

INSTRUCTOR'S SOLUTIONS MANUAL

ROXANE BARROWS

Hocking College

CHERYL MANSKY

Hocking College

INTRODUCTION TO TECHNICAL MATHEMATICS FIFTH EDITION

Allyn J. Washington

Dutchess Community College

Mario F. Triola

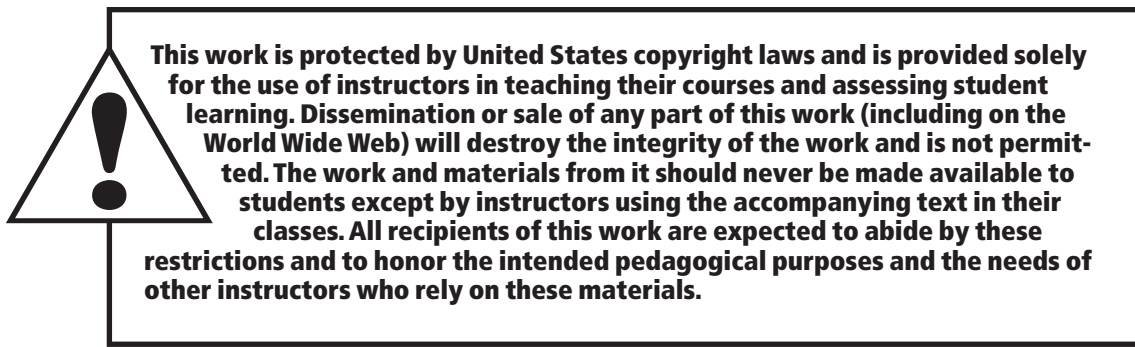
Dutchess Community College

Ellena E. Reda

Dutchess Community College



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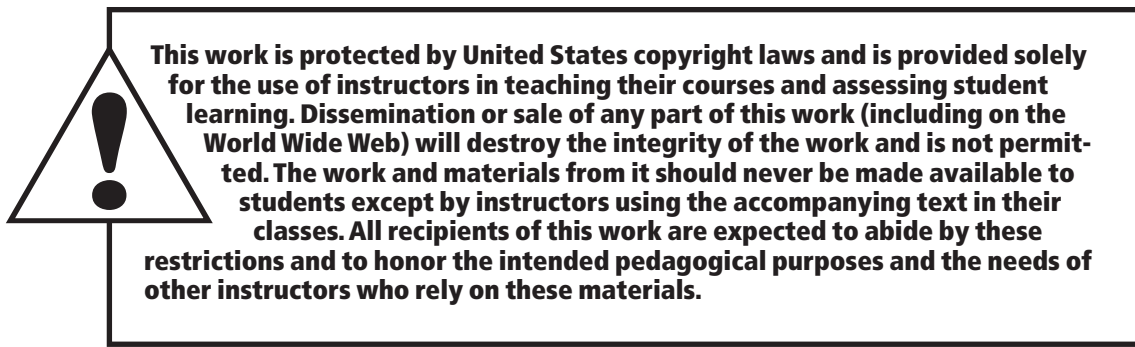
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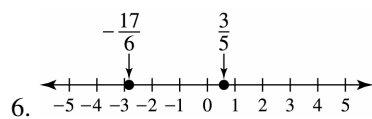
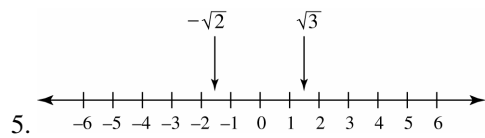
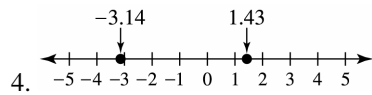
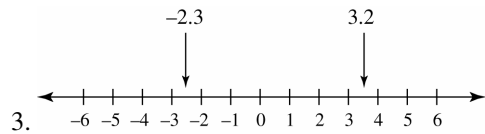
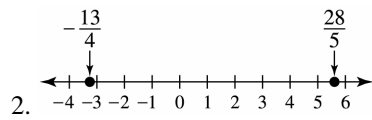
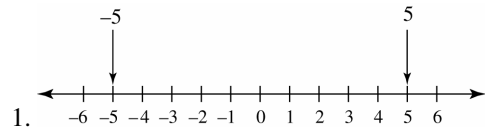
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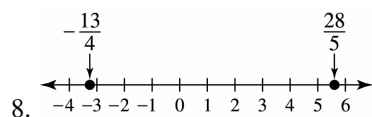
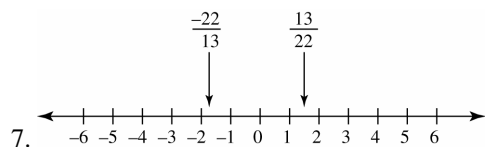
Chapter 1

