

Contents

Chapter 1 Whole Numbers

1.1	Study Tips	1
1.2	Introduction to Whole Numbers	1
1.3	Addition and Subtraction of Whole Numbers and Perimeter	4
1.4	Rounding and Estimating	11
1.5	Multiplication of Whole Numbers and Area	13
1.6	Division of Whole Numbers	19
	Problem Recognition Exercises: Operations on Whole Numbers	27
1.7	Exponents, Algebraic Expressions, and the Order of Operations	29
1.8	Mixed Applications and Computing Mean	33
	Chapter 1 Review Exercises	38
	Chapter 1 Test	44

Chapter 2 Integers and Algebraic Expressions

2.1	Integers, Absolute Value, and Opposite	47
2.2	Addition of Integers	50
2.3	Subtraction of Integers	53
2.4	Multiplication and Division of Integers	56
	Problem Recognition Exercises: Operations on Integers	60
2.5	Order of Operations and Algebraic Expressions	61
	Chapter 2 Review Exercises	67
	Chapter 2 Test	70
	Chapters 1 – 2 Cumulative Review Exercises	72

Chapter 3 Solving Equations

3.1	Simplifying Expressions and Combining <i>Like</i> Terms	74
3.2	Addition and Subtraction Properties of Equality	79
3.3	Multiplication and Division Properties of Equality	83
3.4	Solving Equations with Multiple Steps	88
	Problem Recognition Exercises: Comparing Expressions and Equations	94

3.5	Applications and Problem Solving	96
	Chapter 3 Review Exercises	102
	Chapter 3 Test	107
	Chapters 1 – 3 Cumulative Review Exercises	109

Chapter 4 Fractions and Mixed Numbers

4.1	Introduction to Fractions and Mixed Numbers	111
4.2	Simplifying Fractions	116
4.3	Multiplication and Division of Fractions	121
4.4	Least Common Multiple and Equivalent Fractions	127
4.5	Addition and Subtraction of Fractions	133
4.6	Estimation and Operations on Mixed Numbers	137
	Problem Recognition Exercises: Operations on Fractions and Mixed Numbers	146
4.7	Order of Operations and Complex Fractions	147
4.8	Solving Equations Containing Fractions	153
	Problem Recognition Exercises: Comparing Expressions and Equations	161
	Chapter 4 Review Exercises	163
	Chapter 4 Test	171
	Chapters 1 – 4 Cumulative Review Exercises	175

Chapter 5 Decimals

5.1	Decimal Notation and Rounding	177
5.2	Addition and Subtraction of Decimals	179
5.3	Multiplication of Decimals and Applications with Circles	185
5.4	Division of Decimals	190
	Problem Recognition Exercises: Operations on Decimals	197
5.5	Fractions, Decimals, and the Order of Operations	200
5.6	Solving Equations Containing Decimals	213
5.7	Mean, Median, and Mode	218
	Chapter 5 Review Exercises	223
	Chapter 5 Test	231
	Chapters 1 – 5 Cumulative Review Exercises	234

Chapter 6 Ratio and Proportions

6.1	Ratios	238
6.2	Rates and Unit Cost	241
6.3	Proportions	244
	Problem Recognition Exercises: Operations on Fractions versus Solving Proportions	252
6.4	Applications of Proportions and Similar Figures	254
	Chapter 6 Review Exercises	261
	Chapter 6 Test	265
	Chapters 1 – 6 Cumulative Review Exercises	268

Chapter 7 Percents

7.1	Percents, Fractions, and Decimals	270
7.2	Percent Proportions and Applications	276
7.3	Percent Equations and Applications	285
	Problem Recognition Exercises: Percents	291
7.4	Applications of Sales Tax, Commission, Discount, Markup, and Percent Increase and Decrease	293
7.5	Simple and Compound Interest	298
	Chapter 7 Review Exercises	301
	Chapter 7 Test	305
	Chapters 1 – 7 Cumulative Review Exercises	307

Chapter 8 Measurement and Geometry

8.1	U.S. Customary Units of Measurement	310
8.2	Metric Units of Measurement	315
8.3	Converting Between U.S. Customary and Metric Units	318
	Problem Recognition Exercises: U.S. Customary and Metric Conversions	322
8.4	Medical Applications Involving Measurement	323
8.5	Lines and Angles	324
8.6	Triangles and the Pythagorean Theorem	327
8.7	Perimeter, Circumference, and Area	332
	Problem Recognition Exercises: Area, Perimeter, and Circumference	335

8.8	Volume and Surface Area	337
	Chapter 8 Review Exercises	341
	Chapter 8 Test	346
	Chapters 1 – 8 Cumulative Review Exercises	348

Chapter 9 Graphs and Statistics

9.1	Rectangular Coordinate System	351
9.2	Graphing Two-Variable Equations	354
9.3	Tables, Bar Graphs, Pictographs, and Line Graphs	360
9.4	Frequency Distributions and Histograms	362
9.5	Circle Graphs	365
9.6	Introduction to Probability	368
	Chapter 9 Review Exercises	371
	Chapter 9 Test	375
	Chapters 1 – 9 Cumulative Review Exercises	377

Chapter 10 Exponents and Polynomials

10.1	Addition and Subtraction of Polynomials	381
10.2	Multiplication Properties of Exponents	386
10.3	Multiplication of Polynomials	388
	Problem Recognition Exercises: Operations on Polynomials and Exponential Expressions	392
10.4	Introduction to Factoring	393
10.5	Negative Exponents and the Quotient Rule for Exponents	396
10.6	Scientific Notation	398
	Chapter 10 Review Exercises	401
	Chapter 10 Test	405
	Chapters 1 – 10 Cumulative Review Exercises	407

Chapter 1 Whole Numbers

Review Your Skills

¹ 2	0	² 9	³ 9	1
		⁴ 6	4	
		⁵ 3	2	
		0		⁶ 1
	⁷ 3	2	0	0
	5			0
⁸ 2	7	0	0	0

Section 1.1 Study Tips

Group Activity: Becoming a Successful Student

- Answers will vary.
- Answers will vary.
- Answers will vary.
- Answers will vary.
- Answers will vary.
- Answers will vary.
- Answers will vary.
- Answers will vary.
- Answers will vary.
- Answers will vary.
- (1) e. answers to odd exercises
(2) g. Avoiding Mistakes
(3) b. Connect Math
(4) f. Chapter Summary
(5) d. Problem Recognition Exercises
(6) a. Tips
(7) c. Skill Practice exercises

Section 1.2 Introduction to Whole Numbers

Section 1.2 Practice Exercises

- (a) periods
(b) hundreds
(c) thousands
- 36,791
1: ones
9: tens
7: hundreds
6: thousands
3: ten-thousands

