Complete Solutions Manual
to Accompany

PreStatistics

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Chapter 1 Arithmetic Operations Used in Statistics

Section 1.1 Rounding Numbers

Quick Check Exercises (1 – 14)

1. $0.528376 \approx 0.5284$
2. $0.3826184 \approx 0.382618$
3. $0.4572675 \approx 0.457$
4. $0.4977336 \approx 0.497734$
5. $20.479 \uparrow 21$
6. $166.551 \uparrow 167$
7. $1312.996 \uparrow 1313$
8. $3179 \uparrow 3179$
9. $106{,}294 \approx 110{,}000$
10. $6{,}942{,}060 \approx 7{,}000{,}000$
11. $72{,}195{,}589 \approx 72{,}200{,}000$
12. $309{,}462 \approx 309{,}000$
13. 0.0165 pound ≈ 0.02 pound; The weight of a one euro coin is approximately 0.02 pound.
14. $11{,}536{,}504 \approx 12{,}000{,}000$; The population of Ohio in 2014 was approximately 12,000,000 people.

Exercises (1 – 60)

1. $15.542 \approx 15.5$
2. $9.835 \approx 9.8$
3. $62.061 \approx 62.1$
4. $31.281 \approx 31.3$
5. $16.953 \approx 17.0$
6. $92.981 \approx 93.0$
7. $0.39915 \approx 0.399$
8. $0.98744 \approx 0.987$
9. $0.00494 \approx 0.005$
10. $0.00149 \approx 0.001$
11. $0.19957 \approx 0.200$
12. $0.10462 \approx 0.105$
13. $1.5658 \approx 1.57$
14. $8.8961 \approx 8.90$
15. $0.6211964 \approx 0.6212$
16. $0.4894485 \approx 0.4895$
17. $0.005555 \approx 0.006$
18. $0.077777 \approx 0.078$
19. $0.00028546 \approx 0.000285$
20. $0.000654821 \approx 0.000655$
21. $35.025 \uparrow 36$
22. $144.0019 \uparrow 145$
23. $952 \uparrow 952$
24. $1622 \uparrow 1622$
25. $83.9652 \uparrow 84$
26. $71.00015 \uparrow 72$
27. $49 \uparrow 49$
28. $82 \uparrow 82$
29. $50.151101 \uparrow 51$
30. $28.017 \uparrow 29$
31. $6258 \approx 6000$
32. $9487 \approx 9000$

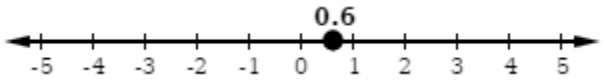
33. 91,565 ≈ 92,000
34. 18,711 ≈ 19,000
35. 125,732 ≈ 126,000
36. 259,783 ≈ 260,000
37. 665,280 ≈ 665,000
38. 95,040 ≈ 95,000
39. 125,970 ≈ 126,000
40. 77,520 ≈ 78,000
41. 1697 ≈ 1700
42. 6595 ≈ 6600
43. 2525 ≈ 3000
44. 3607 ≈ 4000
45. 615,995 ≈ 620,000
46. 177,100 ≈ 180,000
47. 17,100,720 ≈ 17,100,000
48. 27,518,000 ≈ 27,500,000
49. 30,045,015 ≈ 30,000,000
50. 14,307,150 ≈ 14,000,000
51. 4.57 mm ≈ 4.6 mm
52. 4.45 mm ≈ 4.5 mm
53. 0.0016970 28 fluid ounce ≈ 0.00170 fluid ounce
54. 0.00001807 79 pound ≈ 0.00001808 pound
55. 5,308,483 ≈ 5,300,000
56. 5,310,763 ≈ 5,300,000
57. 36,525 ≈ 37,000
58. 24,772 ≈ 25,000
59. 3768 km ≈ 3800 km
60. 6992 km ≈ 7000 km

Section 1.2 Types of Numbers and the Number Line

Quick Check Exercises (1 – 26)

1. 2.8913: rational, real
2. 12: natural, whole, integer, rational, real
3. 1.62818. .. : irrational, real
4. −12: integer, rational, real
5. $5.65\overline{65}$: rational, real
6. $\frac{\sqrt{2}}{2}$: irrational, real

7.



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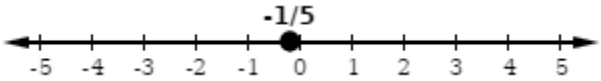

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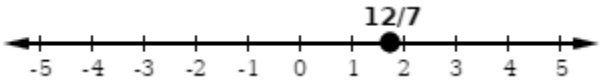

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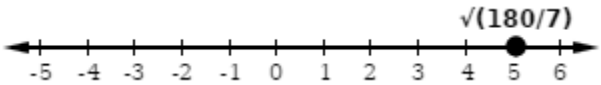
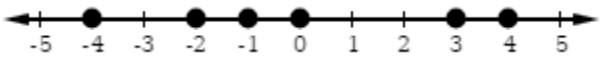
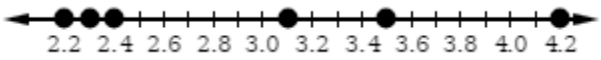


11. $-2.1 < \boxed{-1.9} < 3.2$, yes
12. $-2.1 < \boxed{-2.01} < 3.2$, yes
13. $-2.1 < \boxed{3.15} < 3.2$, yes
14. $-2.1 < 3.2 < \boxed{3.21}$, no
15. $distance = b - a = 2 - (-3) = 2 + 3 = 5$
16. $distance = b - a = 7 - (-4) = 7 + 4 = 11$
17. $distance = rightmost\ number - leftmost\ number = x - z = 7.3 - 2.9 = 4.4$
18. $distance = rightmost\ number - leftmost\ number = x - z = 6.8 - 3.1 = 3.7$
19. $-4, -2, -1, 0, 3, 4$

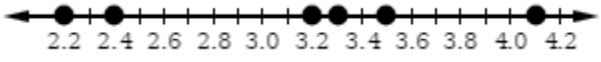


20. $-3, -2, -1, 0, 1, 2$

21. 2.2, 2.3, 2.4, 3.1, 3.5, 4.2



22. 2.2, 2.4, 3.2, 3.3, 3.5, 4.1



23. Flipping through channels while watching TV can be described by a natural number $\mathbb{N}$ and is classified as discrete.
24. The height of a child as he ages is given by a real number $\mathbb{R}$ and is classified as continuous.

25. The body fat percentage of a person as she exercises over time is given by a real number $\mathbb{R}$ and is classified as continuous.
26. Numbering of the Super Bowls is given by a natural number $\mathbb{N}$ and is classified as discrete.