Signed Numbers

1.1 Signed Numbers



2 Chapter1 Signed Numbers



9. 2, farthest to the right

10. 0, farthest to right on number line

11. -1 ; farthest to right on number line

12. -7 ; farthest to right on number line

13. $6 > 2$; 6 is farthest to the right

14. $8 > -3$, 8 is farthest to the right

15. $0 < 4$, 0 is farthest to the right

16. $-3 < 0$, 0 is farthest to the right

17. $-3 > -7$

18. $-9 < -8$

19. $-7 < -5$

20. $-1 > -5$

21. $\sqrt{5} \approx 2.24 > 2.2$

22. $\sqrt{10} \approx 3.16 > -3.2$

23. $|6| = 6$ and $|-6| = 6$

24. $|-3| = 3$ and $-|-3| = -3$

So, $|6| = |-6|$

So, $|-3| > -|-3|$

25. $|6| = 6$ distance from 0, $|-6| = 6$ distance from 0

26. $|-5| = 5$ distance from 0, $|5| = 5$ distance from 0

27. $\left|\frac{-6}{7}\right| = \frac{6}{7}$; $\left|\frac{8}{5}\right| = \frac{8}{5}$

28. $|2.4| = 2.4$; $|-0.1| = 0.1$

29. $-\$30$

30. -0.5 V

31. -8 m below

32. -3 smaller debt

33. answers will vary

34. $+4.5$ cm

35. $-30^\circ\text{C} < -5^\circ\text{C}$

36. -80 m $<$ -60 m

37. -2 V $>$ -5 V

38. $-0.94 < -0.58$

39. a) -890 ft, -1425 ft b) -1425 ft

- 40 a) Some examples
 0° F and 10 mph
 10° F and 45 mph
 -5° F and 5 mph
- b) 20° F and 20 mph results in 4° F
 0° F and 5 mph results in -11° F
 0° F with 5 mph wind seems colder
- c) 4° F ; ranges from 2° F to 9° F
- d) 5° F and 40 mph
 -5° F and 10 mph
 -10° F and 5 mph
 0° F and 20 mph

41. a) 100 V b) $|-200| = 200$
 $|100| = 100$ $|-200|\text{ V}$ is greater

1.2 Addition and Subtraction of Signed Numbers

- $2 + 9 = 11$; the sum of two positive numbers is positive
- $3 + 8 = 11$; the sum of two positive numbers is positive
- $-6 + -9 = -15$; the sum of two negative numbers is negative
- $-6 + -5 = -11$; the sum of two negative numbers is negative
- $-3 + 6 = 3$; unlike signs, subtract and keep the sign of the larger number in absolute value which would be the 6
- $-1 + 8 = 7$; unlike signs, subtract and keep the sign of the larger number in absolute value which would be the 8
- $2 + -10 = 8$; unlike signs, subtract and keep the sign of the larger number in absolute value which would be the -10
- $3 + -11 = 8$; two unlike signs, subtract and keep sign from -11
- $12 - 5 = 7$; subtraction sign changes to addition sign, the positive 5 changes to negative 5, then follow rules of addition. $12 = (-5)$. Adding two unlike signs, subtract and keep the sign of the larger one, 12.
- $14 - 6 = 8$; change to $14 + -6$
- $7 - 10 = -3$; change to $7 + -10$
- $2 - 15 = -13$; change to $2 + -15$
- $-6 - 4 = -10$; change to $-6 + -4$
- $-3 + -8 = -11$
- $7 + 9 = 16$
- $14 + 2 = 16$
- $-6 + 7 = 1$
- $-9 + 5 = -4$
- $1 + -5 + -2$; add left to right
 $-4 + -2 = -6$
- $6 + 5 + -3$; add left to right
 $11 + -3 = 8$
- $2 + -8 - 2$; add left to right
 $-6 - 2$; change to addition
 $-6 + -2 = -8$
- $-4 - 8 + -9$; add left to right
 $-4 + -8 + -9$
 $-12 + -9 = -21$
- $5 - -3 - 7$; add left to right
 $5 + 3 - 7$
 $8 - 7 = 1$