Chapter 1 Whole Numbers

3. 8, 213,457
7: ones
5: tens
4: hundreds
3: thousands
1: ten-thousands
2: hundred-thousands
8: millions
4. 103,596
6: ones
9: tens
5: hundreds
3: thousands
0: ten-thousands
1: hundred-thousands
5. 321 tens
6. 689 tens
7. 214 ones
8. 738 ones
9. 8710 hundreds
10. 2293 hundreds
11. 1430 thousands
12. 3101 thousands
13. 452,723 hundred-thousands
14. 655,878 hundred thousands
15. 1,023,676,207 billions
16. 3,111,901,211 billions
17. 22,422 ten-thousands
18. 58,106 ten-thousands
19. 51,033,201 millions
20. 93,971,224 millions
21. 10,677,881 ten-millions
22. 31,820 mi² thousands
23. 7,653,468,440 billions
24. 31,000 ft ten-thousands
25. 5 tens + 8 ones; $5 \times 10 + 8 \times 1$
26. 7 tens + 1 one; $7 \times 10 + 1 \times 1$
27. 5 hundreds + 3 tens + 9 ones
 $5 \times 100 + 3 \times 10 + 9 \times 1$
28. 3 hundreds + 8 tens + 2 ones
 $3 \times 100 + 8 \times 10 + 2 \times 1$
29. 5 thousands + 2 hundreds + 3 ones
 $5 \times 1,000 + 2 \times 100 + 3 \times 1$
30. 7 thousands + 8 tens + 9 ones
 $7 \times 1,000 + 8 \times 10 + 9 \times 1$
31. 1 ten-thousand + 2 hundreds + 4 tens + 1 one
 $1 \times 10,000 + 2 \times 100 + 4 \times 10 + 1 \times 1$
32. 2 ten-thousands + 8 hundreds + 7 tens + 3 ones
 $2 \times 10,000 + 8 \times 100 + 7 \times 10 + 3 \times 1$
33. 524
34. 318
35. 150
36. 620
37. 1,906
38. 4,201
39. 85,007
40. 26,002
41. ones, thousands, millions, billions
42. ones, tens, hundreds, thousands
43. Two hundred forty-one
44. Three hundred twenty-seven
45. Six hundred three
46. One hundred eight
47. Thirty-one thousand, five hundred thirty

48. Fifty-two thousand, one hundred sixty

49. One hundred thousand, two hundred thirty-four

50. Four hundred thousand, one hundred ninety-nine

51. Nine thousand, five hundred thirty-five

52. One thousand, three hundred seventy-seven

53. Twenty thousand, three hundred twenty

54. One thousand, eight hundred

55. Five hundred ninety thousand, seven hundred twelve

56. Sixty million

57. 6005

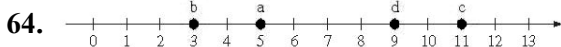
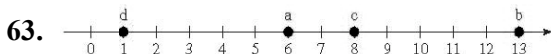
58. 4004

59. 672,000

60. 248,000

61. 1,484,250

62. 2,647,520



65. Counting on a number line, 10 is 4 units to the right of 6.

66. Counting on a number line, 3 is 8 units to the left of 11.

67. Counting on a number line, 4 is 3 units to the left of 7.

68. Counting on a number line, 5 is 5 units to the right of 0.

69. $8 > 2$
8 is greater than 2, or 2 is less than 8.

70. $6 < 11$
6 is less than 11, or 11 is greater than 6.

71. $3 < 7$
3 is less than 7, or 7 is greater than 3.

72. $14 > 12$
14 is greater than 12, or 12 is less than 14.

73. $6 < 11$

74. $14 > 13$

75. $21 > 18$

76. $5 < 7$

77. $3 < 7$

78. $14 < 24$

79. $95 > 89$

80. $28 < 30$

81. $0 < 3$

82. $8 > 0$

83. $90 < 91$

84. $48 > 47$

85. False; 12 is made up of the digits 1 and 2.

86. False; 26 is made up of the digits 2 and 6.

87. 99

88. 999

89. There is no greatest whole number.

90. 0 is the least whole number.

91. 10,000,000 7 zeros

92. 100,000,000,000 11 zeros

93. 964

94. 840

Section 1.3 Addition and Subtraction of Whole Numbers and Perimeter

Section 1.3 Practice Exercises

1. (a) addends

(b) sum

(c) variable

(d) commutative

(e) a ; a (f) $a + (b + c)$

(g) minuend; subtrahend; difference

(h) polygon

(i) perimeter

2. 5 thousands + 2 tens + 4 ones

3. 3 hundreds + 5 tens + 1 one

4. 2004

5. 4012

6. 6206

7. Fill in the table. Use the number line if necessary.

+	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10	11
3	3	4	5	6	7	8	9	10	11	12
4	4	5	6	7	8	9	10	11	12	13
5	5	6	7	8	9	10	11	12	13	14
6	6	7	8	9	10	11	12	13	14	15
7	7	8	9	10	11	12	13	14	15	16
8	8	9	10	11	12	13	14	15	16	17
9	9	10	11	12	13	14	15	16	17	18

8. $11 + 10 = 21$

Addends: 11, 10

Sum: 21

9. $1 + 13 + 4 = 18$

Addends: 1, 13, 4

Sum: 18

10. $5 + 8 + 2 = 15$

Addends: 5, 8, 2

Sum: 15

11. $42 = 4 \text{ tens} + 2 \text{ ones}$ $+ 33 = 3 \text{ tens} + 3 \text{ ones}$ $\underline{\hspace{1cm}}$
 $75 = 7 \text{ tens} + 5 \text{ ones}$ 12. $21 = 2 \text{ tens} + 1 \text{ one}$ $+ 53 = 5 \text{ tens} + 3 \text{ ones}$ $\underline{\hspace{1cm}}$
 $74 = 7 \text{ tens} + 4 \text{ ones}$ 13. $12 = 1 \text{ ten} + 2 \text{ ones}$ $15 = 1 \text{ ten} + 5 \text{ ones}$ $+ 32 = 3 \text{ tens} + 2 \text{ ones}$ $\underline{\hspace{1cm}}$
 $59 = 5 \text{ tens} + 9 \text{ ones}$