Exercises (1 – 70)

1. False. Every integer can be written as a rational number.
2. False. The smallest whole number is 0.
3. True.
4. True.
5. False. Every negative number is a real number which can be either an integer, a rational number, or an irrational number.
6. False. Every fraction is a real number which can be either rational or irrational.
7. Natural numbers: $\sqrt{4}, 7, 9$
8. Whole numbers: $0, \sqrt{4}, 7, 9$
9. Integers: $-8, 0, \sqrt{4}, 7, 9$
10. Rational numbers: $-8, 0, \frac{2}{11}, \sqrt{4}, 7, 9$
11. Irrational numbers: $3.14159265 \ldots, \sqrt{14}$
12. Real numbers: $-8, 0, \frac{2}{11}, \sqrt{4}, 3.14159265 \ldots, \sqrt{14}, 7, 9$
13. b
14. c
15. d
16. a
17. c
18. a
19. c
20. a
21. d
22. c
23. b
24. a
25. $-4.51 < \boxed{-3.01} < 2.11$; yes
26. $-4.51 < 2.11 < \boxed{3.01}$; no
27. $-4.51 < 2.11 < \boxed{2.13}$; no
28. $-4.51 < \boxed{-2.13} < 2.11$; yes
29. $-4.51 < \boxed{0} < 2.11$; yes
30. $-4.51 < 2.11 < \boxed{5}$; no
31. $-4.51 < \boxed{2.10} < 2.11$; yes
32. $\boxed{-4.52} < -4.51 < 2.11$; no
33. $\boxed{-0.55} < 1.03 < 6.58$; no
34. $\boxed{-1.01} < 1.03 < 6.58$; no
35. $\boxed{0} < 1.03 < 6.58$; no
36. $1.03 < 6.58 < \boxed{8}$; no
37. $1.03 < \boxed{1.04} < 6.58$; yes
38. $1.03 < \boxed{1.05} < 6.58$; yes
39. $1.03 < \boxed{6.56} < 6.58$; yes
40. $1.03 < \boxed{6.57} < 6.58$; yes

41. $distance = rightmost\ number - leftmost\ number = 18 - 4 = 14$
42. $distance = rightmost\ number - leftmost\ number = 15 - 6 = 9$
43. $distance = rightmost\ number - leftmost\ number = 12 - (-6) = 12 + 6 = 18$
44. $distance = rightmost\ number - leftmost\ number = 11 - (-5) = 11 + 5 = 16$
45. $distance = rightmost\ number - leftmost\ number = 18.9 - 6.3 = 12.6$
46. $distance = rightmost\ number - leftmost\ number = 14.4 - 3.7 = 10.7$
47. $distance = rightmost\ number - leftmost\ number = \frac{1}{2} - \frac{1}{6} = \frac{1 \cdot 3}{2 \cdot 3} - \frac{1}{6} = \frac{3}{6} - \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$
48. $distance = rightmost\ number - leftmost\ number = \frac{7}{8} - \frac{3}{4} = \frac{7}{8} - \frac{3 \cdot 2}{4 \cdot 2} = \frac{7}{8} - \frac{6}{8} = \frac{1}{8}$
49. $distance = rightmost\ number - leftmost\ number = 61.284 - 55.236 = 6.048$
50. $distance = rightmost\ number - leftmost\ number = 22.685 - 17.684 = 5.001$
51. $6, 9, 11, 13, 15, 16$
52. $1, 2, 4, 7, 8, 9$
53. $-5, -4, -2, 0, 4, 5$
54. $-6, -3, -2, 1, 4, 6$
55. $-20, -19, -18, -17, -15, -10$
56. $-10, -8, -7, -5, -3, -1$
57. $101, 104, 106, 108, 110, 120$
58. $43, 44, 46, 51, 52, 69$
59. $-1.6, -1.4, -0.5, 0.6, 1.2, 1.7$
60. $-2.8, -2.1, -0.3, 0.5, 0.8, 1.4$
61. Natural numbers between 1 and 5, including 1 and 5; discrete
62. Whole numbers from 0 onward; discrete
63. Real numbers; continuous
64. Real numbers; continuous (Note: pace of runner = average speed of runner)
65. Whole numbers; discrete
66. Whole numbers; discrete (Note that there were several years after independence that there was no president, so 0 would be included.)
67. Real numbers; continuous

68. Rational numbers; discrete
69. Real numbers; continuous
70. Real numbers; continuous

Section 1.3 Fractions, Decimals, and Percentages

Quick Check Exercises (1 – 17)

1. $\frac{9}{18} = 9 \div 18 = 0.5$
2. $\frac{12}{36} = 12 \div 36 = 0.333\overline{3} \approx 0.333$
3. $\frac{4}{11} = 4 \div 11 = 0.3\overline{636} \approx 0.364$
4. $\frac{7}{49} = 7 \div 49 \approx 0.1428\ldots \approx 0.143$
5. $0.258 \times 100 = 25.8\% \approx 26\%$
6. $0.678 \times 100 = 67.8\% \approx 68\%$
7. $0.008 \times 100 = 0.8\% \approx 1\%$
8. $0.8 \times 100 = 80\%$
9. $\frac{5}{8} = 5 \div 8 = 0.625 = 62.5\% \approx 63\%$
10. $\frac{11}{16} = 11 \div 16 = 0.6875 = 68.75\% \approx 69\%$
11. $\frac{60}{128} = 60 \div 128 = 0.46875 = 46.875\% \approx 47\%$
12. $\frac{138}{512} = 138 \div 512 = 0.2695\ldots \approx 26.95\% \approx 27\%$
13. $42.3\% = 42.3 \div 100 = 0.423$
14. $78.8\% = 78.8 \div 100 = 0.788$
15. $23\% = 23 \div 100 = 0.23$
16. $33\% = 33 \div 100 = 0.33$
17. $\frac{25{,}722}{205{,}776} = 0.125 = 12.5\%$

Exercises (1 – 50)

