?

16) In a class of 25 students, 6 received B's. What percent of the class received grades of B?

17) New York State has a 7% sales tax on many items. If a television costs $500, a) what is the tax on the TV and b) what is the total cost?

18) If you were to borrow $2,000 for one year at the interest rate of 5% per year (compounded annually), a) how much interest would you owe and b) what amount would you need to repay after one year?

19) At one college 40% of the entering class takes pre-calculus. If there are 2000 students in the entering class, a) how many take pre-calculus and b) how many students do not take pre-calculus?

20) If a real estate broker receives a 5% commission on the sale of a house and she receives a $20,000 commission, what is the selling price of the home?

Section 12.3: Number Problems

"Smart people learn from their mistakes. Very smart people learn from other peoples' mistakes."

1) The sum of a given number and 7 is 25, what is the number?

2) The sum of a given number and 14 is 35, what is the number?

3) The sum of twice a number and 6 is 18, what is the number?

4) The sum of two consecutive numbers is 25, what are the two numbers?

5) The sum of two consecutive numbers is three times the original number, what is the original number?

6) The sum of two numbers is 36. If one is twice the other, what are the two numbers?

7) If three more than four times a number is 39. Find the number.

8) If four less than twice a number is 12, find the number.

9) If eight less than three times a number is 22, find the number.

10) If two times a number is increased by four, the result is 20. Find the original number.

11) If a number is subtracted from 30, the result is 10. Find the number.

12) Six times a number is reduced by 5, the result is 67. Find the number.

13) If three times a number is increased by ten, the result is three less than four times the original number. Find the original number.

14) Four times a number is decreased by five and equals seven more than twice the original number. Find the original number.

15) A fifteen foot long board is cut into two pieces. Find the length of each piece if: a) one is twice the length of the other; b) one is three feet longer than the other; and c) one is three feet longer than twice the length of the other.

Section 12.4: Distance = Rate × Time

"Happiness is not about what the world gives you—happiness is what you think about what the world gives you."

1) Two cars start from the same point and travel in opposite directions. If they each travel at 60 miles per hour, how far apart will they be after 4 hours of travel?

2) Two small airplanes start at the same point and travel in exactly opposite directions. If one travels at 200 miles per hour and the other travels at 150 miles per hour, how far apart will they be after 3 hours of travel?

3) A man on a bicycle travels 48 miles in 6 hours. What was the average speed for this trip?

4) If an airplane makes a 2500 mile trip in 5 hours, what was the average rate of speed for the plane?

5) If an airplane travels 400 miles per hour for 3 ½ hours, how far did the plane go?

6) If it takes a jogger 12 minutes to run a mile, at that rate of speed, how many miles will she cover in 2 hours?

7) A hiker can walk 32 miles in an 8 hour day. What is her average rate of speed for this hike?

8) If a hiker can travel 12 miles per day over flat terrain, 8 miles per day over steep terrain, and 24 miles per day in a canoe, how many miles will the hiker have travelled in 6 days if there were 1 day of canoeing, 2 days of steep hiking, and 3 days of flat hiking?

9) A truck driver leaves a factory at 8:00 am and travels till noon and then stops for 1 hour for a lunch break. If the truck driver then drives till 4:00 pm and averaged 55 miles per hour while driving, how far did he go?

10) The Pacific Coast Trail (PCT) is 2659 miles long. If a hiker covers the trail in 5 months (150 days), a) how many miles per day did she cover and b) if she hikes for 10 hours a day, what was her average rate per hour?

11) The Pacific Coast Trail (PCT) is 4279 kilometers long. If a hiker covers the trail in 5 months (150 days), a) how many kilometers per day did he cover and b) if he hikes for 10 hours a day, what was her average rate per hour?

12) The Appalachian Trail (AT) is 2181 miles long. If a hiker covers the trail in 4 months (120 days), a) how many miles per day did she cover and b) if she hikes for 10 hours a day, what was her average rate per hour?

13) The Appalachian (AT) is 3510 kilometers long. If a hiker covers the trail in 4 months (120 days), a) how many miles per day did he cover and b) if he hikes for 10 hours a day, what was her average rate per hour?

14) Two cars start from the same point and travel in exactly opposite directions. If one travels at 65 miles per hour and the other at 50 miles per hour, after 6 hours: a) how far apart will the cars be; b) if they each can go 30 miles on 1 gallon of gasoline, how much gas will be used ; and c) if gas costs $2.50 per gallon, how much must each car pay?