Section 1.3 Addition and Subtraction of Whole Numbers and Perimeter

$$\begin{array}{l} 14. \quad 10 = 1 \text{ ten} + 0 \text{ ones} \\ \quad \quad 8 = 0 \text{ tens} + 8 \text{ ones} \\ \quad \quad 30 = 3 \text{ tens} + 0 \text{ ones} \\ \quad \quad 48 = 4 \text{ tens} + 8 \text{ ones} \end{array}$$

$$\begin{array}{r} 15. \quad 890 \\ + 107 \\ \hline 997 \end{array}$$

$$\begin{array}{r} 16. \quad 444 \\ + 354 \\ \hline 798 \end{array}$$

$$\begin{array}{r} 17. \quad \quad 4 \\ \quad \quad 13 \\ + 102 \\ \hline 119 \end{array}$$

$$\begin{array}{r} 18. \quad 11 \\ \quad 221 \\ + \quad 5 \\ \hline 237 \end{array}$$

$$\begin{array}{r} 19. \quad \quad 1 \\ \quad 76 \\ + 45 \\ \hline 121 \end{array}$$

$$\begin{array}{r} 20. \quad \quad 1 \\ \quad 25 \\ + 59 \\ \hline 84 \end{array}$$

$$\begin{array}{r} 21. \quad \quad 1 \\ \quad 87 \\ + 24 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 22. \quad \quad 1 \\ \quad 38 \\ + 77 \\ \hline 115 \end{array}$$

$$\begin{array}{r} 23. \quad 658 \\ + 231 \\ \hline 889 \end{array}$$

$$\begin{array}{r} 24. \quad \quad 1 \\ \quad 642 \\ + 295 \\ \hline 937 \end{array}$$

$$\begin{array}{r} 25. \quad \quad 11 \\ \quad 152 \\ + 549 \\ \hline 701 \end{array}$$

$$\begin{array}{r} 26. \quad \quad 11 \\ \quad 462 \\ + 388 \\ \hline 850 \end{array}$$

$$\begin{array}{r} 27. \quad \quad 11 \\ \quad 79 \\ \quad 112 \\ + 12 \\ \hline 203 \end{array}$$

$$\begin{array}{r} 28. \quad \quad 11 \\ \quad 62 \\ \quad 907 \\ + 34 \\ \hline 1003 \end{array}$$

$$\begin{array}{r} 29. \quad \quad 11 \\ \quad 4980 \\ + 10223 \\ \hline 15,203 \end{array}$$

$$\begin{array}{r} 30. \quad \quad 11 \\ \quad 23112 \\ \quad \quad 892 \\ \hline 24,004 \end{array}$$

$$\begin{array}{r} 31. \quad \quad 11 \quad 11 \\ \quad 10 \quad 223 \\ \quad 25 \quad 782 \\ \quad \quad 4980 \\ \hline 40,985 \end{array}$$

$$\begin{array}{r} 32. \quad \quad 11 \quad 11 \\ \quad 92 \quad 377 \\ \quad \quad 5 \quad 622 \\ \quad \quad 34 \quad 659 \\ \hline 132,658 \end{array}$$

$$33. \quad 101 + 44 = 44 + 101$$

$$34. \quad 8 + 13 = 13 + 8$$

$$35. \quad x + y = y + x$$

$$36. \quad t + q = q + t$$

Chapter 1 Whole Numbers

37. $(23 + 9) + 10 = 23 + (9 + 10)$

38. $7 + (12 + 8) = (7 + 12) + 8$

39. $r + (s + t) = (r + s) + t$

40. $(c + d) + e = c + (d + e)$

41. The commutative property changes the order of the addends, and the associative property changes the grouping.

42. The sum of any number and 0 is that number.

(a) $423 + 0 = 423$

(b) $0 + 25 = 25$

(c) $67 + 0 = 67$

(d) $0 + x = x$

43. $12 - 8 = 4$
 minuend: 12
 subtrahend: 8
 difference: 4

44.
$$\begin{array}{r} 9 \\ - 6 \\ \hline 3 \end{array}$$

 minuend: 9
 subtrahend: 6
 difference: 3

45. $27 - 9 = 18$ because $18 + 9 = 27$.

46. $20 - 8 = 12$ because $12 + 8 = 20$.

47. $102 - 75 = 27$ because $27 + 75 = 102$.

48. $211 - 45 = 166$ because $166 + 45 = 211$.

49. $8 - 3 = 5$ Check: $5 + 3 = 8$

50. $7 - 2 = 5$ Check: $5 + 2 = 7$

51. $4 - 1 = 3$ Check: $3 + 1 = 4$

52. $9 - 1 = 8$ Check: $8 + 1 = 9$

53.
$$\begin{array}{r} 1347 \\ - 221 \\ \hline 1126 \end{array}$$
 Check:
$$\begin{array}{r} 1126 \\ + 221 \\ \hline 1347 \end{array} \checkmark$$

54.
$$\begin{array}{r} 4865 \\ - 713 \\ \hline 4152 \end{array}$$
 Check:
$$\begin{array}{r} 4152 \\ + 713 \\ \hline 4865 \end{array} \checkmark$$

55.
$$\begin{array}{r} 14,356 \\ - 13,253 \\ \hline 1,103 \end{array}$$
 Check:
$$\begin{array}{r} 1,103 \\ + 13,253 \\ \hline 14,356 \end{array} \checkmark$$

56.
$$\begin{array}{r} 34,550 \\ - 31,450 \\ \hline 3100 \end{array}$$
 Check:
$$\begin{array}{r} 3100 \\ + 31,450 \\ \hline 34,550 \end{array} \checkmark$$

57.
$$\begin{array}{r} 616 \\ \cancel{7} \cancel{6} \\ - 59 \\ \hline 17 \end{array}$$
 Check:
$$\begin{array}{r} 1 \\ 17 \\ + 59 \\ \hline 76 \end{array} \checkmark$$

58.
$$\begin{array}{r} 514 \\ \cancel{6} \cancel{4} \\ - 48 \\ \hline 16 \end{array}$$
 Check:
$$\begin{array}{r} 1 \\ 16 \\ + 48 \\ \hline 64 \end{array} \checkmark$$

59.
$$\begin{array}{r} 10 \\ 6 \cancel{0} 10 \\ \cancel{7} \cancel{1} \cancel{0} \\ - 189 \\ \hline 521 \end{array}$$
 Check:
$$\begin{array}{r} 11 \\ 521 \\ + 189 \\ \hline 710 \end{array} \checkmark$$

60.
$$\begin{array}{r} 410 \\ 8 \cancel{8} \cancel{0} \\ - 303 \\ \hline 547 \end{array}$$
 Check:
$$\begin{array}{r} 1 \\ 547 \\ + 303 \\ \hline 850 \end{array} \checkmark$$

61.
$$\begin{array}{r} 99 \\ 5 \cancel{1} \cancel{0} \cancel{1} 2 \\ \cancel{0} \cancel{0} \cancel{0} \cancel{2} \\ - 1238 \\ \hline 4764 \end{array}$$
 Check:
$$\begin{array}{r} 111 \\ 4764 \\ + 1238 \\ \hline 6002 \end{array} \checkmark$$

62.
$$\begin{array}{r} 99 \\ 2 \cancel{1} \cancel{0} \cancel{1} 0 \\ \cancel{0} 0 0 0 \\ - 2356 \\ \hline 644 \end{array}$$
 Check:
$$\begin{array}{r} 111 \\ 644 \\ + 2356 \\ \hline 3000 \end{array} \checkmark$$

63.
$$\begin{array}{r} 010 \\ \cancel{1} \cancel{0} 425 \\ - 9022 \\ \hline 1,403 \end{array}$$
 Check:
$$\begin{array}{r} 1403 \\ + 9022 \\ \hline 10,425 \end{array} \checkmark$$