1. $\frac{5}{13} = 5 \div 13 = 0.3846 \ldots \approx 0.385$
2. $\frac{2}{7} = 2 \div 7 = 0.2857 \ldots \approx 0.286$
3. $\frac{9}{23} = 9 \div 23 = 0.3913 \ldots \approx 0.391$
4. $\frac{10}{16} = 10 \div 16 = 0.625$
5. $\frac{11}{23} = 11 \div 23 = 0.4782 \ldots \approx 0.478$
6. $\frac{18}{21} = 18 \div 21 = 0.8571 \ldots \approx 0.857$
7. $\frac{15}{210} = 15 \div 210 = 0.0714 \ldots \approx 0.071$
8. $\frac{16}{252} = 16 \div 252 = 0.0634 \ldots \approx 0.063$
9. $\frac{116}{120} = 116 \div 120 = 0.966\overline{6} \approx 0.967$
10. $\frac{40}{45} = 40 \div 45 = 0.888\overline{8} \approx 0.889$
11. $0.31 = 31\%$
12. $0.49 = 49\%$
13. $0.192 = 19.2\% \approx 19\%$
14. $0.454 = 45.4\% \approx 45\%$
15. $0.009 = 0.9\% \approx 1\%$
16. $0.003 = 0.3\% \approx 0\%$
17. $0.955 = 95.5\% \approx 96\%$
18. $0.699 = 69.9\% \approx 70\%$
19. $0.631 = 63.1\% \approx 63\%$
20. $0.844 = 84.4\% \approx 84\%$
21. $\frac{2}{10} = 0.2 = 20\%$
22. $\frac{19}{50} = 0.38 = 38\%$
23. $\frac{6}{56} \approx 0.1071 \approx 11\%$
24. $\frac{8}{75} \approx 0.106\overline{6} \approx 11\%$
25. $\frac{56}{60} \approx 0.933\overline{3} \approx 93\%$
26. $\frac{10}{12} \approx 0.833\overline{3} \approx 83\%$
27. $\frac{96}{252} \approx 0.3809 \approx 38\%$
28. $\frac{216}{220} \approx 0.9818 \approx 98\%$
29. $\frac{495}{924} \approx 0.5357 \approx 54\%$
30. $\frac{455}{1365} \approx 0.333\overline{3} \approx 33\%$
31. $48\% = 48 \div 100 = 0.48$
32. $84\% = 84 \div 100 = 0.84$
33. $12.6\% = 12.6 \div 100 = 0.126$
34. $87.1\% = 87.1 \div 100 = 0.871$
35. $55.5\% = 55.5 \div 100 = 0.555$
36. $77.7\% = 77.7 \div 100 = 0.777$
37. $9\% = 9 \div 100 = 0.09$
38. $2\% = 2 \div 100 = 0.02$
39. $0.6\% = 0.6 \div 100 = 0.006$
40. $0.3\% = 0.3 \div 100 = 0.003$
41. $0.08\% = 0.08 \div 100 = 0.0008$
42. $0.01\% = 0.01 \div 100 = 0.0001$
43. $\frac{5}{16} = 0.3125 \approx 31.3\%$
44. $\frac{8}{11} \approx 0.727\overline{2} \approx 72.7\%$
45. $\frac{7}{8} = 0.875 \approx 88\%$
46. $\frac{7}{23} \approx 0.3043 \approx 30\%$

47. $\frac{13}{16} = 0.8125 \approx 81.3\%$

48. $\frac{5}{16} = 0.3125 \approx 31.3\%$

49. $\frac{4}{15} \approx 0.266\overline{6} \approx 27\%$

50. $\frac{3}{120} = 0.025 \approx 3\%$

Section 1.4 Operations with Fractions

Quick Check Exercises (1 – 20)

1. Proper

2. Proper

3. Improper

4. Improper

5. $\frac{52}{80} = \frac{13 \cdot 4}{20 \cdot 4} = \frac{13}{20}$

6. $\frac{21}{66} = \frac{7 \cdot 3}{22 \cdot 3} = \frac{7}{22}$

7. $\frac{159}{42} = \frac{53 \cdot 3}{14 \cdot 3} = \frac{53}{14}$

8. $\frac{84}{70} = \frac{6 \cdot 14}{5 \cdot 14} = \frac{6}{5}$

9. $\frac{2}{7} \cdot \frac{3}{7} = \frac{2 \cdot 3}{7 \cdot 7} = \frac{6}{49}$

10. $\frac{9}{11} \cdot \frac{5}{7} = \frac{9 \cdot 5}{11 \cdot 7} = \frac{45}{77}$

11. $12 \cdot \frac{3}{8} = \frac{12}{1} \cdot \frac{3}{8} = \frac{12 \cdot 3}{1 \cdot 8} = \frac{36}{8} = \frac{9 \cdot 4}{2 \cdot 4} = \frac{9}{2}$

12. $10 \cdot \frac{3}{50} = \frac{10}{1} \cdot \frac{3}{50} = \frac{30}{50} = \frac{10 \cdot 3}{10 \cdot 5} = \frac{3}{5}$

13. $\frac{2}{13} \div \frac{1}{6} = \frac{2}{13} \cdot \frac{6}{1} = \frac{2 \cdot 6}{13 \cdot 1} = \frac{12}{13}$

14. $\frac{5}{12} \div \frac{2}{7} = \frac{5}{12} \cdot \frac{7}{2} = \frac{5 \cdot 7}{12 \cdot 2} = \frac{35}{24}$

15. $\frac{10}{11} \div 8 = \frac{10}{11} \cdot \frac{1}{8} = \frac{10 \cdot 1}{11 \cdot 8} = \frac{10}{88} = \frac{5 \cdot 2}{44 \cdot 2} = \frac{5}{44}$

16. $\frac{6}{7} \div 12 = \frac{6}{7} \cdot \frac{1}{12} = \frac{6 \cdot 1}{7 \cdot 12} = \frac{6}{84} = \frac{1 \cdot 6}{14 \cdot 6} = \frac{1}{14}$

17. $\frac{\frac{9}{2}}{\frac{2}{5}} = \frac{9}{2} \div \frac{2}{5} = \frac{9}{2} \cdot \frac{5}{2} = \frac{9 \cdot 5}{2 \cdot 2} = \frac{45}{4}$

18. $\frac{\frac{6}{11}}{\frac{7}{2}} = \frac{6}{11} \div \frac{7}{2} = \frac{6}{11} \cdot \frac{2}{7} = \frac{6 \cdot 2}{11 \cdot 7} = \frac{12}{77}$

19. $\frac{\frac{6}{5}}{8} = \frac{6}{5} \div 8 = \frac{6}{5} \cdot \frac{1}{8} = \frac{6 \cdot 1}{5 \cdot 8} = \frac{6}{40} = \frac{3 \cdot 2}{20 \cdot 2} = \frac{3}{20}$

20. $\frac{\frac{12}{9}}{11} = \frac{12}{9} \div 11 = \frac{12}{9} \cdot \frac{1}{11} = \frac{12 \cdot 1}{9 \cdot 11} = \frac{12}{99} = \frac{4 \cdot 3}{33 \cdot 3} = \frac{4}{33}$

Exercises (1 – 82)