Answers to Odd Numbered Problems

Section 1.1: Nomenclature-Terms, Constants, Monomials, Binomials, Trinomials, Absolute Values

1) Coefficent: 8; Variable: x
3) Coefficent: 7; Variables: x and y
5) Coefficent: 12; Variables: x, y and z
7) Monomial
9) Monomial
11) Trinomial
13) Terms: $4x^2$, $8x$, -10
15) Terms: $-6x^3$, $7x^2$, $-3x$, 4
17) Variables: $10x^2, -7x$; Constant: 2
19) Variables: $-7x^4, 3x^2$, $-4x$; Constant: 17
21) Degree: 2; Number of Terms: 3; Constant: -7
23) Degree: 16; Number of Terms: 4; Constant: -21
25) Degree: 7; Number of Terms: 5; Constant: none
27) 4
29) 24
31) $\dfrac{3}{8}$
33) 11

Section 1.2: Exponents

1) $3^6 = 729$
3) 16
5) -16
7) x^8
9) m^{11}
11) $a^{10}b^{15}$
13) $-20x^7y^5$
15) $21d^3f^5$
17) $2x^6$
19) $8z^{16}$
21) $16a^8b^{12}$
23) a^2

25) c^4

27) $\dfrac{1}{p^6}$

29) $\dfrac{1}{r^2}$

31) $\dfrac{1}{t^8}$

33) w^{13}

35) $\dfrac{1}{y^{11}}$

37) $\dfrac{16}{9}$

39) $\dfrac{9}{4}$

41) $\dfrac{1}{16}$

43) $-\dfrac{1}{16}$

45) b

47) $\dfrac{128}{r^{18}}$

49) $625x^8$

51) $\dfrac{125x^6}{y^{12}}$

53) $-16a^5$

Section 1.3: Scientific Notation

1) 2.4×10^3

3) 2.8×10^2

5) 3×10^{-2}

7) 4.5×10^{-7}

9) 480,000

11) 8,140,000,000

13) .094

15) .356

17) 6×10^7 = 60,000,000

19) 4.212×10^{17} = 421,200,000,000,000,000

21) 8×10^{-8} = .00000008

23) 2.34×10^{-7} = .000000234

25) 3×10^2 = 300

27) $3 \times 10^{-8} = .00000003$
29) 2
31) $1.02 \times 10^{6} = 1,020,000$
33) $1 \times 10^{-6} = .000001$

Section 2.1: Operations Involving Addition, Subtraction, Multiplication, or Division
1) 30
3) -21
5) -10
7) -45
9) 21
11) 33
13) -36
15) -160
17) 6
19) -8
21) -2
23) 2
25) 9
27) -2
29) 0
31) 10
33) 5
35) 7
37) -21
39) 12
41) 20
43) -7
45) -5
47) 18
49) -5
51) 0
53) 0
55) 22
57) 32
59) -3
61) 4

1) 34
3) 0
5) 5
7) 20
9) 40
11) 6
13) 19
15) 28
17) 8
19) 17
21) 2
23) 1
25) 2
27) -5
29) -1
31) -17
33) 79
35) 26
37) 10
39) -96

Section 3.1: Evaluating Algebraic Expressions

1) 12
3) 18
5) 48
7) 36
9) 1
11) 8
13) -9
15) -28
17) 9
19) 12
21) -8
23) 4

25) -4
27) 12

Section 3.2: Functional Notation

1) 17
3) 1
5) -12
7) -39
9) -34
11) 4
13) 9
15) 6
17) 3
19) 0
21) 14
23) 2
25) 4a+4h+3
27) $a^2 + 2ah + h^2 + 4a + 4h + 6$
29) $-4a^2 + 2a - 6$

Section 4.1: Multiply Monomial · Monomial

1) x^5
3) $20a^8$
5) $-18s^{12}$
7) $24a^3b^3$
9) $-10r^6s^4$
11) $9x^8y^{10}$
13) $64x^4$
15) $54x^4y^4$
17) $90r^7s^{12}$
19) $60x^3y^5z^9$
21) $24a^5b^{14}$
23) $-24x^5y^9z^8$
25) $-30p^{11}q^{12}r^{15}$
27) $-18a^5b^8$

29) $180x^7y^4$
31) $-20x^6$

Section 4.2: Multiply Monomial · Binomial—The Distributive Law
1) $16x + 48$
3) $18x^3 + 42x$
5) $-2y^4 - 6y^2$
7) $-27z^4 + 45z^3$
9) $2a^4 + 5a^3$
11) $44b^2 - 8b^3$
13) $-2r^3 + 20r^2 - 18r$
15) $3x^4y^2 - 4x^3y^3 + 9x^2y$
17) $-2x^4 - 10x^3 + 12x^2$
19) $-20r^7s^5 - 24r^6s^4 - 16r^6s^3 + 4r^4s^3$