4 Chapter1 Signed Numbers

24. $-7 - -1 - 6$; add left to right

$$-7 + 1 - 6$$

$$-6 - 6$$

$$-6 + -6 = -12$$

25. $-7 - -15 + -2$; add left to right

$$-7 + 15 + -2$$

$$8 + -2 = 6$$

26. $-6 + 13 - -11$; add left to right

$$-19 - -11$$

$$-19 + 11 = -8$$

27. $-9 - -5 + -8 - 5$; add left to right

$$-9 + 5 + -8 - 5$$

$$-4 + -8 - 5$$

$$-12 - 5 = -17$$

28. $-17 - -5 + -4 - 6$; add left to right

$$-17 + 5 + -4 - 6$$

$$-12 + -4 - 6$$

$$-16 - 6 = -22$$

29. $3 - -7 - 9 + -3$; add left to right

$$10 - 9 + -3$$

$$1 + -3 = -2$$

30. $6 + -11 - -5 - 8$; add left to right

$$-5 - -5 - 8$$

$$0 - 8 = -8$$

31. $-6 - 9 - -12 + -4 - -1$; add left to right

$$-15 - -12 + 4 - -1$$

$$-3 + 4 - -1$$

$$-7 - -1 = -6$$

32. $-5 + 6 - 3 - -14 + -3$; add left to right

$$1 - 3 - -14 + -3$$

$$-2 - -14 + -3$$

$$12 + -3 = 9$$

33. a) $-10^\circ \text{ C} + 5^\circ \text{ C} = -5^\circ \text{ C}$

b) $-10^\circ \text{ C} - 5^\circ \text{ C} = -15^\circ \text{ C}$

34. $120^\circ \text{ C} - -30^\circ \text{ C} = 150^\circ \text{ C}$

35. $12 \text{ A} - -5 \text{ A} = 17 \text{ A}$

36. $6000 \text{ ft} + -150 \text{ ft} = 5850 \text{ ft}$

37. $5000 + 2000 - 3000 + 1000 = 5000$

38. $-2 + -5 = -7$

39. $-8 + 3 = -5$

40. $7 - -2 = 9$

41. $3 - -8 = 11$

42. $-4 - -3 + -2 = -3$

43. $8 - -5 + -1 = 12$

44. $-2 - -5 - -4 = 7$

45. $12 - -20 - -15 + -3 = 44$

1.3 Multiplication and Division of Signed Numbers

1. -63 ; odd number of negatives gives negative product

2. -44 ; odd number of negatives gives negative product

3. -84 ; odd number of negatives gives negative product

4. -60 ; odd number of negatives gives negative product

5. 30 ; even number of negatives gives positive product

6. 72 ; even number of negatives gives positive product

7. 0 ; zero multiplication rule

1.3 Multiplication and Division of Signed Numbers 5

8. -56 ; odd number of negatives
10. 180; even number of negatives
12. 0; multiplication by zero
14. 0; multiplication by zero
16. -9 ; odd number of negatives
18. 7; even number of negatives
20. -5 ; odd number of negatives
22. 4 even number of negatives
24. undefined; can't divide by 0
26. 0; zero can be in the numerator
28. $\frac{(-6)(-3)}{-9} = \frac{-18}{-9} = 2$
30. $\frac{(-36)(12)}{-4(-27)} = \frac{-432}{108} = -4$
32. $\frac{(-6)(4)}{3(8)} = \frac{-24}{24} = -1$
34. $\frac{-22(8)(18)}{6(-44)} = \frac{-3168}{-264} = 12$
36. positive; subtract becomes add and negative number becomes positive
37. negative; odd number of negatives
39. positive; even number of negatives
41. zero, multiply by 0
43. 5 s
45. 5 days; $\frac{-10^\circ \text{ C}}{-2^\circ \text{ C}}$
47. $-3 \times -6 = 18$
49. $-7 \times 8 = -56$
51. $-63 \div -3 = 21$
9. -56 ; odd number of negatives
11. 30; even number of negatives
13. -168 ; odd number of negatives
15. -8 ; odd number of negatives
17. -3 ; odd number of negatives
19. -11 ; odd number of negatives
21. 15, even number of negatives
23. 0; zero can be in the numerator
25. undefined; can't divide by 0
27. $\frac{8(-4)}{2} = \frac{-32}{2} = -16$
29. $\frac{(-5)(15)}{25(-1)} = \frac{-75}{-25} = 3$
31. $\frac{(-3)(-24)}{-2(-12)} = \frac{72}{24} = 3$
33. $\frac{10(-6)(-14)}{8(-21)} = \frac{840}{-168} = -5$
35. negative; odd number of negatives
38. positive; both positive
40. positive
42. -50 mm; 2 mm times -25
44. $-\$12$; -3×4
46. 240 mV; $10 \times 2 + 220$
48. $14,482 \div -26 = -557$
50. $-5 \times -4 = 20$
52. $4 \times -2 = -8$