Section 1.3 Addition and Subtraction of Whole Numbers and Perimeter

$$\begin{array}{r}
 9 \\
 1 \text{ } 13 \text{ } 8 \text{ } \cancel{10} \text{ } 11 \\
 64. \quad \cancel{2} \cancel{3}, \cancel{0} \cancel{0} \cancel{1} \\
 - 8 \text{ } 0 \text{ } 6 \text{ } 4 \\
 \hline
 15,8 \text{ } 3 \text{ } 7
 \end{array}
 \quad
 \begin{array}{r}
 1 \text{ } 11 \\
 15 \text{ } 837 \\
 \text{Check: } + 8 \text{ } 064 \\
 \hline
 23,901 \checkmark
 \end{array}$$

$$\begin{array}{r}
 9 \\
 7 \text{ } \cancel{10} \text{ } 2 \text{ } 14 \\
 71. \quad \cancel{8}, \cancel{0} \cancel{0} 7, \cancel{2} \cancel{4} \\
 - 2, \text{ } 3 \text{ } 45, \text{ } 11 \text{ } 5 \\
 \hline
 5, \text{ } 6 \text{ } 62, \text{ } 11 \text{ } 9
 \end{array}
 \quad
 \begin{array}{r}
 \text{Check:} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 11 \\
 5 \text{ } \cancel{10} \\
 65. \quad \cancel{6} \cancel{2} \cancel{0} 88 \\
 - 59 \text{ } 871 \\
 \hline
 2,217
 \end{array}
 \quad
 \begin{array}{r}
 11 \\
 2 \text{ } 217 \\
 \text{Check: } + 59 \text{ } 871 \\
 \hline
 62,088 \checkmark
 \end{array}$$

$$\begin{array}{r}
 1 \text{ } 1 \quad 1 \\
 5 \text{ } 662 \text{ } 119 \\
 + 2 \text{ } 345 \text{ } 115 \\
 \hline
 8,007,234 \checkmark
 \end{array}$$

$$\begin{array}{r}
 11 \text{ } 10 \text{ } 10 \\
 2 \text{ } \cancel{10} \cancel{0} \cancel{12} \\
 66. \quad \cancel{3} \cancel{2}, \cancel{1} \cancel{1} \cancel{2} \\
 - 28, \text{ } 3 \text{ } 3 \text{ } 4 \\
 \hline
 3 \text{ } 77 \text{ } 8
 \end{array}
 \quad
 \begin{array}{r}
 1 \text{ } 11 \\
 13 \text{ } 778 \\
 \text{Check: } + 28 \text{ } 334 \\
 \hline
 32,112 \checkmark
 \end{array}$$

$$\begin{array}{r}
 9 \\
 2 \text{ } \cancel{10} \text{ } 14 \quad 4 \text{ } 16 \\
 72. \quad \cancel{3} \cancel{0} \cancel{4} 5 \quad \cancel{3} \cancel{0} \cancel{7} \\
 - 1 \text{ } 8 \text{ } 71 \text{ } 4 \text{ } 95 \\
 \hline
 1, \text{ } 1 \text{ } 74, \text{ } 0 \text{ } 72
 \end{array}
 \quad
 \begin{array}{r}
 \text{Check:} \\
 1 \text{ } 174 \text{ } 072 \\
 + 1 \text{ } 871 \text{ } 495 \\
 \hline
 3,045,567 \checkmark
 \end{array}$$

$$\begin{array}{r}
 16 \text{ } 9 \\
 2 \text{ } \cancel{10} \cancel{10} \\
 67. \quad \cancel{3} \cancel{7} \cancel{0} \\
 - 29 \text{ } 87 \\
 \hline
 7 \text{ } 13
 \end{array}
 \quad
 \begin{array}{r}
 1 \text{ } 11 \\
 713 \\
 \text{Check: } + 2987 \\
 \hline
 3700 \checkmark
 \end{array}$$

73. The expression $7 - 4$ means 7 minus 4, yielding a difference of 3. The expression $4 - 7$ means 4 minus 7 which results in a difference of -3 .

74. Subtraction is not associative. For example, $10 - (6 - 2) = 10 - 4 = 6$, and $(10 - 6) - 2 = 4 - 2 = 2$. Therefore $10 - (6 - 2)$ does not equal $(10 - 6) - 2$.

$$\begin{array}{r}
 9 \text{ } 9 \\
 7 \text{ } \cancel{10} \cancel{10} \text{ } 10 \\
 68. \quad \cancel{8} \cancel{0} \cancel{0} \cancel{0} \\
 - 3 \text{ } 7 \text{ } 8 \text{ } 8 \\
 \hline
 4 \text{ } 2 \text{ } 1 \text{ } 2
 \end{array}
 \quad
 \begin{array}{r}
 111 \\
 4212 \\
 \text{Check: } + 3788 \\
 \hline
 8000 \checkmark
 \end{array}$$

$$\begin{array}{r}
 1 \\
 13 + 7 \quad 13 \\
 + 7 \\
 \hline
 20
 \end{array}$$

$$\begin{array}{r}
 13 \\
 1 \text{ } \cancel{13} \\
 69. \quad \cancel{3} \cancel{2}, \cancel{4} \cancel{9} \\
 - 1 \text{ } 4 \text{ } 98 \\
 \hline
 30,941
 \end{array}
 \quad
 \begin{array}{r}
 1 \text{ } 1 \\
 30 \text{ } 941 \\
 \text{Check: } + 1 \text{ } 498 \\
 \hline
 32,439 \checkmark
 \end{array}$$

$$\begin{array}{r}
 100 + 42 \quad 100 \\
 + 42 \\
 \hline
 142
 \end{array}$$

$$\begin{array}{r}
 1 \text{ } 11 \\
 \cancel{2} \cancel{1} \text{ } 335 \\
 70. \quad - 4 \text{ } 123 \\
 \hline
 17,212
 \end{array}
 \quad
 \begin{array}{r}
 1 \\
 17 \text{ } 212 \\
 \text{Check: } + 4 \text{ } 123 \\
 \hline
 21,335 \checkmark
 \end{array}$$

$$\begin{array}{r}
 1 \\
 7 + 45 \quad 7 \\
 + 45 \\
 \hline
 52
 \end{array}$$

$$\begin{array}{r}
 23 + 81 \quad 23 \\
 + 81 \\
 \hline
 104
 \end{array}$$

$$\begin{array}{r}
 1 \\
 18 + 5 \quad 18 \\
 + 5 \\
 \hline
 23
 \end{array}$$

Chapter 1 Whole Numbers

$$\begin{array}{r} 80. \quad 76 + 2 \quad 76 \\ \quad \quad \quad + 2 \\ \hline \quad \quad \quad 78 \end{array}$$