Section 4.3: Binomial · Binomial
1) $x^2 + 4x + 3$
3) $x^2 + 2x - 35$
5) $y^2 + 10y + 16$
7) $-y^2 + y + 6$
9) $2a^2 + 21a + 27$
11) $12b^2 + 11b - 15$
13) $12c^2 - 28c + 15$
15) $15x^2 - 25x + 10$
17) $18x^4 - 69x^3 - 12x^2$
19) $x^2 - 6x + 9$
21) $9x^2 - 42x + 49$
23) $x^2 - 16$
25) $36 - y^2$
27) $16x^2 - 25$
29) $20x^3 + 20x^2 + 5x$

Section 4.4: Multiply Binomial · Trinomial or Trinomial · Trinomial
1) $x^3 + 3x^2 + 5x + 3$
3) $x^3 - 5x^2 + 14x - 24$

5) $2y^3 - 3y^2 - 32y + 48$
7) $5z^3 - 5z^2 + 34z - 48$
9) $4z^4 + 36z^3 + 6z^2 + 51z\text{-}27$
11) $a^3 + 9a^2 + 15a + 7$
13) $b^3 + 3b^2 + 3b + 1$
15) $8r^3 + 12r^2 + 6r + 1$
17) $x^4 + 5x^3 + 8x^2 + 5x + 7$
19) $2x^4 + 18x^3 + 16x^2 - 120x$

Section 5.1: Combining Like Terms

1) $-11x$
3) $8x^2y$
5) $2x + 16y$
7) $23p - 32$
9) $7rs^2 + 10$
11) $2x^2y + 10xy^2 - 8xy$
13) $-11a^3 - 24ab - 7a$
15) $4x^2 + x - 5$
17) $3x^3 - 15x^2 + 5x - 16$
19) $3x^2 + 19x - 27$
21) $-6c^3d + 9c^2d^2 - 12c^2d^3 + 5c^2d$
23) $9 - 14x + 14y$
25) $4x^2 - 5x - 2$
27) $-34r^3s^3 + 18r^2s^2 + 10rs$
29) $16p^2q - 9p^2q^2$
31) $10x^3y^2 - 26x - 2x^3y + 2x^2$
33) 0
35) $-38x^2 + 49x - 45$

Section 6.1: Unique Prime Factorization of Integers

1) $2^2 \cdot 3$
3) $2^5 \cdot 3$
5) $2 \cdot 3^2$
7) $2^2 \cdot 5$
9) $2^3 \cdot 3^2$
11) $3^2 \cdot 11$
13) $2^4 \cdot 3$
15) $2^4 \cdot 5$
17) $2^2 \cdot 3^3$
19) $2 \cdot 3 \cdot 7$
21) 3^3
23) $2^5 \cdot 3 \cdot 5$
25) $2 \cdot 5^3$
27) $2^4 \cdot 3^2 \cdot 5$
29) $2^3 \cdot 3^2 \cdot 5$

Section 6.2: Greatest Common Monomial Factor (GCF)-Numerical or Algebraic

1) $2(x-2)$
3) $z(5z+8)$
5) $4y(y^2+5y-2)$
7) $7b(b^2-2b+3)$
9) $12xy^3(3x+1)$
11) $7r(2r^2-4r+5)$
13) $5a^3(4a^7+2a^2-1)$
15) $9x^2y^2z^2(2xy^2z^3-3yz+1)$
17) $11a^2bc(1-2b+3bc)$
19) $yz(2xz-3x+4)$
21) $4(x^3+2)$
23) $15xy^2(1+2y)$
25) $2(3x^2+8y^2+13z^2)$
27) $4xy(2x^2y^3+4xy^2+1)$
29) $10\alpha(4+2\beta+\mu)$

1) $(x+3)(x-3)$
3) $(y+8)(y-8)$
5) $(10+z)(10-z)$
7) Not Factorable
9) Not Factorable
11) $(x^2+1)(x+1)(x-1)$
13) $(y^4+12)(y^4-12)$
15) $(6y^8+11)(6y^8-11)$
17) $(4y^8+7)(4y^8-7)$
19) $(g^3h^2+m)(g^3h^2-m)$
21) $(3+5y)(3-5y)$
23) $(9x+2z)(9x-2z)$
25) $(x^2+y)(x^2-y)$
27) $(5a^3b^4+2)(5a^3b^4-2)$
29) $(g^3h^2+m)(g^3h^2-m)$
31) $(a^8b^{18}+6)(a^8b^{18}-6)$
33) $(m^2+n^2)(m+n)(m-n)$