6 Chapter1 Signed Numbers

53. $12 \div 0 = \text{error, undefined}$

55. $-108 \div 12 = -9$

57. $(2 \times 3 \times 4) \div (-2 \times -6) = 2$

54. $-17 \times -23 = 391$

56. $(26 \times -12) \div (13 \times -3) = 8$

58. $(-8 \times -2 \times 0) \div (-7 \times 3) = 0$

1.4 Powers and Roots

1. 8^3 ; there are three 8's

3. 2^4 ; there are four 2's

5. 3^5 ; there are five 3's

7. 10^5 ; there are five 10's

9. 8×8

11. $-3 \times 3 \times 3 \times 3 \times 3$

13. $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$

15. $5 \times 5 \times 5 \times 5 \times 5$

17. $-243; -3 \times 3 \times 3 \times 3 \times 3$

19. $64; 4 \times 4 \times 4$

21. $0.09; 0.03 \times 0.03$

23. $42.875; 3.5 \times 3.5 \times 3.5$

25. 4; since $4^2 = 16$

27. 11; since $11^2 = 121$

29. $-4; \sqrt[3]{(-64)} = \sqrt[3]{-4 \times -4 \times -4}$

31. $2; \sqrt[5]{32} = \sqrt[5]{2 \times 2 \times 2 \times 2 \times 2}$

33. $0.4; \sqrt{0.16} = \sqrt{0.4 \times 0.4}$

35. $0.3; \sqrt{0.09} = \sqrt{0.3 \times 0.3}$

37. 108, $(27)(4)$

39. $-4500; -125 \times 36$

2. 4^5 ; there are five 4's

4. 5^3 ; there are three 5's

6. 12^3 ; there are three 12's

8. 6^8 ; there are eight 6's

10. $-2 \times -2 \times -2 \times -2 \times -2$

12. $-4 \times 4 \times 4$

14. $10 \times 10 \times 10 \times 10$

16. $6 \times 6 \times 6 \times 6 \times 6$

18. $128; 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

20. $-1296; -6 \times 6 \times 6 \times 6$

22. $-144; -12 \times 12$

24. $0.000512; 0.08 \times 0.08 \times 0.08$

26. 9; since $9^2 = 81$

28. 20; since $20^2 = 400$

30. $2; \sqrt[4]{16} = \sqrt[4]{2 \times 2 \times 2 \times 2}$

32. -3.11 ; rounded to hundredths

34. $0.9; \sqrt{0.81} = \sqrt{0.9 \times 0.9}$

36. $1.1; \sqrt{1.21} = \sqrt{1.1 \times 1.1}$

38. $-1600; 25 \times -64$

40. $3,430,000; (343)(10,000)$

41. $891; (11)(81)$

42. $768; 12(64)$

43. 0.637

44. 2.45

45. $70,000 \text{ J}; 7(10,000)$

46. $2,000,000,000 \text{ cycles/s}$

47. $\frac{15}{4} \text{ or } 3.75; \frac{\sqrt{225}}{4}$

48. $22 \text{ in}; \sqrt{484}$

49. $\$10,737,418.24; 2^{30} \div 100$

50. $\$2,514.48; 2,000(1.0425)^{5.5}$

51. $484 \text{ ft}; 16(5.5)^2$

52. $512 \text{ in}^3; (8 \text{ in})^3$

53. $125.340; (0.586)^2 (365)$

54. $4.6 \text{ Ohms}; \sqrt{(5.4)^2 - (2.8)^2} = \sqrt{21.32}$

55. $27 \text{ in}; \sqrt{(20.4)^2 - (17.5)^2} = \sqrt{722.41}$

56. $20\%; 100\left(1 - \sqrt{\frac{20,480}{32,000}}\right) = 100(1 - 0.8) = 100(0.2)$

1.5 Order of Operations

1. $4 - (-8)(2)$

$4 - -16$

20

2. $-6 + (-3)(-9)$

$-6 + 27$

21

3. $(7.95 \times 10^4)(8.54 \times 10^{-3})$

$67.893 \times 10^{4+-3}$

67.893×10^1

$6.7893 \times 10^{1+1}$

6.7893×10^2

4. $-1 + \frac{18}{-9}$

$-1 + -2$

-3

5. $(-1)(7) + (-6)(7)$

$-7 + -42$

-49

6. $(-5)(8) - \frac{15}{3}$

$-40 + 5$

-35

7. $\frac{-22}{2} - (5)(-2)$

$-11 + 10$

-1

8. $(3)(-10) + (-12)(5)$

$-30 + -60$

-90

9. $(-8)(9) - \frac{-9}{3}$

$-72 + 3$

-69

10. $\frac{-60}{4} + (-1)(-9)$

$-15 + 9$

-6

8 Chapter1 Signed Numbers

$$11. \frac{-18}{2} - \frac{24}{-6}$$
$$-9 + 4$$
$$-5$$

$$12. \frac{40}{-5} - \frac{-90}{15}$$
$$-8 + 6$$
$$-2$$

$$13. (-7)(15) - (-1)^2$$
$$-105 - 1$$
$$-106$$

$$14. (-6)(4) - (-2)^2$$
$$-24 - 4$$
$$-28$$

$$15. 4^2 - 2(3) \div (4 - 2)$$
$$16 - 2(3) \div 2$$
$$16 - 6 \div 2$$
$$16 - 3$$
$$13$$

$$16. -(-9) + (-5)^3$$
$$9 + -125$$
$$-116$$

$$17. -2(-9) - (-1)^4 + \frac{-18}{6}$$
$$18 - 1 + -3$$
$$17 + -3$$
$$14$$

$$18. -3(7) + (-3)^3 + \frac{-48}{4}$$
$$-21 + 27 + -12$$
$$-60$$

$$19. \frac{6 + 7 \times 2}{10 - 7}$$
$$\frac{6 + 14}{10 - 7}$$
$$\frac{20}{3}$$

$$20. (-3 + 5)^2 + 3(-4) - 5$$
$$2^2 + 3(-4) - 5$$
$$4 + -12 - 5$$
$$-8 - 5$$
$$-13$$