1. Improper
2. Improper
3. Proper
4. Proper
5. Proper
6. Improper
7. Improper
8. Improper
9. Improper
10. Proper

11. $\frac{4}{20} = \frac{1 \cdot 4}{5 \cdot 4} = \frac{1}{5}$
12. $\frac{2}{14} = \frac{1 \cdot 2}{7 \cdot 2} = \frac{1}{7}$
13. $\frac{30}{50} = \frac{3 \cdot 10}{5 \cdot 10} = \frac{3}{5}$
14. $\frac{35}{40} = \frac{7 \cdot 5}{8 \cdot 5} = \frac{7}{8}$
15. $\frac{28}{48} = \frac{7 \cdot 4}{12 \cdot 4} = \frac{7}{12}$
16. $\frac{35}{49} = \frac{5 \cdot 7}{7 \cdot 7} = \frac{5}{7}$
17. $\frac{6}{33} = \frac{2 \cdot 3}{11 \cdot 3} = \frac{2}{11}$
18. $\frac{9}{27} = \frac{1 \cdot 9}{3 \cdot 9} = \frac{1}{3}$
19. $\frac{56}{63} = \frac{8 \cdot 7}{9 \cdot 7} = \frac{8}{9}$
20. $\frac{16}{36} = \frac{4 \cdot 4}{9 \cdot 4} = \frac{4}{9}$
21. $\frac{1}{6} + \frac{2}{3} = \frac{1}{2 \cdot 3} + \frac{2}{3} = \frac{1 + 2 \cdot 2}{6} = \frac{5}{6}$
22. $\frac{4}{5} + \frac{1}{7} = \frac{7 \cdot 4 + 5 \cdot 1}{35} = \frac{33}{35}$
23. $\frac{11}{44} + \frac{2}{4} = \frac{11}{4 \cdot 11} + \frac{2}{4} = \frac{1 + 2}{4} = \frac{3}{4}$
24. $\frac{3}{6} + \frac{2}{4} = \frac{3}{2 \cdot 3} + \frac{2}{2 \cdot 2} = \frac{1 + 1}{2} = 1$
25. $\frac{19}{74} + \frac{14}{37} = \frac{19}{2 \cdot 37} + \frac{14}{37} = \frac{19 + 2 \cdot 14}{74} = \frac{47}{74}$
26. $\frac{19}{43} + \frac{15}{86} = \frac{19}{43} + \frac{15}{2 \cdot 43} = \frac{2 \cdot 19 + 15}{86} = \frac{53}{86}$
27. $\frac{1}{21} + \frac{3}{7} = \frac{1}{3 \cdot 7} + \frac{3}{7} = \frac{1 + 3 \cdot 3}{21} = \frac{10}{21}$
28. $\frac{15}{23} + \frac{1}{46} = \frac{15}{23} + \frac{1}{2 \cdot 23} = \frac{2 \cdot 15 + 1}{46} = \frac{31}{46}$
29. $\frac{4}{7} + \frac{18}{21} = \frac{4}{7} + \frac{18}{3 \cdot 7} = \frac{3 \cdot 4 + 18}{21} = \frac{30}{21} = \frac{10}{7}$
30. $\frac{16}{42} + \frac{20}{21} = \frac{16}{2 \cdot 21} + \frac{20}{21} = \frac{16 + 2 \cdot 20}{42} = \frac{56}{42} = \frac{4}{3}$
31. $\frac{2}{20} + \frac{9}{10} - \frac{1}{5} = \frac{2}{2 \cdot 2 \cdot 5} + \frac{9}{2 \cdot 5} - \frac{1}{5} = \frac{2 + 2 \cdot 9 - 4 \cdot 1}{20} = \frac{16}{20} = \frac{4}{5}$
32. $\frac{13}{42} + \frac{2}{21} - \frac{1}{14} = \frac{13}{2 \cdot 3 \cdot 7} + \frac{2}{3 \cdot 7} - \frac{1}{2 \cdot 7} = \frac{13 + 2 \cdot 2 - 3 \cdot 1}{42} = \frac{14}{42} = \frac{1}{3}$
33. $\frac{3}{4} + \frac{1}{10} - \frac{1}{2} = \frac{3}{2 \cdot 2} + \frac{1}{2 \cdot 5} - \frac{1}{2} = \frac{5 \cdot 3 + 2 \cdot 1 - 10 \cdot 1}{20} = \frac{7}{20}$

34. $\frac{3}{7}+\frac{7}{56}-\frac{2}{7}=\frac{3}{7}+\frac{7}{7\cdot 8}-\frac{2}{7}=\frac{8\cdot 3+7-8\cdot 2}{56}=\frac{15}{56}$

35. $\frac{10}{11}+\frac{8}{44}-\frac{3}{44}=\frac{10}{11}+\frac{8}{4\cdot 11}-\frac{3}{4\cdot 11}=\frac{4\cdot 10+8-3}{44}=\frac{45}{44}$

36. $\frac{8}{82}+\frac{2}{41}-\frac{3}{82}=\frac{8}{2\cdot 41}+\frac{2}{41}-\frac{3}{2\cdot 41}=\frac{8+2\cdot 2-3}{82}=\frac{9}{82}$

37. $\frac{1}{17}+\frac{14}{34}-\frac{1}{4}=\frac{1}{17}+\frac{2\cdot 7}{2\cdot 17}-\frac{1}{2\cdot 2}=\frac{4\cdot 1+4\cdot 7-17\cdot 1}{68}=\frac{15}{68}$

38. $\frac{12}{13}+\frac{16}{26}-\frac{1}{13}=\frac{12}{13}+\frac{2\cdot 8}{2\cdot 13}-\frac{1}{13}=\frac{12+8-1}{13}=\frac{19}{13}$

39. $\frac{9}{88}+\frac{6}{11}-\frac{2}{88}=\frac{9}{8\cdot 11}+\frac{6}{11}-\frac{2}{8\cdot 11}=\frac{9+8\cdot 6-2}{88}=\frac{55}{88}=\frac{5}{8}$

40. $\frac{10}{55}+\frac{7}{11}-\frac{2}{11}=\frac{2\cdot 5}{5\cdot 11}+\frac{7}{11}-\frac{2}{11}=\frac{2+7-2}{11}=\frac{7}{11}$

41. $\frac{4}{5}\cdot\frac{7}{12}=\frac{4\cdot 7}{5\cdot 12}=\frac{28}{60}=\frac{7}{15}$

42. $\frac{1}{2}\cdot\frac{8}{15}=\frac{1\cdot 8}{2\cdot 15}=\frac{8}{30}=\frac{4}{15}$

43. $\frac{11}{13}\cdot\frac{10}{12}=\frac{11\cdot 10}{13\cdot 12}=\frac{110}{156}=\frac{55}{78}$

44. $\frac{8}{14}\cdot\frac{7}{13}=\frac{8\cdot 7}{14\cdot 13}=\frac{56}{182}=\frac{4}{13}$

45. $\frac{5}{9}\cdot\frac{5}{9}=\frac{5\cdot 5}{9\cdot 9}=\frac{25}{81}$

46. $\frac{4}{13}\cdot\frac{4}{13}=\frac{4\cdot 4}{13\cdot 13}=\frac{16}{169}$

47. $\frac{2}{3}\cdot 3=\frac{2\cdot 3}{3}=\frac{2}{1}=2$

48. $\frac{3}{8}\cdot 6=\frac{3\cdot 6}{8}=\frac{18}{8}=\frac{9}{4}$

49. $\frac{5}{16}\cdot\frac{4}{15}\cdot\frac{3}{14}=\frac{5\cdot 4\cdot 3}{16\cdot 15\cdot 14}=\frac{60}{3360}=\frac{1}{56}$