Section 6.4: Combination of Greatest Common Factor and Difference of Two Squares

1) $2(x^2-1) = 2(x+1)(x-1)$
3) $6z(1-4z^2) = 6z(1+2z)(1-2z)$
5) $2(1-4b^2) = 2(1+2b)(1-2b)$
7) $4(d^2-25) = 4(d+5)(d-5)$
9) $2(y^4-16) = 2(y^2+4)(y^2-4) = 2(y^2+4)(y+2)(y-2)$
11) $8(9a^2-1) = 8(3a+1)(3a-1)$
13) $16(1-c^{16}) = 16(1+c^8)(1-c^8) = 16(1+c^8)(1+c^4)(1-c^4)$
$$= 16(1+c^8)(1+c^4)(1+c^2)(1-c^2)$$
$$= 16(1+c^8)(1+c^4)(1+c^2)(1+c)(1-c)$$
15) $x^2(x^2-121) = x^2(x+11)(x-11)$
17) $a^2(4b^2-a^2) = a^2(2b+a)(2b-a)$
19) $2x^2y^3z^2(9z^2-1) = 2x^2y^3z^2(3z+1)(3z-1)$
21) $a^3(a^2-1) = a^3(a+1)(a-1)$
23) $x^2(25x^2-4) = x^2(5x+2)(5x-2)$
25) $9(x^2-9) = 9(x+3)(x-3)$

27) $a(a^2 - 144) = a(a + 12)(a - 12)$
29) $9cd(c^2d^2 - 4) = 9cd(cd + 2)(cd - 2)$

Section 6.5: Trinomial With Leading Coefficient One $(x^2 + bx + c)$

1) $(x + 2)(x + 1)$
3) $(x + 2)(x - 1)$
5) $(y + 3)(y + 2)$
7) $(y - 3)(y + 2)$
9) $(z + 3)(z + 1)$
11) $(z - 3)(z + 1)$
13) $(a + 6)(a + 4)$
15) $(c - 4)(c - 2)$
17) $(s - 6)(s - 3)$
19) $(w - 5)(w + 3)$
21) $(x - 8)(x + 6)$
23) $(z - 15)(z - 2)$
25) $(b + 5)(b + 5)$
27) $(d - 14)(d - 2)$
29) $(y + 11)(y - 6)$
31) $(u + 5)(u + 1)$
33) $(b - 8)(b + 2)$
35) $(d + 5)(d + 4)$
37) $(y + 10)(y + 4)$
39) $(a + 8)(a + 6)$

Section 6.6: Trinomial With Leading Coefficient Other Than One
$(ax^2 + bx + c)$

1) $(2a + 1)(a + 2)$
3) $(2x + 1)(x - 2)$
5) $(3y - 1)(y - 2)$
7) $(3y - 2)(y - 1)$
9) $(5z + 1)(z - 3)$
11) $(5z - 1)(z - 3)$
13) $(3a + 2)(a - 1)$
15) $(3c - 4)(c - 1)$

17) $2(2g^2 + 5g - 12) = 2(2g - 3)(g + 4)$
19) $(3s - 5)(2s + 1)$
21) $(4u + 3)(2u + 3)$
23) $(3w + 4)(3w - 2)$
25) $(6y - 5)(2y + 3)$
27) $(5a - 3)(3a + 2)$
29) $(4c + 1)(4c + 1)$

Section 6.7: Combination of Greatest Common Monomial Factor and Trinomial

1) $4(x^2 - x - 2) = 4(x - 2)(x + 1)$
3) $z^3(z^2 - 2z - 3) = z^3(z - 3)(z + 1)$
5) $6(b^2 - b - 20) = 6(b - 5)(b + 4)$
7) $4(b^2 + 5b + 6) = 4(b + 2)(b + 3)$
9) $5s^2(s^2 - 6s - 7) = 5s^2(s - 7)(s + 1)$
11) $4u^2(u^2 + 3u + 2) = 4u^2(u + 2)(u + 1)$
13) $6(x^2 + 5x + 6) = 6(x + 3)(x + 2)$
15) $8(y^2 + 4y + 3) = 8(y + 3)(y + 1)$
17) $11(a^2 - 6a + 8) = 11(a - 4)(a - 2)$
19) $15(c^2 - 3c - 10) = 15(c - 5)(c + 2)$