$$\begin{array}{r} 81. \quad 1523 + 90 \quad 1523 \\ \quad \quad \quad + 90 \\ \hline \quad \quad \quad 1613 \end{array}$$

$$\begin{array}{r} 82. \quad 1320 + 448 \quad 1320 \\ \quad \quad \quad + 448 \\ \hline \quad \quad \quad 1768 \end{array}$$

$$\begin{array}{r} 83. \quad 5 + 39 + 81 \quad 5 \\ \quad \quad \quad \quad \quad 39 \\ \quad \quad \quad \quad \quad + 81 \\ \hline \quad \quad \quad \quad \quad 125 \end{array}$$

$$\begin{array}{r} 84. \quad 78 \\ \quad \quad - 6 \\ \hline \quad \quad 72 \end{array}$$

$$\begin{array}{r} 85. \quad 422 \\ \quad \quad - 100 \\ \hline \quad \quad 322 \end{array}$$

$$\begin{array}{r} 86. \quad 89 \\ \quad \quad - 42 \\ \hline \quad \quad 47 \end{array}$$

$$\begin{array}{r} 87. \quad \overset{8}{10} \overset{10}{\cancel{00}} \\ \quad \quad - 72 \\ \hline \quad \quad 1018 \end{array}$$

$$\begin{array}{r} 88. \quad \overset{0}{3} \overset{11}{\cancel{77}} 1 \\ \quad \quad - 60 \\ \hline \quad \quad 3051 \end{array}$$

$$\begin{array}{r} 89. \quad \overset{4}{\cancel{8}} \overset{10}{\cancel{0}} \\ \quad \quad - 13 \\ \hline \quad \quad 37 \end{array}$$

$$\begin{array}{r} 90. \quad 405 \\ \quad \quad - 103 \\ \hline \quad \quad 302 \end{array}$$

$$\begin{array}{r} 91. \quad \overset{9}{\cancel{10}} \overset{13}{\cancel{3}} \\ \quad \quad - 35 \\ \hline \quad \quad 68 \end{array}$$

$$\begin{array}{r} 92. \quad \overset{8}{\cancel{9}} \overset{11}{\cancel{1}} \\ \quad \quad - 14 \\ \hline \quad \quad 77 \end{array}$$

$$\begin{array}{r} 93. \quad \overset{1}{21}, \overset{2}{209}, 000 \\ \quad \quad 20,836,000 \\ \quad \quad + 16,448,000 \\ \hline \quad \quad 58,493,000 \end{array}$$

The shows had a total of 58,493,000 viewers.

$$\begin{array}{r} 94. \quad \overset{33}{38} \\ \quad \quad 54 \\ \quad \quad 44 \\ \quad \quad 61 \\ \quad \quad 97 \\ \quad \quad 103 \\ \quad \quad + 124 \\ \hline \quad \quad 521 \end{array}$$

521 deliveries were made.

$$\begin{array}{r} 95. \quad \overset{1}{\$60} \\ \quad \quad 82 \\ \quad \quad + 58 \\ \hline \quad \quad \$200 \end{array}$$

The total amount is \$200.

$$\begin{array}{r} 96. \quad \overset{11}{115} \\ \quad \quad 104 \\ \quad \quad 93 \\ \quad \quad + 111 \\ \hline \quad \quad 423 \end{array}$$

423 desks were delivered.

$$\begin{array}{r} 97. \quad \overset{110}{\cancel{20}}, \overset{21110}{\cancel{20}} \text{ ft} \\ \quad \quad - 14,246 \text{ ft} \\ \hline \quad \quad 6,074 \text{ ft} \end{array}$$

Denali is 6074 ft higher than White Mountain Peak.

Section 1.3 Addition and Subtraction of Whole Numbers and Perimeter

$$\begin{array}{r} 415 \\ 98. \quad \cancel{8} \cancel{8} \\ - 39 \\ \hline 16 \end{array}$$

16 DVDs are left.

$$\begin{array}{r} 99 \\ 7\cancel{1}\cancel{0}\cancel{1}\cancel{0} \\ 99. \quad 239\cancel{8}000 \\ - 2390252 \\ \hline 7748 \end{array}$$

The difference is 7748 marriages.

$$\begin{array}{r} 100. \quad 2,398,000 \\ - 2,248,000 \\ \hline 150,000 \end{array}$$

The decrease is 150,000 marriages.

$$\begin{array}{r} 13 \\ 3\cancel{4}13 \\ 101. \quad 2\cancel{4}\cancel{4}\cancel{8}489 \\ - 2248000 \\ \hline 195,489 \end{array}$$

The difference is 195,489 marriages.

$$\begin{array}{r} 102. \quad 2,398,000 \\ - 2,336,000 \\ \hline 62,000 \end{array}$$

The greatest increase occurred between Year 4 and Year 5; the increase was 62,000 marriages.

$$\begin{array}{r} 11111 \\ 103. \quad 100,052 \\ 675,038 \\ + 45,934 \\ \hline 821,024 \end{array}$$

There are 821,024 nonteachers.

$$\begin{array}{r} 111 \\ 104. \quad \$7329 \\ 9560 \\ 1248 \\ + 3500 \\ \hline \$21,637 \end{array}$$

The total cost is \$21,637.

$$\begin{array}{r} 105. \quad 6288 \\ - 2032 \\ \hline 4256 \end{array}$$

Mt. Washington is 4256 ft higher than the Pinkham Notch Visitor Center.

$$\begin{array}{r} 10 \\ 4\cancel{1}14 \\ 106. \quad \cancel{8}\cancel{1}\cancel{4}9 \\ - 2670 \\ \hline 2479 \end{array}$$

The Lion King had been performed 2479 more times.

$$\begin{array}{r} 1 \\ 107. \quad 26,960 \\ + 2600 \\ \hline 29,560 \end{array}$$

Jeannette will pay \$29,560 for 1 year.

$$\begin{array}{r} 11 \\ 108. \quad 138 \\ + 96 \\ \hline 234 \end{array}$$

They are 234 miles apart.

$$\begin{array}{r} 1 \\ 109. \quad 35 \text{ cm} \\ 35 \text{ cm} \\ + 34 \text{ cm} \\ \hline 104 \text{ cm} \end{array}$$

$$\begin{array}{r} 1 \\ 110. \quad 27 \text{ in.} \\ 13 \text{ in.} \\ + 20 \text{ in.} \\ \hline 60 \text{ in.} \end{array}$$

$$\begin{array}{r} 2 \\ 111. \quad 6 \text{ yd} \\ 10 \text{ yd} \\ 11 \text{ yd} \\ 3 \text{ yd} \\ 5 \text{ yd} \\ + 7 \text{ yd} \\ \hline 42 \text{ yd} \end{array}$$

$$\begin{array}{r} 112. \quad 200 \text{ yd} \\ 136 \text{ yd} \\ 142 \text{ yd} \\ 98 \text{ yd} \\ 58 \text{ yd} \\ + 38 \text{ yd} \\ \hline 672 \text{ yd} \end{array}$$

$$\begin{array}{r} 113. \quad 94 \text{ ft} \\ 94 \text{ ft} \\ 50 \text{ ft} \\ + 50 \text{ ft} \\ \hline 288 \text{ ft} \end{array}$$

$$\begin{array}{r} 114. \quad 90 \text{ ft} \\ 90 \text{ ft} \\ 90 \text{ ft} \\ + 90 \text{ ft} \\ \hline 360 \text{ ft} \end{array}$$

$$\begin{array}{r} 115. \quad 14 \text{ m} \quad 39 \text{ m} \\ + 12 \text{ m} \quad - 26 \text{ m} \\ \hline 26 \text{ m} \quad 13 \text{ m} \end{array}$$