50. $\frac{7}{11}\cdot\frac{6}{10}\cdot\frac{5}{9}=\frac{7\cdot 6\cdot 5}{11\cdot 10\cdot 9}=\frac{210}{990}=\frac{7}{33}$

51. $\frac{1}{2}\div\frac{3}{5}=\frac{1}{2}\cdot\frac{5}{3}=\frac{5}{6}$

52. $\frac{3}{4}\div\frac{7}{8}=\frac{3}{4}\cdot\frac{8}{7}=\frac{24}{28}=\frac{6}{7}$

53. $\frac{7}{12}\div\frac{14}{16}=\frac{7}{12}\cdot\frac{16}{14}=\frac{112}{168}=\frac{2}{3}$

54. $\frac{4}{8} \div \frac{6}{10} = \frac{4}{8} \cdot \frac{10}{6} = \frac{40}{48} = \frac{5}{6}$

55. $\frac{2}{8} \div \frac{3}{5} = \frac{2}{8} \cdot \frac{5}{3} = \frac{10}{24} = \frac{5}{12}$

56. $\frac{2}{6} \div \frac{1}{2} = \frac{2}{6} \cdot \frac{2}{1} = \frac{4}{6} = \frac{2}{3}$

57. $\frac{2}{18} \div \frac{13}{16} = \frac{2}{18} \cdot \frac{16}{13} = \frac{32}{234} = \frac{16}{117}$

58. $\frac{5}{10} \div \frac{19}{20} = \frac{5}{10} \cdot \frac{20}{19} = \frac{100}{190} = \frac{10}{19}$

59. $\frac{6}{13} \div 2 = \frac{6}{13} \cdot \frac{1}{2} = \frac{6}{26} = \frac{3}{13}$

60. $\frac{5}{12} \div 4 = \frac{5}{12} \cdot \frac{1}{4} = \frac{5}{48}$

61. $\frac{\frac{2}{9}}{\frac{9}{10}} = \frac{2}{9} \div \frac{9}{10} = \frac{2}{9} \cdot \frac{10}{9} = \frac{20}{81}$

62. $\frac{\frac{2}{8}}{\frac{13}{15}} = \frac{2}{8} \div \frac{13}{15} = \frac{2}{8} \cdot \frac{15}{13} = \frac{30}{104} = \frac{15}{52}$

63. $\frac{\frac{1}{2}}{\frac{15}{18}} = \frac{1}{2} \div \frac{15}{18} = \frac{1}{2} \cdot \frac{18}{15} = \frac{18}{30} = \frac{3}{5}$

64. $\frac{\frac{8}{14}}{\frac{4}{6}} = \frac{8}{14} \div \frac{4}{6} = \frac{8}{14} \cdot \frac{6}{4} = \frac{48}{56} = \frac{6}{7}$

65. $\frac{\frac{5}{33}}{\frac{15}{33}} = \frac{5}{33} \div \frac{15}{33} = \frac{5}{33} \cdot \frac{33}{15} = \frac{5}{15} = \frac{1}{3}$

66. $\frac{\frac{8}{28}}{\frac{12}{28}} = \frac{8}{28} \div \frac{12}{28} = \frac{8}{28} \cdot \frac{28}{12} = \frac{8}{12} = \frac{2}{3}$

67. $\frac{\frac{6}{20}}{\frac{3}{4}} = \frac{6}{20} \div \frac{3}{4} = \frac{6}{20} \cdot \frac{4}{3} = \frac{24}{60} = \frac{2}{5}$

68. $\frac{\frac{3}{15}}{\frac{2}{10}} = \frac{3}{15} \div \frac{2}{10} = \frac{3}{15} \cdot \frac{10}{2} = \frac{30}{30} = 1$

69. $\frac{\frac{5}{17}}{\frac{15}{17}} = \frac{5}{17} \div \frac{15}{17} = \frac{5}{17} \cdot \frac{17}{15} = \frac{5}{15} = \frac{1}{3}$

70. $\frac{\frac{12}{25}}{\frac{24}{25}} = \frac{12}{25} \div \frac{24}{25} = \frac{12}{25} \cdot \frac{25}{24} = \frac{12}{24} = \frac{1}{2}$

71. $\frac{1}{3} + \frac{3}{10} = \frac{10+9}{30} = \frac{19}{30}$; Joan completed $\frac{19}{30}$ of the crossword puzzle.

72. $\frac{1}{4} + \frac{7}{10} = \frac{5+14}{20} = \frac{19}{20}$; Sandy completed $\frac{19}{20}$ of her chores.

73. $\frac{1}{3} + \frac{2}{5} = \frac{5+6}{15} = \frac{11}{15}$; Tom planted $\frac{11}{15}$ of his garden with red peppers and green beans.

74. $\frac{3}{8} + \frac{1}{2} = \frac{3+4}{8} = \frac{7}{8}$; The recipe calls for $\frac{7}{8}$ cup of the nuts.

75. $\frac{1}{4} + \frac{5}{12} = \frac{3+5}{12} = \frac{8}{12} = \frac{2}{3}$; Kenneth did $\frac{2}{3}$ of his laundry.

76. $\frac{3}{10} + \frac{2}{5} + \frac{1}{10} = \frac{3+4+1}{10} = \frac{8}{10} = \frac{4}{5}$; Alyssa drank $\frac{4}{5}$ cup of milk.

77. $16 \div \frac{8}{15} = \frac{16}{1} \cdot \frac{15}{8} = 30$; He will be able to serve 30 students.

78. $11 \div \frac{11}{16} = \frac{11}{1} \cdot \frac{16}{11} = 16$; It will take the frog 16 hours to make the 11-mile trek.

79. $7 \div \frac{1}{2} = \frac{7}{1} \cdot \frac{2}{1} = 14$; Maurice can make 14 batches.

80. $17 \div \frac{17}{20} = \frac{17}{1} \cdot \frac{20}{17} = 20$; Melaka can make 20 bows.

81. $8 \div \frac{4}{5} = \frac{8}{1} \cdot \frac{5}{4} = 10$; The athletes have to complete 10 laps to run 8 miles.

82. $15 \div \frac{3}{8} = \frac{15}{1} \cdot \frac{8}{3} = 40$; 40 of Jesse's friends will get a mug of hot chocolate.