Section 6.8: Factoring by Grouping

1) $(x + 4)(x + 2)$
3) $(z + 9)(z - 7)$
5) $(b + 7)(4b + 3)$
7) $(d - 8)(7d - 5)$
9) $(x - 6)(x^2 + 4)$
11) $(z - 4)(z^2 + 3)$
13) $(x + 2)(2x + 3)$
15) $(4z - 1)(z - 2)$
17) $(x + 3y)(3x^2 - 4)$
19) $(b + 3c)(5a^2 - 6)$
21) $(7v + 2w)(9u^2 + 5x)$

Section 6.9: Review of all Factoring

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

3) $7ab(4ab^2 - 5ab + 1)$

5) $(x^2 + 1)(x^2 - 1) = (x^2 + 1)(x + 1)(x - 1)$

7) $(4a^8 + 5)(4a^8 - 5)$

9) $y(4xz + 5x + 6z)$

11) $c^2(b^4 - 1) = c^2(b^2 + 1)(b^2 - 1) = c^2(b^2 + 1)(b + 1)(b - 1)$

13) $(r + 10)(r - 3)$

15) Not Factorable

17) $3v^2(5v + 4)$

19) $4x(x - 1)$

21) $5xy(4x - 5y + 6)$

23) $(x^2 + 4)(x^2 - 4) = (x^2 + 4)(x + 2)(x - 2)$

25) $(2z + 3)(z - 5)$

27) $(7 + b)(3 + b)$

29) $(x + 5)(x - 5)$

31) $(6x - 5)(x + 1)$

33) $(2x + 3y)(3z^2 + 5)$

Section 7.1: Is a Given Number a Solution to an Equation

1) $5 = 5$, Yes

3) $-2 = -2$, Yes

5) $-3 \neq 6$, No

7) $8 \neq 0$, No

9) $4 \neq 0$, No

11) $12 \neq 0$, No

13) $-16 \neq 0$, No

15) $12 \neq -4$, No

17) $37 \neq 36$, No

Section 7.2: Linear (First Degree) Equations

1) $x = 9$

3) $x = -4$

5) $y = -7$

7) $y = 9$

9) $z = 9$

11) $a = 16$
13) $b = 7$
15) $x = 0$
17) $c = 3$
19) $d = 6$
21) $r = {}^3/_2$
23) $s = {}^7/_2$
25) $t = 6$
27) $v = {}^{14}/_5$
29) $x = 1$
31) $z = 2$
33) $z + 10$

Section 7.3: Decimal Equations

1) $x = 2$
3) $x = 2$
5) $y = 2$
7) $z = 200$
9) $z = -1$
11) $a = {}^4/_3$
13) $b = {}^{140}/_9$
15) $c = 1$
17) $r = -1$
19) $s = 40$
21) $t = -3$
23) $w = {}^9/_5$
25) $x = 2$
27) $y = 3000$
29) $z = 2$

Section 7.4: Fractional Equations with Monomials or Binomials in the Numerator

1) $x = 20$
3) $x = -16$
5) $y = 51$

7) $z = 4$

9) $x = -3$

11) $b = -5$

13) $s = 3$

15) $x = 12$

17) $z = 4$

19) $x = 8$

21) $x = {}^{-3}/_5$

23) $x = 5$

25) $x = 9$

27) $x = 0$

29) $x = {}^{155}/_{29}$

Section 7.5: Literal Equations

1) $r = {}^{d}/_t$

3) $I = {}^{V}/_R$

5) $h = {}^{2A}/_b$

7) $R = {}^{PV}/_{nT}$

9) $m = {}^{2k}/_{v^2}$

11) $T = {}^{(v_2 - v_1)}/_a$

13) $b = P - a - c$

15) $l = {}^{(S - 2\pi r^2)}/_{2\pi r}$

17) $m_1 = {}^{(Fr^2)}/_{Gm_2}$

19) $r = {}^{(I - P)}/_{Pt}$

21) $x = {}^{y^2}/_{4p}$

23) $r = {}^{mv^2}/_{Fg}$

25) $v_2 = {}^{P_1 V_1 T_2}/_{P_2 T_1}$

27) $y = {}^{(4x - 20)}/_5$

29) $z = {}^{(10 - 2x - 3y)}/_4$

Section 7.6: Quadratic (Second Degree) Equations

1) $x = 2, 5$
3) $y = 0, 6$
5) $z = 0, 9$
7) $a = 8, -8$
9) $x = 4, -3$
11) $x = 10, -2$
13) $y = -5,\ ^{-1}\!/_2$
15) $y = -2,\ ^{3}\!/_4$
17) $z = 2,\ -1$
19) $z = 3, -1, 0$
21) $a = 6, -2$
23) $c = 2, -1$
25) $r = 4, 2$
27) $t = 4, 0$
29) $v = 9, -9$
31) $x = -1, -2$
33) $x = 2, -3$
35) $y = 2$
37) $x = 1, -1$
39) $z = -2, -1$