$$21. -20 \div -5 + 36 \div -4$$
$$4 + -9$$
$$-5$$

$$22. 2^2(5)^2 + (-3 + 1)(2)$$
$$4(25) + (-2)(2)$$
$$100 + -4$$
$$96$$

$$23. 120 - (8)(3) + 12$$
$$120 - 24 + 12$$
$$108$$

$$24. \sqrt{5^2 + (-12)^2}$$
$$\sqrt{25 + 144}$$
$$\sqrt{169}$$
$$13$$

$$25. \frac{6(14 - 20)}{3(5) - 6}$$
$$\frac{6(-6)}{15 - 6}$$
$$\frac{-36}{9}$$
$$-4$$

$$26. 3(4^2 + 1) - 30 \div 3$$
$$3(16 + 1) - 30 \div 3$$
$$3(17) - 30 \div 3$$
$$51 - 10$$
$$41$$

$$27. \begin{aligned} 26 + 8 \div 2^3 - 3(-3) \\ 26 + 8 \div 8 - 3(-3) \\ 26 + 1 + 9 \\ 36 \end{aligned}$$

$$28. \begin{aligned} \frac{4(6+2) + (-8+3)}{6(2-4) - 2^2} \\ \frac{4(8) + -5}{6(-2) - 4} \\ \frac{32 + -5}{-12 - 4} \\ \frac{27}{-16} \end{aligned}$$

$$29. \begin{aligned} -1000 \text{ ft} \times 4 + 500 \text{ ft} \times 6 \\ -4000 \text{ ft} + 3000 \text{ ft} \\ -1000 \text{ ft} \end{aligned}$$

$$30. \begin{aligned} 2^\circ \text{ F} \times 5 - 3^\circ \text{ F} \times 10 \\ 10 - 30 \\ -20^\circ \text{ F} \end{aligned}$$

$$31. \begin{aligned} \frac{-9.75 \times 4^2}{2} \\ \frac{-156}{2} \\ -78 \text{ m} \end{aligned}$$

$$32. \begin{aligned} F &= \frac{9C}{5} + 32 \\ F &= \frac{9 \times 27}{5} + 32 \\ F &= \frac{243}{5} + 32 \\ F &= 80\frac{2}{5} \text{ or } 80.6 \end{aligned}$$

$$33. \begin{aligned} \frac{102(18.05 - 15.02)}{15.02 - 8.33} \\ \frac{102(3.03)}{6.69} \\ \frac{309.06}{6.69} \\ 46.197 \end{aligned}$$

$$34. \begin{aligned} 15(20) + 32^2 + (32 - 6)(10) \\ 300 + 1024 + 260 \\ 1584 \text{ ft}^2 \end{aligned}$$

$$35. \begin{aligned} 2000 - 120 \times 6 + 300(4) \\ 2000 - 720 + 1200 \\ 2480 \text{ gal} \end{aligned}$$

$$36. \begin{aligned} 325 - 0.15 \times 12 + 0.05(6) \\ 3.25 - 1.8 + 0.3 \\ 1.75 \text{ mA} \end{aligned}$$

$$37. 15 \div (10 - 7) - (-2 \div -1) = 3$$

$$38. (-3) \wedge 4 \div (8 - 2) - 36 \div -4 = 22.5$$

$$39. 5 \wedge 4 \div (6 - 8) + (9 - 4) \div 3 \wedge 2 = -311.94$$

$$40. (2 - 5) \div (6 - 18) - (4 \wedge 3 - 3 \wedge 4) \div (53 - 70) = -0.75$$

$$41. (-2) \wedge 6 - 3 \wedge 6 - [(-2) \wedge 5 - 2 \wedge 3] \div (-2 \times -2 \times 5) = -663$$