Section 1.5 Absolute, Relative, and Percent Error

Quick Check Exercises (1 – 15)

1. $AE = |v_e - v| = |68 - 69.40| = |-1.4| = 1.4$
2. $AE = |v_e - v| = |72 - 72.46| = |-0.46| = 0.46$
3. $AE = |v_e - v| = |550 - 553| = |-3| = 3$
4. $AE = |v_e - v| = |6000 - 6777| = |-777| = 777$
5. $AE = |v_e - v| = |25 - 30| = |-5| = 5$; Vale's estimate was off by five treats.
6. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|6000-6777|}{6777} = \frac{777}{6777} \approx 0.115$
7. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|570-598|}{598} = \frac{28}{598} \approx 0.047$

8. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|90 - 90.37|}{90.37} = \frac{0.37}{90.37} \approx 0.004$
9. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|1.5 - 1.72|}{1.72} = \frac{0.22}{1.72} \approx 0.128$
10. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|8.5 - 9.25|}{9.25} = \frac{0.75}{9.25} \approx 0.081$; The relative error of $RE = 0.081$ occurred because Matt's estimation was less than the actual weight.
11. $\text{PE} = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|0.23 - 0.31|}{0.31} \cdot 100\% = \frac{0.08}{0.31} \cdot 100\% \approx 25.8\%$
12. $\text{PE} = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|0.47 - 0.63|}{0.63} \cdot 100\% = \frac{0.16}{0.63} \cdot 100\% \approx 25.4\%$
13. $\text{PE} = \frac{AE}{v} \cdot 100\% = \frac{0.9}{6.2} \cdot 100\% \approx 14.5\%$
14. $\text{PE} = \frac{AE}{v} \cdot 100\% = \frac{2.23}{12.16} \cdot 100\% \approx 18.3\%$
15. Calculate estimate: $v_e = 247.4 - 1.8 \cdot 5 = 238.4$ lb;. actual weight: $v = 235.8$ lb;

    $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|238.4 - 235.8|}{235.8} \cdot 100\% = \frac{2.6}{235.8} \cdot 100\% \approx 1.1\%$

    The estimated weight had a 1.1% error. Since this percent error is less than 5%, the estimate was good.

Exercises (1 – 50)

1. $AE = |v_e - v| = |6 - 4| = 2$
2. $AE = |v_e - v| = |5 - 3| = 2$
3. $AE = |v_e - v| = |2.1 - 3| = |-0.9| = 0.9$
4. $AE = |v_e - v| = |3.2 - 4| = |-0.8| = 0.8$
5. $AE = |v_e - v| = |25.5 - 24.6| = 0.9$
6. $AE = |v_e - v| = |16.8 - 14.9| = 1.9$
7. $AE = |v_e - v| = |638 - 651| = |-13| = 13$
8. $AE = |v_e - v| = |246 - 310| = |-64| = 64$
9. $AE = |v_e - v| = |76.89 - 75.1| = 1.79$
10. $AE = |v_e - v| = |19.47 - 20.02| = |-0.55| = 0.55$
11. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|12 - 10|}{10} = \frac{2}{10} = 0.2$
12. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|16 - 20|}{20} = \frac{|-4|}{20} = \frac{4}{20} = 0.2$
13. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|15.2 - 16|}{16} = \frac{|-0.8|}{16} = \frac{0.8}{16} = 0.05$
14. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|24.5 - 25|}{25} = \frac{|-0.5|}{25} = \frac{0.5}{25} = 0.02$

15. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|5.28 - 5.5|}{5.5} = \frac{|-0.22|}{5.5} = \frac{0.22}{5.5} = 0.04$

16. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|4.56 - 4.8|}{4.8} = \frac{|-0.24|}{4.8} = \frac{0.24}{4.8} = 0.05$

17. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|27.648 - 25.6|}{25.6} = \frac{2.048}{25.6} = 0.08$

18. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|16.854 - 15.9|}{15.9} = \frac{0.954}{15.9} = 0.06$

19. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|66.98 - 78.8|}{78.8} = \frac{|-11.82|}{78.8} = \frac{11.82}{78.8} = 0.15$

20. $\text{RE} = \frac{|v_e - v|}{v} = \frac{|40.392 - 45.9|}{45.9} = \frac{|-5.508|}{45.9} = \frac{5.508}{45.9} = 0.12$

21. Given: $v_e = 68\ beats\ per\ minute, v = 73\ beats\ per\ minute$

    (a) $AE = |v_e - v| = |68 - 73| = |-5| = 5$; The patient's estimated pulse rate was 5 beats per minute less than the actual.

    (b) $\text{RE} = \frac{|v_e - v|}{v} = \frac{|68 - 73|}{73} = \frac{5}{73} \approx 0.068$; The relative error of 0.068 was due to the patient's estimate of her pulse rate.

22. Given: $v_e = 30\ years, v = 26\ years$

    (a) $AE = |v_e - v| = |30 - 26| = 4$; The person's guess of the participant's age was 4 years greater than the participant's actual age.

    (b) $\text{RE} = \frac{|v_e - v|}{v} = \frac{|30 - 26|}{26} = \frac{4}{26} = 0.154$; The relative error of 0.154 was due to the person's estimate of a participant's age.

23. Given: $v_e = 400\ sq\ ft, v = 378\ sq\ ft$

    (a) $AE = |v_e - v| = |400 - 378| = 22$; Clarice's estimate was 22 square feet more than the actual square footage.

    (b) $\text{RE} = \frac{|v_e - v|}{v} = \frac{|400 - 378|}{378} = \frac{22}{378} = 0.058$; The relative error of 0.058 was due to Clarise's estimate of the area of the room.

24. Given: $v_e = 3.72\ miles, v = 3.58\ miles$

    (a) $AE = |v_e - v| = |3.72 - 3.58| = 0.14$; The pedometer's measurement of the mileage walked was 0.14 mile more than the actual.

    (b) $\text{RE} = \frac{|v_e - v|}{v} = \frac{|3.72 - 3.58|}{3.58} = \frac{0.14}{3.58} = 0.039$; The relative error of 0.039 was due to the pedometer's estimate of the mileage walked.

25. Given: $v_e = 30{,}000\ people, v = 31{,}634\ people$

(a) $AE = |v_e - v| = |30{,}000 - 31{,}634| = = |-1634| = 1634$; Debbie's estimate of the attendance was 1634 lower than the actual attendance.

(b) $RE = \frac{|v_e - v|}{v} = \frac{|30{,}000 - 31{,}634|}{31{,}634} = \frac{1634}{31{,}634} = 0.052$; The relative error of 0.052 was due to Debbie's estimate of the attendance.

26. Given: $v_e = 30\ years, v = 28.4\ years$

(a) $AE = |v_e - v| = |30 - 28.4| = 1.6$; Claude's estimate was 1.6 years older than the actual average age.

(b) $RE = \frac{|v_e - v|}{v} = \frac{|30 - 28.4|}{28.4} = \frac{1.6}{28.4} = 0.056$; The relative error of 0.056 was due to Claude's estimate of the average age in the class.

27. Given: $v_e = 1\ minute = 60\ seconds, v = 52.2\ seconds$

(a) $AE = |v_e - v| = |60 - 52.2| = 7.8$; Sasha overestimated the time by 7.8 seconds.