Section 7.7: Linear Inequalities

1) $x > 5$
3) $x \geq 4$
5) $x < -5$
7) $x \leq -2$
9) $x \geq -2$
11) $x < 2$
13) $x > 15$
15) $x \leq -28$
17) $x \geq 12$
19) $x < -28$
21) $x < 2$
23) $x \leq -27$

25) $x \geq 4$

27) $x > 2$

29) $x \geq -4$

31) $x < 1$

33) $x < -15$

35) $x \leq 5$

37) $x > 4$

39) $x \leq -1$

Section 8.1: Simplifying Fractions (Rational Expressions)

1) 3

3) $-x^2$

5) $2x$

7) $\dfrac{-1}{3p^2 q}$

9) $-6ab^4 c^5$

11) $4x^2 - 2x + 1$

13) $4a^2 b - 2a + 1$

15) $-25c^{19} - 16c^7 + 9c^3$

17) -1

19) $\dfrac{4(x-1)}{(x+1)(x-1)} = \dfrac{4}{(x+1)}$

21) $\dfrac{6z(z-2)}{(z+2)(z-2)} = \dfrac{6z}{(z+2)}$

23) $\dfrac{(b-4)(b+3)}{(b+4)(b-4)} = \dfrac{(b+3)}{(b+4)}$

25) $\dfrac{3r(r-1)}{(r+6)(r-1)} = \dfrac{3r}{(r+6)}$

27) $\dfrac{(t-4)(t+3)}{(t+3)(t+2)} = \dfrac{(t-4)}{(t+2)}$

29) $\dfrac{(z-4)(z-2)}{2(z-4)} = \dfrac{(z-2)}{2}$

31) $\dfrac{6x^2 y^3}{z}$

Section 8.2: Multiplying Fractions (Rational Expressions)

1) 1

3) 10

5) 6

7) $\dfrac{a}{b^2}$

9) $2ab$

11) $14xz$

13) 3

15) $\dfrac{-4xy}{15}$

17) $-4r^4s^2$

19) $-3x^2y^8z^5$

21) $\dfrac{1}{2}$

Section 8.3: Dividing Fractions (Rational Expressions)

1) $\dfrac{3}{2}$

3) 6

5) $\dfrac{a^2}{b^2}$

7) $\dfrac{-8y}{bx}$

9) $\dfrac{9d}{2}$

11) $\dfrac{1}{9b}$

13) a^3p^3qr

15) $\dfrac{-6xy}{c}$

17) $-16r^4s^2pq$

19) $15y^2$

21) $\dfrac{8y^3}{b}$

23) $\dfrac{4}{3aq}$

25) $\dfrac{x}{x-1}$

27) $\dfrac{y(x-3)}{x-4}$

Section 8.4: Adding or Subtracting Fractions (Rational Expressions)