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1.6 Scientific Notation

1. $4 \times 1,000,000 = 4,000,000$

2. $3.8 \times 1,000,000,000 = 3,800,000,000$

3. $8 \times \frac{1}{100} = 0.08$

4. $7.03 \times \frac{1}{100,000,000,000} = 0.0000000000703$

5. $2.17 \times 1 = 2.17$

6. $7.93 \times \frac{1}{10} = 0.793$

7. $3.65 \times \frac{1}{1000} = 0.00365$

8. $8.04 \times 1000 = 8,040$

9. 3.000×10^3 ; moved the decimal point 3 places to the left

10. 4.2×10^5 ; moved the decimal point 5 places to the left

11. 7.6×10^{-2} ; moved the decimal point 2 places to the right

12. 2.9×10^{-3} ; moved the decimal point 3 places to the right

13. 7.04×10^{-1} ; moved the decimal point 1 places to the right

14. 1.08×10^{-2} ; moved the decimal point 2 places to the right

15. 9.21×10^0

16. 1.03×10^1 ; moved the decimal point 1 place to the left

17. 5.3×10^{-5} ; moved the decimal point 5 places to the right

18. 1.006×10^6 ; moved the decimal point 6 places to the left

19. 2.010×10^9 ; moved the decimal point 9 places to the left

20. 4.923×10^{-4} ; moved the decimal point 4 places to the right

21. $(6.7 \times 10^3)(2.32 \times 10^4)$

$15.544 \times 10^{3+4}$

15.544×10^7

$1.5544 \times 10^{7+1}$

1.5544×10^8

22. $(4.851 \times 10^4) + (9.7 \times 10^3)$

$(4.851 \times 10^4) + (0.97 \times 10^{3+1})$

5.821×10^4

$$23. (1.53 \times 10^{-2})(6.08 \times 10^{-1})$$

$$9.3024 \times 10^{-2+-1}$$

$$9.3024 \times 10^{-3}$$

$$24. (7.95 \times 10^4)(8.54 \times 10^{-3})$$

$$67.893 \times 10^{4+-3}$$

$$67.893 \times 10^1$$

$$6.7893 \times 10^{1+1}$$

$$6.7893 \times 10^2$$

$$25. 725 - 12.50(40)$$

$$725 - 500$$

$$225$$

$$\frac{225}{18.75} = 12 \text{ hour overtime}$$

$$26. \frac{3.74 \times 10^3}{8.05 \times 10^7}$$

$$0.464596 \times 10^{3-7}$$

$$0.464596 \times 10^{-4}$$

$$4.65 \times 10^{-4-1}$$

$$4.65 \times 10^{-5}$$

$$27. \frac{1.86 \times 10^{-2}}{6.65 \times 10^{-5}}$$

$$0.2797 \times 10^{-2-(-5)}$$

$$0.2797 \times 10^3$$

$$2.797 \times 10^{3-1}$$

$$2.797 \times 10^2$$

$$28. (6.4 \times 10^{-3}) - (4.2 \times 10^0)$$

$$(0.0064 \times 10^0) - (4.2 \times 10^0)$$

$$-4.1936 \times 10^0$$

$$29. (1.037 \times 10^5) + (8.364 \times 10^3)$$

$$(1.037 \times 10^5) - (0.08364 \times 10^5)$$

$$1.12 \times 10^5$$

$$30. \frac{5.82 \times 10^{-5}}{8.635 \times 10^3}$$

$$0.674 \times 10^{-8}$$

$$6.74 \times 10^{-9}$$

$$31. \frac{3.85 \times 10^{-5}}{9.03 \times 10^{-7}}$$

$$0.426 \times 10^2$$

$$4.26 \times 10^1$$

$$32. \frac{(6.8 \times 10^0)(8.04 \times 10^6)}{4.2 \times 10^6}$$

$$\frac{54.672 \times 10^6}{4.2 \times 10^6}$$

$$13.01714 \times 10^0$$

$$1.30 \times 10^1$$

$$33. \frac{(7.53 \times 10^{-2})(7.39 \times 10^4)}{8.11 \times 10^{-5}}$$

$$\frac{55.6467 \times 10^2}{8.11 \times 10^{-5}}$$

$$6.86 \times 10^7$$

$$34. 1.75 \times 10^4 \text{ mph}$$

$$35. 9.1 \times 10^{-28} \text{ g}$$

$$36. 6.5 \times 10^{-7} \text{ m}$$

$$37. 5 \times 10^4 = 5 \times 10,000 = 50,000 \text{ lb}$$

$$38. 0.0000000015 \text{ s}$$

$$39. 3.6 \times 10^8 \text{ km}^2$$

$$40. 5 \times 10^{-5} \text{ F}$$

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41. $0.00000000000016 \text{ W}$