(b) $RE = \frac{|v_e - v|}{v} = \frac{|60 - 52.2|}{52.2} = \frac{7.8}{52.2} = 0.13$; The relative error of 0.13 was due to Sasha's estimate of time.

28. Given: $v_e = \$15, v = \$18.23$

(a) $AE = |v_e - v| = |15 - 18.23| = |-3.23| = 3.23$; Franklin underestimated the bill by \$3.23.

(b) $RE = \frac{|v_e - v|}{v} = \frac{|15 - 18.23|}{18.23} = \frac{3.23}{18.23} = 0.177$; The relative error of 0.177 was due to Franklin's estimate of the total cost of his meal.

29. Given: $v_e = 355\ ml, v = 358.7\ ml$

(a) $AE = |v_e - v| = |355 - 358.7| = |-3.7| = = 3.7$; The advertised standard volume for the can of soda was off by 3.7 milliliters compared to the actual volume of the selected can.

(b) $RE = \frac{|v_e - v|}{v} = \frac{|355 - 358.7|}{358.7} = \frac{3.7}{358.7} = 0.01$; The relative error of 0.01 was due to the variation in how much the advertised volume of the soda compared to the actual volume.

30. Given: $v_e = 1.5\ ounces, v = 1.517\ ounces$

(a) $AE = |v_e - v| = |1.5 - 1.517| = |-0.017| = 0.017$; The weight of the bag of potato chips measured was 0.017 ounces more than the advertised weight..

(b) $RE = \frac{|v_e - v|}{v} = \frac{|1.5 - 1.517|}{1.517} = \frac{0.017}{1.517} = 0.011$; The relative error of 0.011 was due to the variation of the advertised weight compared to the actual weight.

31. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|4.5-5|}{5} \cdot 100\% = \frac{0.5}{5} \cdot 100\% = 10\%$

32. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|2.85-3|}{3} \cdot 100\% = \frac{0.15}{3} \cdot 100\% = 5\%$

33. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|28.52-24.8|}{24.8} \cdot 100\% = \frac{3.72}{24.8} \cdot 100\% = 15\%$

34. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|18.84-15.7|}{15.7} \cdot 100\% = \frac{3.14}{15.7} \cdot 100\% \approx 20\%$

35. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|0.057-0.05|}{0.05} \cdot 100\% = \frac{0.007}{0.05} \cdot 100\% = 14\%$

36. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|0.092-0.08|}{0.08} \cdot 100\% = \frac{0.012}{0.08} \cdot 100\% = 15\%$

37. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|635.06-562|}{562} \cdot 100\% = \frac{73.06}{562} \cdot 100\% = 13\%$

38. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|284.16-256|}{256} \cdot 100\% = \frac{28.16}{256} \cdot 100\% = 11\%$

39. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|1550.06-1598|}{1598} \cdot 100\% = \frac{47.94}{1598} \cdot 100\% = 3\%$

40. $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|1027.42-1093|}{1093} \cdot 100\% = \frac{65.58}{1093} \cdot 100\% = 6\%$

41. $v_e = \$1018.56, v = \$1061;$

    $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|1018.56-1061|}{1061} \cdot 100\% = \frac{42.44}{1061} \cdot 100\% = 4\%;$

    Since the percent error is $4\% < 5\%$, the good-faith estimate was a good estimate.

42. $v_e = \$464.63, v = \$479;$

    $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|464.63-479|}{479} \cdot 100\% = \frac{14.37}{479} \cdot 100\% = 3\%;$

    Since the percent error is $3\% < 5\%$, the "quick check" estimate was a good estimate.

43. $v_e = 618.53\ sq.ft., v = 562.3\ sq.ft.;$

    $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|618.53-562.3|}{562.3} \cdot 100\% = \frac{56.23}{562.3} \cdot 100\% = 10\%;$

    Since the percent error is $10\% > 5\%$, Bethany's measurements did not result in a good estimate.

44. $v_e = 4.9\ miles, v = 5\ miles;$

    $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|4.9-5|}{5} \cdot 100\% = \frac{0.1}{5} \cdot 100\% = 2\%;$

    Since the percent error is $2\% < 5\%$, the race director's estimate was a good estimate.

45. $v_e = 38{,}675, v = 45{,}500;$

    $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|38{,}675-45{,}500|}{45{,}500} \cdot 100\% = \frac{6825}{45{,}500} \cdot 100\% = 15\%;$ Since the percent error is $15\% > 5\%$, the initial estimate was not a good estimate.

46. $v_e = 40.95\ years, v = 45.5\ years;$

    $PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|40.95-45.5|}{45.5} \cdot 100\% = \frac{4.55}{45.5} \cdot 100\% = 10\%;$

    Since the percent error is $10\% > 5\%$, the initial estimate was not a good estimate.

47. $v_e = 60\ seconds, v = 65.4\ seconds$;

$PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|65.4-60|}{60} \cdot 100\% = \frac{5.4}{60} \cdot 100\% = 9\%$;

Since the percent error is $9\% > 5\%$, the initial estimate was not a good estimate.

48. $v_e = \$58.77, v = \$65.30$;

$PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|58.77-65.30|}{65.30} \cdot 100\% = \frac{6.53}{65.30} \cdot 100\% = 10\%$;

Since the percent error is $10\% > 5\%$, the guess was not a good guess.

49. $v_e = 355\ ml, v = 351.45\ ml$;

$PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|355-351.45|}{351.45} \cdot 100\% = \frac{3.55}{351.45} \cdot 100\% \approx 1.01\%$;

Since the percent error is $1.01\% < 5\%$, the advertised volume was an accurate estimate.

50. $v_e = 1.5\ ounces, v = 1.7125\ ounces$;

$PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{|1.5-1.7125|}{1.7125} \cdot 100\% = \frac{0.2125}{1.7125} \cdot 100\% \approx 12.4\%$;

Since the percent error is $12.4\% > 5\%$, the advertised weight was not an accurate estimate.