1) 1

3) $\dfrac{1}{5}$

5) $\dfrac{5}{6}$

7) $\dfrac{7}{8}$

9) $\dfrac{17}{12}$

11) $\dfrac{8y}{21}$

13) $\dfrac{(2b-3a)}{ab}$

15) $\dfrac{13}{3x}$

17) $\dfrac{31}{36y}$

19) $\dfrac{(6-3x)}{2x^2}$

21) $\dfrac{(27c-1)}{9c}$

23) $\dfrac{(33s+20)}{24s^2}$

25) $\dfrac{-43p}{30}$

27) $\dfrac{(7t-15)}{5t^2}$

29) $\dfrac{(3v-10)}{10}$

31) $\dfrac{(4x+15)}{30x}$

Section 9.1: The Pythagorean Theorem

1) AB=5

3) c=17

5) b=10

7) AC=9

9) a=12

11) AB=10

13) $c=\sqrt{2}$

15) AB=$\sqrt{13}$

17) BC=$2\sqrt{5}$

19) b=$2\sqrt{5}$

21) c=$4\sqrt{3}$

23) b=$4\sqrt{2}$

25) AB=$5\sqrt{5}$

Section 9.2: Simplifying Radicals

1) 5

3) -12

5) $2\sqrt{3}$

7) $-4\sqrt{3}$

9) $8\sqrt{3}$

11) $-12\sqrt{2}$

13) $20\sqrt{5}$

15) x^3

17) $-z^5$

19) $b^3\sqrt{b}$

21) $d^4\sqrt{d}$

23) $-r^8$

25) $2x^2\sqrt{x}$

27) $-4z^4\sqrt{z}$

29) xy^2

31) $-c^5d^6$

33) $2x\sqrt{3}$

35) $3c^2\sqrt{3}$

37) $2xy^3\sqrt{2y}$

39) $3cd^5\sqrt{6cd}$

41) $16xyz^2\sqrt{2y}$

43) $-30r^8s^4t^{12}\sqrt{2st}$

45) $-24a^8b^{10}c^{20}$

47) $14x^2y^3z^4\sqrt{5y}$

49) $-72r^2s^7t^{11}\sqrt{2}$

Section 9.3 Multiplying Radicals

1) √15
3) 6√5
5) 10√2
7) 8√15
9) 90√3
11) 24x⁴√2x
13) 120z⁷
15) −96b³
17) 60x³y²z³
19) −64x³yz²√3x
21) 3√7 − 24
23) 5 + 2√3
25) 5√3 − 5
27) 24 − 36√6
29) 3√2 + 4√3 + 5√6 + 20
31) −23
33) 94
35) 21 + 8√5
37) 32 − 10√7
39) 5 + 2√6

Section 9.4: Dividing Radicals

1) 5/6
3) 10
5) 2√2
7) 7√3
9) 2√10
11) 3x
13) 2ab
15) √15/3

Section 9.3 Multiplying Radicals

1) $\sqrt{15}$
3) $6\sqrt{5}$

Section 9.4: Dividing Radicals

1) $\frac{5}{6}$
...
15) $\frac{\sqrt{15}}{3}$

Section 9.3 Multiplying Radicals

1) $\sqrt{15}$

3) $6\sqrt{5}$

5) $10\sqrt{2}$

7) $8\sqrt{15}$

9) $90\sqrt{3}$

11) $24x^4\sqrt{2x}$

13) $120z^7$

15) $-96b^3$

17) $60x^3y^2z^3$

19) $-64x^3yz^2\sqrt{3x}$

21) $3\sqrt{7} - 24$

23) $5 + 2\sqrt{3}$

25) $5\sqrt{3} - 5$

27) $24 - 36\sqrt{6}$

29) $3\sqrt{2} + 4\sqrt{3} + 5\sqrt{6} + 20$

31) -23

33) 94

35) $21 + 8\sqrt{5}$

37) $32 - 10\sqrt{7}$

39) $5 + 2\sqrt{6}$

Section 9.4: Dividing Radicals

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

3) 10

5) $2\sqrt{2}$

7) $7\sqrt{3}$

9) $2\sqrt{10}$

11) $3x$

13) $2ab$

15) $\frac{\sqrt{15}}{3}$

17) $\dfrac{\sqrt{6}}{5}$

19) $\dfrac{\sqrt{21}}{3}$

21) $\dfrac{\sqrt{6x}}{12}$

23) $\dfrac{x^4}{y^3}$

25) $\sqrt{5}$

27) $8\sqrt{2}$

29) 20

31) $9x^{10}\sqrt{2x}$

33) $20\sqrt{6}$

35) $4x^4\sqrt{6}$

37) $5\sqrt{2}$

39) $\sqrt{5} - 1$

Section 9.5: Combining Radicals

1) $5\sqrt{7}$

3) $2\sqrt{5}$

5) $-2\sqrt{3x}$

7) $-3\sqrt{5abc}$

9) $-2\sqrt{3}$

11) $-20\sqrt{3}$

13) $12\sqrt{5}$

15) $69\sqrt{2}$

17) $48\sqrt{5}$

19) $10x\sqrt{5x}$

21) $-3a\sqrt{b}$

23) $-9\sqrt{3xy}$

25) $25\sqrt{2} - 45\sqrt{5}$

Section 10.1: The Rectangular Coordinate System

1) One of two perpendicular lines intersecting at the origin. It is also called the abscissa and indicates how far left or right of the origin the point is.
3) The point where the x-axis and y-axis meet indicated by (0, 0)
5) Two numbers usually written with parenthesis (a, b) where the first number indicates how far to the left or right the point is and the second number indicates how high up or down.
17) A (2, 6) and B (8, 3)
19) No point E and F (2, 0)
21) J (4, -4) and K (-8, -3)