The missing length is 13 m.

$$\begin{array}{r} 116. \quad 139 \text{ cm} \quad 547 \text{ cm} \\ 87 \text{ cm} \quad - 427 \text{ cm} \\ + 201 \text{ cm} \quad \hline 427 \text{ cm} \quad 120 \text{ cm} \end{array}$$

The missing length is 120 cm.

$$\begin{array}{r} 117. \quad 45,418 \\ 81,990 \\ 9,063 \\ + 56,309 \\ \hline 192,780 \end{array}$$

$$\begin{array}{r} 118. \quad 9,300,050 \\ 7,803,513 \\ 3,480,009 \\ + 907,822 \\ \hline 21,491,394 \end{array}$$

$$\begin{array}{r} 119. \quad 3,421,019 \\ 822,761 \\ 1,003,721 \\ + 9,678 \\ \hline 5,257,179 \end{array}$$

$$\begin{array}{r} 120. \quad 4,905,620 \\ - 458,318 \\ \hline 4,447,302 \end{array}$$

$$\begin{array}{r} 121. \quad 953,400,415 \\ - 56,341,902 \\ \hline 897,058,513 \end{array}$$

$$\begin{array}{r} 122. \quad 82,025,160 \\ - 79,118,705 \\ \hline 2,906,455 \end{array}$$

$$\begin{array}{r} 123. \quad 103,718 \text{ mi}^2 \\ - 54,310 \text{ mi}^2 \\ \hline 49,408 \text{ mi}^2 \end{array}$$

The difference in land area between Colorado and Wisconsin is $49,408 \text{ mi}^2$.

$$\begin{array}{r} 124. \quad 41,217 \text{ mi}^2 \\ - 24,078 \text{ mi}^2 \\ \hline 17,139 \text{ mi}^2 \end{array}$$

Tennessee has $17,139 \text{ mi}^2$ more than West Virginia.

$$\begin{array}{r} 125. \quad 1,045 \text{ mi}^2 \\ 41,217 \text{ mi}^2 \\ + 54,310 \text{ mi}^2 \\ \hline 96,572 \text{ mi}^2 \end{array}$$

The combined land area of Rhode Island, Tennessee, and Wisconsin is $96,572 \text{ mi}^2$.

$$\begin{array}{r} 126. \quad 1,045 \text{ mi}^2 \\ 41,217 \text{ mi}^2 \\ 24,078 \text{ mi}^2 \\ 54,310 \text{ mi}^2 \\ + 103,718 \text{ mi}^2 \\ \hline 224,368 \text{ mi}^2 \end{array}$$

The combined land area of the five states is $224,368 \text{ mi}^2$.

Section 1.4 Rounding and Estimating

Section 1.4 Practice Exercises

1. rounding

$$\begin{array}{r} 1 \\ 2. \quad 13 \\ 12 \\ + 5 \\ \hline 30 \end{array}$$

The perimeter is 30 ft.

$$\begin{array}{r} 3. \quad 59 \\ - 33 \\ \hline 26 \end{array}$$

$$\begin{array}{r} 01210 \\ 4. \quad \cancel{1}\cancel{2}\cancel{0} \\ - 98 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 111 \\ 5. \quad 4009 \\ + 998 \\ \hline 5007 \end{array}$$

$$\begin{array}{r} 6. \quad 12,033 \\ + 23,441 \\ \hline 35,474 \end{array}$$

7. Ten-thousands

8. Hundreds

9. If the digit in the tens place is 0, 1, 2, 3, or 4, then change the tens and ones digits to 0. If the digit in the tens place is 5, 6, 7, 8, or 9, increase the digit in the hundreds place by 1 and change the tens and ones digits to 0.

10. If the digit in the ones place is 0, 1, 2, 3, or 4, then change the ones digits to 0. If the digit in the ones place is 5, 6, 7, 8, or 9, increase the digit in the tens place by 1 and change the ones digit to 0.

$$11. \quad 34\boxed{2} \approx 340$$

$$12. \quad 83\boxed{4} \approx 830$$

$$13. \quad 72\boxed{5} \approx 730$$

$$14. \quad 44\boxed{5} \approx 450$$

$$15. \quad 93\boxed{8}4 \approx 9400$$

$$16. \quad 83\boxed{6}3 \approx 8400$$

$$17. \quad 85\boxed{3}9 \approx 8500$$

$$18. \quad 98\boxed{1}7 \approx 9800$$

$$19. \quad 34\boxed{9}92 \approx 35,000$$

$$20. \quad 76\boxed{8}31 \approx 77,000$$

$$21. \quad 2\boxed{5}78 \approx 3000$$

$$22. \quad 3\boxed{5}11 \approx 4000$$

$$23. \quad 99\boxed{8}2 \approx 10,000$$

$$24. \quad 79\boxed{7}4 \approx 8000$$

$$25. \quad 109\boxed{3}37 \approx 109,000$$

$$26. \quad 437\boxed{2}08 \approx 437,000$$

$$27. \quad 48\boxed{9},090 \approx 490,000$$

$$28. \quad 38\boxed{8},725 \approx 390,000$$

$$29. \quad \$77\boxed{0}25,481 \approx \$77,000,000$$

$$30. \quad \$33\boxed{0}50 \approx \$33,000$$

$$31. \quad 238\boxed{8}63 \text{ mi} \approx 239,000 \text{ mi}$$

$$32. \quad 49\boxed{2},000 \text{ m}^2 \approx 500,000 \text{ m}^2$$

$$\begin{array}{rcl} 33. \quad 57 & \rightarrow & 60 \\ 82 & \rightarrow & 80 \\ + 21 & \rightarrow & + 20 \\ \hline & & 160 \end{array}$$

$$\begin{array}{rcl} 34. & 33 & \rightarrow 30 \\ & 78 & \rightarrow 80 \\ & + 41 & \rightarrow + 40 \\ \hline & & 150 \end{array}$$

$$\begin{array}{rcl} 35. & 639 & \rightarrow 640 \\ & - 422 & \rightarrow - 420 \\ \hline & & 220 \end{array}$$