42. $3.6 \times 10^7 \text{ mi}$

43. $7.10 \times 10^8 \text{ yr}$

44. $0.000000000010 \text{ W/m}^2$

45. $6.0 \times 10^{-19} \text{ J}$

46. $40,000,000,000 \text{ bytes}$

47. $f = \frac{3.00 \times 10^{10}}{4.95 \times 10^2}$

$f = 0.6061 \times 10^8$

$f = 6.061 \times 10^7 \text{ Hz}$

48. $4.83 \times 10^3 + 2.47 \times 10^4 + 3.77 \times 10^5$

$406,530 = 4.0653 \times 10^5 \Omega$

49. $P = (3.75 \times 10^{-3})(7.24 \times 10^{-4})$

$P = 27.15 \times 10^{-7}$

$P = 2.715 \times 10^{-6}$

50. $(8.0 \times 10^{12})(2.0 \times 10^{-10})$

16×10^2

$1.6 \times 10^3 \text{ s}$

51. $(3.0 \times 10^8)(2.0 \times 10^{-13})$

6×10^{-5}

52. $\frac{5000}{299,792.458} = 0.01668$

$1.668 \times 10^{-2} \text{ s}$

53. $(2.5 \times 10^8)(2.6 \times 10^1)$

$6.5 \times 10^9 \text{ gal}; 6,500,000,000 \text{ gal}$

54. $(1.0735 \times 10^{12})(7.6 \times 10^{-2})$

$8.1586 \times 10^{10} \text{ gal}; 81,586,000,000 \text{ gal}$

1.7 Problem Solving Strategies

1. $\frac{390 \text{ mi}}{65 \text{ mi/hr}} = 6 \text{ hr}$

2. A car registers two counts and a truck registers 3 counts

0 cars 15 trucks

3 cars 13 trucks

6 cars 11 trucks

9 cars 9 trucks

12 cars 7 trucks

15 cars 5 trucks

18 cars 3 trucks

21 cars 1 truck

3. $\frac{20 \text{ breaths}}{\text{min}} \times 60 = 1200 \text{ breaths/h}$

$1200 \times 0.5 \text{ L} = 600 \text{ L}$

4. If it takes 30 seconds to go from the 1st floor to the 3rd floor

then it takes 15 seconds to go from 1st to second and

15 seconds to go from 2nd to 3rd.

So it is 15 seconds from floor to floor.

So to go from 1st to 6th, it would take:

$15 \text{ s} \times 5 = 75 \text{ s}$

$$5. \text{ The mean} = \bar{X} = \frac{\sum X}{n}$$

$$69 = \frac{550 + 2X}{10}$$

$$690 = 550 + 2X$$

$$140 = 2X$$

$$70 = X$$

Each student scored a 70 on the test

$$6. \text{ It will take you } \frac{1232 \text{ pages}}{11 \text{ pg/h}} = 112 \text{ h to read the book}$$

You have 5 days or 120 h until the book must be read

120 h - 112 h would only give you 8 h left

No, you will not be able to finish the book before the exam

7. The flagpole and rope form a right triangle with the rope being the hypotenuse. Since the hypotenuse cannot equal a leg, the flagpoles have 0 ft between them.