Section 10.2 Graphing by Use of the Table Method
1) $y = x + 3$

x	y
0	3
2	5
4	7

2) $y = x - 2$

x	y
0	-2
2	0
4	2

3) $y = 3x + 2$

x	y
0	2
1	5
2	8

4) $y = 4x - 3$

x	y
0	-3
1	1
2	5

5) $x + y = 6$

x	y
0	6
2	4
4	2

6) $x - y = 4$

x	y
0	-4
2	-2
4	0

7) $2x + 3y = 12$

x	y
0	4
3	2
6	0

8) $3x - 4y = 12$

x	y
0	-3
4	0
6	1.5

9) $6x + 3y - 18 = 0$

x	y
-2	10
0	6
3	0

10) $2x - 5y - 10 = 0$

x	y
-5	-4
0	-2
5	0

x	y

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

0	3
4	4
8	5

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

x	y
0	-5
6	-4
12	-3

Section 10.3: Graphing by Use of the Intercepts Method

1) The x-intercept is (0, 2) and the y-intercept is (3, 0)

3) The x-intercept is (0, -5) and the y-intercept is (6, 0)

5) The x-intercept is $(0, \frac{7}{2})$ and the y-intercept is $(\frac{7}{3}, 0)$

7) The x-intercept is $(0, \frac{-11}{3})$ and the y-intercept is $(\frac{-11}{5}, 0)$

9) The x-intercept is (0, -3) and the y-intercept is $(\frac{3}{2}, 0)$

11) $x + y = 5$

x	y
0	5
5	0
2	3

13) $2x + 5y = 10$

x	y
0	2
5	0

3	$\dfrac{4}{5}$

15) $3x - 4y = 12$

x	y
0	-3
4	0
2	$\dfrac{-3}{2}$

17) $x + 2y = 7$

x	y
0	$\dfrac{7}{2}$
7	0
5	1

19) $2x - 3y = 9$

x	y
0	-3
$\dfrac{9}{2}$	0
2	$\dfrac{-5}{3}$

21) $y = 2x + 3$

x	y
0	3
$\frac{-3}{2}$	0
-1	1

Section 10.4 Graphing by Use of the Slope-Y Intercept Method

1) Slope is m=2 and the y-intercept is (0, 3)

3) Slope is m=5 and the y-intercept is (0, -2)

5) Slope is m=$\frac{1}{2}$ and the y-intercept is (0, 3)

7) Slope is m=2 and the y-intercept is (0, 0)

9) Slope is m=0 and the y-intercept is (0, 4)

11) Slope is m=$\frac{-2}{3}$ and the y-intercept is (0, 2)

13) Slope is m=$\frac{3}{4}$ and the y-intercept is (0, -3)

15) Slope is m=$\frac{-1}{4}$ and the y-intercept is (0, 6)

17) $y = x + 1$

19) $y = x + 2$

21) $y = x + 4$

23) $y = 3x$

25) $x = 2$

27) $x = -8$

29) $y = 5$

31) $y = 8$

33) $y = x + 2$

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

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

Section 11.1: Solving a System of 2 Equations in 2 Unknowns Graphically

1) (3, 1)

3) (1, 3)

5) (2, 4)
7) (3, 1)
9) (1, 2)
11) (-3, 4)
13) (5, 0)
15) (6, 5)
17) Inconsistent
19) Dependent

Section 11.2: Solving a System of 2 Equations in 2 Unknowns by the Use of the Substitution Method

1) (4, 3)
3) (5, 2)
5) (1, 3)
7) (7, 2)
9) (4, 2)
11) (1, 3)
13) (3, -3)
15) (6, 7)
17) (2, 1)
19) (2, 2)

Section 11.3: Solving a System of 2 Equations in 2 Unknowns by the Use of the Elimination Method (Adding or Subtracting)

1) (2, 1)
3) (4, 3)
5) (3, -1)
7) (-5, 3)
9) (-2, 2)
11) (5, -3)
13) (-3, 4)
15) (6, 5)
17) (4, -3)
19) (-3, 4)

Section 12.1: Ratio and Proportion

1) 4.8 gallons
3) 3 and 1/8 pounds
5) 16 ounces
7) a) $6; b) $9; c) $12
9) a) 90 students; b) 150 students; c) 200 students

Section 12.2: Percent Problems

1) 12
3) 6000
5) 27 students
7) 72 million
9) a) $160 reduction; b) $640 new price
11) a) $9 tip; b) $54
13) 4%
15) $18,200
17) a) $35 sales tax; b) $535
19) a) 800 students; b) 1200 students

Section 12.3: Number Problems

1) 18
3) 6
5) 1
7) 9
9) 10
11) 20
13) 13
15) a) 5 feet and 10 feet; b) 6 feet and 9 feet; c) 4 feet and 11 feet

Section 12.4: Distance = Rate X Time

1) 480 miles
3) 8 miles per hour
5) 1400 miles
7) 4 miles per hour
9) 385 miles

11) a) 28.23 kilometers per day; b) 2.823 kilometers per hour
13) a) 29.25 kilometers per day; b) 2.925 kilometers per hour