$$\begin{array}{rcl} 36. & 851 & \rightarrow 850 \\ & - 399 & \rightarrow - 400 \\ \hline & & 450 \end{array}$$

$$\begin{array}{rcl} 37. & 892 & \rightarrow 900 \\ & + 129 & \rightarrow + 100 \\ \hline & & 1000 \end{array}$$

$$\begin{array}{rcl} 38. & 347 & \rightarrow 300 \\ & + 563 & \rightarrow + 600 \\ \hline & & 900 \end{array}$$

$$\begin{array}{rcl} 39. & 3412 & \rightarrow 3400 \\ & - 1252 & \rightarrow - 1300 \\ \hline & & 2100 \end{array}$$

$$\begin{array}{rcl} 40. & 9771 & \rightarrow 9800 \\ & - 4544 & \rightarrow - 4500 \\ \hline & & 5300 \end{array}$$

$$\begin{array}{rcl} 41. & 97,404,576 & \xrightarrow{1} 97,000,000 \\ & + 53,695,428 & \rightarrow + 54,000,000 \\ \hline & & 151,000,000 \end{array}$$

\$151,000,000 was brought in by Mars.

$$\begin{array}{rcl} 42. & 81,296,784 & \xrightarrow{1} 81,000,000 \\ & 54,391,268 & \rightarrow 54,000,000 \\ & + 38,168,580 & \rightarrow + 38,000,000 \\ \hline & & 173,000,000 \end{array}$$

\$173,000,000 was brought in by Hershey.

$$\begin{array}{rcl} 43. & 71,339,710 & \rightarrow 71,000,000 \\ & - 59,684,076 & \rightarrow - 60,000,000 \\ \hline & & 11,000,000 \end{array}$$

Neil Diamond earned \$11,000,000 more.

$$\begin{array}{rcl} 44. & 63,640 & \rightarrow 64,000 \\ & - 43,130 & \rightarrow - 43,000 \\ \hline & & 21,000 \end{array}$$

A teacher in California makes about \$21,000 more than a teacher in Iowa.

$$\begin{array}{rcl} 45. & \$3,316,897 & \xrightarrow{1} \$3,300,000 \\ & 3,272,028 & \rightarrow 3,300,000 \\ & + 3,360,289 & \rightarrow + 3,400,000 \\ \hline & & \$10,000,000 \end{array}$$

$$\begin{array}{rcl} 46. & \$3,470,295 & \rightarrow \$3,500,000 \\ & 3,173,050 & \rightarrow 3,200,000 \\ & + 1,970,380 & \rightarrow + 2,000,000 \\ \hline & & \$8,700,000 \end{array}$$

47. (a) 2003; \$3,470,295 → \$3,500,000

(b) 2005; \$1,970,380 → \$2,000,000

$$\begin{array}{rcl} 48. & \$3,500,000 \\ & - 2,000,000 \\ \hline & \$1,500,000 \end{array}$$

49. Massachusetts; 78,771 → 79,000 students

50. Vermont; 7456 → 7000 students

$$\begin{array}{rcl} 51. & 79,000 \\ & - 7,000 \\ \hline & 72,000 \end{array}$$

The difference students. is 72,000

$$\begin{array}{rcl} 52. & 46,377 & \xrightarrow{3} 46,000 \\ & 11,726 & \rightarrow 12,000 \\ & 15,259 & \rightarrow 15,000 \\ & 78,771 & \rightarrow 79,000 \\ & 17,108 & \rightarrow 17,000 \\ & 13,137 & \rightarrow 13,000 \\ & + 7,456 & \rightarrow + 7,000 \\ \hline & & 189,000 \end{array}$$

The total is 189,000 students.

$$\begin{array}{rcl} 53. & 3045 \text{ mm} & \rightarrow 3000 \text{ mm} \\ & 1892 \text{ mm} & \rightarrow 2000 \text{ mm} \\ & 3045 \text{ mm} & \rightarrow 3000 \text{ mm} \\ & + 1892 \text{ mm} & \rightarrow + 2000 \text{ mm} \\ \hline & & 10,000 \text{ mm} \end{array}$$

$$\begin{array}{rcl}
 54. & 1851 \text{ cm} & \rightarrow 2000 \text{ cm} \\
 & 1782 \text{ cm} & \rightarrow 2000 \text{ cm} \\
 & 1851 \text{ cm} & \rightarrow 2000 \text{ cm} \\
 & + 1782 \text{ cm} & \rightarrow + 2000 \text{ cm} \\
 & \hline
 & & 8000 \text{ cm}
 \end{array}$$

$$\begin{array}{rcl}
 56. & 182 \text{ ft} & \rightarrow 200 \text{ ft} \\
 & 121 \text{ ft} & \rightarrow 100 \text{ ft} \\
 & 182 \text{ ft} & \rightarrow 200 \text{ ft} \\
 & 169 \text{ ft} & \rightarrow 200 \text{ ft} \\
 & + 169 \text{ ft} & \rightarrow + 200 \text{ ft} \\
 & \hline
 & & 900 \text{ ft}
 \end{array}$$

$$\begin{array}{rcl}
 55. & 105 \text{ in.} & \rightarrow 100 \text{ in.} \\
 & 57 \text{ in.} & \rightarrow 60 \text{ in.} \\
 & 57 \text{ in.} & \rightarrow 60 \text{ in.} \\
 & 105 \text{ in.} & \rightarrow 100 \text{ in.} \\
 & 57 \text{ in.} & \rightarrow 60 \text{ in.} \\
 & + 57 \text{ in.} & \rightarrow + 60 \text{ in.} \\
 & \hline
 & & 440 \text{ in.}
 \end{array}$$

Section 1.5 Multiplication of Whole Numbers and Area

Section 1.5 Practice Exercises

1. (a) factors; product
(b) commutative
(c) associative; $a \cdot (b \cdot c)$
(d) 0; 0
(e) a ; a
(f) distributive; $a \cdot b + a \cdot c$
(g) area
(h) $l \cdot w$

$$\begin{array}{rcl}
 3. & 869,240 & \rightarrow 870,000 \\
 & 34,921 & \rightarrow 30,000 \\
 & + 108,332 & \rightarrow + 110,000 \\
 & \hline
 & & 1,010,000
 \end{array}$$

$$\begin{array}{rcl}
 4. & 907,801 & \rightarrow 900,000 \\
 & - 413,560 & \rightarrow - 400,000 \\
 & \hline
 & & 500,000
 \end{array}$$

$$\begin{array}{rcl}
 2. & 5,981 & \rightarrow 6,000 \\
 & + 7,206 & \rightarrow + 7,000 \\
 & \hline
 & & 13,000
 \end{array}$$

$$\begin{array}{rcl}
 5. & 8821 & \rightarrow 8800 \\
 & - 3401 & \rightarrow - 3400 \\
 & \hline
 & & 5400
 \end{array}$$