8. $\$700 - \$600 = \$100$ profit after first transaction

$\$900 - \$800 = \$100$ profit after second transaction

So total profit is $\$200$

9. There are 280 cat owners. So $416 - 280 = 136$

$$10. 0.08x + 0.07(20,000 - x) = 1500$$

$$0.08x + 1400 - 0.07x = 1500$$

$$0.01x + 1400 = 1500$$

$$0.01x = 100$$

$$x = \$10,000 \text{ in each}$$

Review Exercises

1. $4 + -6 = -2$; adding unlike signs

2. $-6 + -2 = -8$; adding like signs

3. $-5 - 8 = -13$

4. $-3 - -7 = 4$

5. -63 ; odd number of negatives

6. 96 ; even number of negatives

7. 9 ; even number of negatives

8. -8 ; odd number of negatives

9. $(-3) - (-9) + 4$

$$-3 + 9 + 4$$

$$6 + 4$$

$$10$$

10. $10 + (-4) - (-7)$

$$6 - (-7)$$

$$13$$

11. $9 - 2 - (-12)$

$$7 - (-12)$$

$$19$$

12. $-6 - 5 + -8$

$$-11 + -8$$

$$-19$$

13. $(-2)(-6)(8)$

$$96$$

14. $(-1)(4)(7)$

$$-28$$

15. -60 ; odd number of negatives

16. -360 ; odd number of negatives

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$$17. \frac{30}{3} = 10$$

$$18. \frac{-56}{-14} = 4$$

$$19. \frac{-72}{12} = -6$$

$$20. \frac{-72}{12} = -6$$

$$21. (-4)^4 = -4 \times -4 \times -4 \times -4 = 256$$

$$22. (-7)^3 = -7 \times -7 \times -7 = -343$$

$$23. \frac{225}{45} = 5$$

$$24. \frac{384}{48} = 8$$

$$25. -8 + 3 + 5 \\ -5 + 5 \\ 0$$

$$26. -10 - 3 + 4 \\ -13 + 4 \\ -9$$

$$27. \frac{6}{-6} + -8 + 2 \\ -1 + -8 + 2 \\ -9 + 2 \\ -7$$

$$28. -5 - 10 - 2 \\ -15 - 2 \\ -17$$

$$29. 7 + 12 - 9 \\ 19 - 9 \\ 10$$

$$30. -4 + 4 - 16 \\ 0 - 16 \\ -16$$

$$31. -\frac{6}{-6} + -8 - 3^2 \\ 1 + -8 - 9 \\ -16$$

$$32. -5 + 7 - 16 - 1 \\ 2 - 16 - 1 \\ -14 - 1 \\ -15$$

$$33. 9 - 13 \\ -4$$

$$34. 5 - -64 \\ 69$$

$$35. \frac{6+14}{10-7} \\ \frac{20}{3} \text{ or } 6.\bar{6}$$

$$36. 2^2 + -12 - 5 \\ 4 + -12 - 5 \\ -8 - 5 \\ -13$$

$$37. 4 + -9 \\ -5$$

$$38. 2.05 \times 10^5$$

$$39. 9.805 \times 10^9$$

$$40. 4.005 \times 10^3$$

$$41. 3.5 \times 10^{-4}$$

$$42. 7.5 \times 10^{-7}$$

$$43. 7.07 \times 10^{-1}$$

$$44. 47,000$$

45. 302,000,000

46. 831.9

47. 0.00187

48. 0.0000000077

49. 0.0000000000091

50. $(1.93 \times 10^6) + (1.71 \times 10^6)$
 3.64×10^6

51. $(3.06 \times 10^4) + (4.07 \times 10^6)$
 $(0.0306 \times 10^6) + (4.07 \times 10^6)$
 4.1006×10^6

52. $(5.6 \times 10^{-1}) - (2.8 \times 10^{-3})$
 $(560 \times 10^{-3}) + (2.8 \times 10^{-3})$
 557.2×10^{-3}
 5.572×10^{-1}

53. $(7.3 \times 10^7)(3.5 \times 10^{-11})$
 25.55×10^{-4}
 2.555×10^{-3}

54. $\frac{1.45 \times 10^{10}}{1.25 \times 10^{-7}}$
 1.16×10^{17}

55. $6 \text{ qt} - 3 \text{ qt} + 2 \text{ qt} = 5 \text{ qt}$

56. $2000 - 5000 = -3000 \text{ AD}$

57. $4 + 22 = 26 \text{ ft}$

58. $2 - 1 - 3 - 2 = -4$

59. $-0.1\% + 0.3\% - 0.4\% = -0.2\%$

60. $\$800 - \$45(8) = \$440$

61. $\frac{990,000}{600} = 1650$

62. $\frac{5.96 + 6.3918}{11.89}$
 $\frac{12.3518}{11.89}$
1.0388

63. $-8 - 2(4) + 3(3)$
 -7 C

64. $300,000 \text{ m/s} \times 0.25 \text{ s} = 75,000,000 \text{ s}$

65. $\frac{87,600,000 \text{ mi}}{180,000 \text{ mi/s}} = 487 \text{ s}$

66. 1.6735×10^{-24} ; hydrogen atom
 2.6561×10^{-23} ; oxygen atom
hydrogen atom is smaller
 $(2.6561 \times 10^{-23}) - (1.6735 \times 10^{-24})$
 $(2.6561 \times 10^{-23}) - (0.16735 \times 10^{-23})$
 2.48875×10^{-23}

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Chapter Test

1. $-3 + -5 = -8$

3. $-8 - 3 = -11$

5. $7 - (4 - 2) - 1$
 $7 - 2 - 1$
4

7. 3; even number of negatives

9. $-3 + 2^3 - 7$
 $-3 + 8 - 7$
-2

11. $(12.25 + 342.7405928)^3$
 $(354.9905928)^3$
44,735,318.5

13. 1.7×10^{-12}

15. 0.000000035

17. $(4.5 \times 10^{-4}) + (5.9 \times 10^{-2})$
 $(0.045 \times 10^{-2}) + (5.9 \times 10^{-2})$
 5.945×10^{-2}

19. $(2.46 \times 10^{-6})(5.9 \times 10^{-3})$
 14.514×10^{-9}
 1.4514×10^{-8}

21. $-5 + 7 + 9 - 5 + 15 + 4 - 6 + 20 - 1 + 5 = 43$ yd gain

22. $\frac{4.1601 \times 10^{20}}{6.2415 \times 10^{18}}$
 0.666522×10^2
66.65 coulombs

2. $-2 + 7 = 5$

4. 24; even number of negatives

6. $\left(\frac{-1}{2}\right)^3 = \frac{-1}{2} \times \frac{-1}{2} \times \frac{-1}{2} = \frac{-1}{8}$

8. $12 - 8(4 + 1)$
 $12 - 8(5)$
 $12 - 40$
-28

10. $\frac{(4.55)^2 - \sqrt{27}}{(3.2)^3}$
 $\frac{20.7025 - 5.196152423}{32.768}$
0.47

12. $\sqrt{(3.4^3 + 100)}$
 $\sqrt{(39.304 + 100)}$
 $\sqrt{139.304}$
11.8

14. 5.67×10^6

16. 12,400

18. $(4.92 \times 10^4) - (3.21 \times 10^3)$
 $(4.92 \times 10^4) - (0.321 \times 10^4)$
 4.599×10^4

20. $\frac{2.29 \times 10^7}{7.328 \times 10^{-2}}$
 0.3125×10^9
 3.125×10^8

23. $725 - 12.50(40)$
 $725 - 500$
225
 $\frac{225}{18.75} = 12$ hour overtime