Section 1.6 Scientific Notation and E-Notation

Quick Check Exercises (1 – 20)

1. $5.71 \times 10^8 = 5.71E8$
2. $2.38 \times 10^{12} = 2.38E12$
3. $9.376 \times 10^{10} = 9.376E10$
4. $1.362 \times 10^7 = 1.362E7$
5. $8.417 \times 10^{-6} = 8.417E-6$
6. $3.579 \times 10^{-4} = 3.579E-4$
7. $4.208 \times 10^{-7} = 4.208E-7$
8. $1.701 \times 10^{-7} = 1.701E-7$
9. 0.0000015013
10. 0.000085279
11. 974,900,000
12. 71,370,000
13. 2,365,490,000
14. 0.0006478
15. 0.0000000051395
16. 56,830
17. 4.45×10^{-7}
18. 2.2794×10^{11}
19. 6.124×10^7
20. 7.53×10^{-10}

Exercise (1 – 64)

1. $5.04 \times 10^3 = 5.04E3$
2. $4.8 \times 10^3 = 4.8E3$
3. $3.25 \times 10^4 = 3.25E4$
4. $1.63 \times 10^4 = 1.63E4$
5. $3.62 \times 10^5 = 3.62E5$
6. $1.55 \times 10^5 = 1.55E5$
7. $3.628 \times 10^6 = 3.628E6$
8. $1.814 \times 10^6 = 1.814E6$

9. $3.99 \times 10^{7} = 3.99E7$

10. $6.28 \times 10^{7} = 6.28E7$

11. $3.0 \times 10^{-3} = 3.0E-3$

12. $8.0 \times 10^{-3} = 8.0E-3$

13. $5.2 \times 10^{-4} = 5.2E-4$

14. $1.1 \times 10^{-4} = 1.1E-4$

15. $6.21 \times 10^{-5} = 6.21E-5$

16. $8.11 \times 10^{-5} = 8.11E-5$

17. $9.6 \times 10^{-6} = 9.6E-6$

18. $7.6 \times 10^{-6} = 7.6E-6$

19. $6.01 \times 10^{-7} = 6.01E-7$

20. $8.17 \times 10^{-7} = 8.17E-7$

21. 0.0067

22. 0.0055

23. 0.00915

24. 0.00105

25. 9600

26. 4400

27. 75,600

28. 65,200

29. 0.0000101

30. 0.0000708

31. 0.0000936

32. 0.0000284

33. 6,530,000

34. 7,250,000

35. 3,080,000

36. 8,980,000

37. 0.00000562

38. 0.00000141

39. 0.000000911

40. 0.000000172

41. 0.0009

42. 0.0004

43. 62,000

44. 55,000

45. 896,000

46. 251,000

47. 0.00000926

48. 0.00000515

49. 0.000000305

50. 0.000000986

51. 0.0000000647

52. 0.0000000313

53. 0.0000000059233

54. 0.0000000033157

55. 0.0000413488

56. 0.0000741186

57. $1.0E11$

58. $1.6E5$

59. 0.0000000058

60. 0.00000143

61. 7,350,000,000

62. 4,550,000,000

63. 1.53×10^{-5}

64. 3.0×10^{-8}

Section 1.7 Read and Use Mathematical Tables

Quick Check Exercises (1 – 14)

1. 13.494 mm
2. 3.175 mm
3. 0.594 inch
4. 0.047 inch
5. $v_e = 0.625, v = \frac{5}{8}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.625 - \frac{5}{8}\right|}{\frac{5}{8}} \cdot 100\% = 0\%$
6. $v_e = 0.094, v = \frac{3}{32}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.094 - \frac{3}{32}\right|}{\frac{3}{32}} \cdot 100\% = 0.27\%$
7. $v_e = 0.563, v = \frac{9}{16}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.563 - \frac{9}{16}\right|}{\frac{9}{16}} \cdot 100\% = 0.09\%$
8. $v_e = 0.063, v = \frac{1}{16}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.063 - \frac{1}{16}\right|}{\frac{1}{16}} \cdot 100\% = 0.8\%$
9. 12
10. 6
11. C
12. 1011
13. 13
14. 19

Exercises (1 – 60)

1. 17.463 mm
2. 10.716 mm
3. 0.719 inch
4. 0.438 inch
5. $\frac{47}{64}$ inch
6. $\frac{31}{32}$ inch
7. 0.266 inch
8. 0.578 inch
9. $\frac{17}{32}$ inch

10. $\frac{3}{8}$ inch

11. 17.463 mm

12. 23.813 mm

13. $v_e = 0.094, v = \frac{3}{32}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.094 - \frac{3}{32}\right|}{\frac{3}{32}} \cdot 100\% \approx 0.27\%$

14. $v_e = 0.109, v = \frac{7}{64}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.109 - \frac{7}{64}\right|}{\frac{7}{64}} \cdot 100\% \approx 0.34\%$

15. $v_e = 0.469, v = \frac{15}{32}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.469 - \frac{15}{32}\right|}{\frac{15}{32}} \cdot 100\% \approx 0.05\%$

16. $v_e = 0.953, v = \frac{61}{64}; PE = \frac{|v_e - v|}{v} \cdot 100\% = \frac{\left|0.953 - \frac{61}{64}\right|}{\frac{61}{64}} \cdot 100\% \approx 0.01\%$

17. 5.89E12 bytes

18. 2.13E9 bytes

19. $6.64 \times 10^{-12} = 0.00000000000664$ meter

20. $3.88 \times 10^{-6} = 0.00000388$ meter

21. 1.87×10^{6} watts

22. 7.41×10^{3} watts

23. 6.74E−2 meters

24. 1.09E−15 meters

25. 28 meters

26. 1990 meters

27. 1400 megabytes

28. 3.7 megabytes

29. 384,000 kilometers

30. 6.371 megameters

31. 5 quadrillion

32. 9 trillion

33. 5.8 sextillion

34. 1.7 billion

35. 3 googol

36. 8 million

37. 8.7 octillion

38. 4.8 billion

39. 2 googolplex

40. 7.7 googol

41. 5.5E18

42. 6.7E24

43. 8.16E9

44. 9.35E6

45. 4.2E100

46. 2.1E27

47. 3,580,000,000

48. 6,940,000

49. 19,700,000,000,000,000

50. 5,860,000,000,000

51. 18

52. 110

53. 17

54. E

55. 5

56. 111

57. 111

58. 20

59. 1001

60. 6

Chapter 2 Algebraic Expressions Used in Statistics and Basics of Solving Equations

Section 2.1 Translating English to Algebra: Expressions, Equations, and Inequalities

Quick Check Exercises (1 – 28)

1. Equation; x is the variable; 4 is the coefficient of x; -7 and 12 are constants
2. Expression; x is the variable; 4 is the coefficient of x; 12 is the constant
3. Expression; t is the variable; $1/5$ is the coefficient of t; $6(4) = 24$ is the constant
4. Equation; t is the variable; $1/5$ is the coefficient of t; $6(4) = 24$ and 10 are the constants
5. $x - 5 = 12$
6. $9y = 19$
7. $t/15 = 15 \cdot 3$
8. $10k + 27 = k + 19$
9. $4.99 \square 5$

   $4.99 \boxed{<} 5$
10. $\frac{3}{2} \square \frac{2}{3}$

    $\frac{3}{2} \boxed{>} \frac{2}{3}$
11. $2 \times 10^3 \square 4 \times 10^2$

    $2000 \boxed{>} 400$

    $2 \times 10^3 \boxed{>} 4 \times 10^2$
12. $1{,}340{,}000 \boxed{<} 45{,}500{,}000$

    $1.34E6 \square 4.55E7$

    $1.34E6 \boxed{<} 4.55E7$