6. \times	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

Chapter 1 Whole Numbers

7. $5 + 5 + 5 + 5 + 5 + 5 = 6 \times 5 = 30$

8. $2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 = 9 \times 2 = 18$

9. $9 + 9 + 9 = 3 \times 9 = 27$

10. $7 + 7 + 7 + 7 = 4 \times 7 = 28$

11. $13 \times 42 = 546$
factors: 13, 42; product: 546

12. $26 \times 9 = 234$
factors: 26, 9; product: 234

13. $3 \cdot 5 \cdot 2 = 30$
factors: 3, 5, 2; product: 30

14. $4 \cdot 3 \cdot 8 = 96$
factors: 4, 3, 8; product: 96

15. For example: 5×12 ; $5 \cdot 12$; $5(12)$

16. For example: 23×14 ; $23 \cdot 14$; $23(14)$

17. d

18. a

19. e

20. b

21. c

22. a

23. $14 \cdot 8 = 8 \cdot 14$

24. $3 \cdot 9 = 9 \cdot 3$

25. $6 \cdot (2 \cdot 10) = (6 \cdot 2) \cdot 10$

26. $(4 \cdot 15) \cdot 5 = 4 \cdot (15 \cdot 5)$

27. $5(7 + 4) = (5 \cdot 7) + (5 \cdot 4)$

28. $3(2 + 6) = (3 \cdot 2) + (3 \cdot 6)$

29.
$$\begin{array}{r} 24 \\ \times 6 \\ \hline 24 \\ + 120 \\ \hline 144 \end{array}$$
 Multiply 6×4 .
Multiply 6×20 .
Add.

30.
$$\begin{array}{r} 18 \\ \times 5 \\ \hline 40 \\ + 50 \\ \hline 90 \end{array}$$
 Multiply 5×8 .
Multiply 5×10 .
Add.

31.
$$\begin{array}{r} 26 \\ \times 2 \\ \hline 12 \\ + 40 \\ \hline 52 \end{array}$$
 Multiply 2×6 .
Multiply 2×20 .
Add.

32.
$$\begin{array}{r} 71 \\ \times 3 \\ \hline 3 \\ + 210 \\ \hline 213 \end{array}$$
 Multiply 3×1 .
Multiply 3×70 .
Add.

33.
$$\begin{array}{r} 131 \\ \times 5 \\ \hline 5 \\ 150 \\ + 500 \\ \hline 655 \end{array}$$
 Multiply 5×1 .
Multiply 5×30 .
Multiply 5×100 .
Add.

34.
$$\begin{array}{r} 725 \\ \times 3 \\ \hline 15 \\ 60 \\ + 2100 \\ \hline 2175 \end{array}$$
 Multiply 3×0 .
Multiply 3×20 .
Multiply 3×700 .
Add.

35.
$$\begin{array}{r} 344 \\ \times 4 \\ \hline 16 \\ 160 \\ + 1200 \\ \hline 1376 \end{array}$$
 Multiply 4×4 .
Multiply 4×40 .
Multiply 4×300 .
Add.

36.
$$\begin{array}{r} 105 \\ \times 9 \\ \hline 45 \\ 00 \\ + 900 \\ \hline 945 \end{array}$$
 Multiply 9×5 .
Multiply 9×0 .
Multiply 9×100 .
Add.

37.
$$\begin{array}{r} 3 \\ 1410 \\ \times 8 \\ \hline 11,280 \end{array}$$

Section 1.5 Multiplication of Whole Numbers and Area

$$\begin{array}{r} ^3 \\ 38. \quad 2016 \\ \times 6 \\ \hline 12,096 \end{array}$$

$$\begin{array}{r} ^2 ^1 \\ 39. \quad 3312 \\ \times 7 \\ \hline 23,184 \end{array}$$

$$\begin{array}{r} ^4 \\ 40. \quad 4801 \\ \times 5 \\ \hline 24,005 \end{array}$$

$$\begin{array}{r} ^1 ^{13} \\ 41. \quad 42,014 \\ \times 9 \\ \hline 378,126 \end{array}$$

$$\begin{array}{r} ^4 \\ 42. \quad 51,006 \\ \times 8 \\ \hline 408,048 \end{array}$$

$$\begin{array}{r} 43. \quad 32 \\ \times 14 \\ \hline 128 \\ + 320 \\ \hline 448 \end{array}$$

$$\begin{array}{r} 44. \quad 41 \\ \times 21 \\ \hline 41 \\ + 820 \\ \hline 861 \end{array}$$

$$\begin{array}{r} ^1 \\ ^3 \\ 45. \quad 68 \\ \times 24 \\ \hline 1 \\ 272 \\ + 1360 \\ \hline 1632 \end{array}$$

$$\begin{array}{r} ^2 \\ 46. \quad 55 \\ \times 41 \\ \hline 55 \\ + 2200 \\ \hline 2255 \end{array}$$

$$\begin{array}{r} 47. \quad 72 \\ \times 12 \\ \hline 144 \\ + 720 \\ \hline 864 \end{array}$$

$$\begin{array}{r} ^1 \\ ^1 \\ 48. \quad 13 \\ \times 46 \\ \hline 78 \\ + 520 \\ \hline 598 \end{array}$$

$$\begin{array}{r} ^3 ^2 \\ 49. \quad 143 \\ \times 17 \\ \hline 1001 \\ + 1430 \\ \hline 2431 \end{array}$$

$$\begin{array}{r} ^1 ^1 \\ 50. \quad 722 \\ \times 28 \\ \hline 1111 \\ 5776 \\ + 14440 \\ \hline 20,216 \end{array}$$

$$\begin{array}{r} ^4 ^8 \\ 51. \quad 349 \\ \times 19 \\ \hline 1 \\ 3141 \\ + 3490 \\ \hline 6631 \end{array}$$

$$\begin{array}{r} 52. \quad 512 \\ \times 31 \\ \hline 512 \\ + 15360 \\ \hline 15,872 \end{array}$$

$$\begin{array}{r}
 \text{53.} \quad \begin{array}{r} 1 \\ 3 \\ \times 151 \\ \hline 1057 \\ 3020 \\ + 15100 \\ \hline 19,177 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{54.} \quad \begin{array}{r} 1 \\ 1 \\ \times 703 \\ \hline 14218 \\ 28120 \\ + 70300 \\ \hline 102,638 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{55.} \quad \begin{array}{r} 11 \\ \times 222 \\ \hline 11222 \\ 8880 \\ + 177600 \\ \hline 186,702 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{56.} \quad \begin{array}{r} 43 \\ 54 \\ \times 387 \\ \hline 2322 \\ 0000 \\ + 193500 \\ \hline 195,822 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{57.} \quad \begin{array}{r} 311 \\ 21 \\ \times 3532 \\ \hline 14128 \\ 35320 \\ 000000 \\ + 21192000 \\ \hline 21,241,448 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{58.} \quad \begin{array}{r} 2 \\ 7 \\ \times 2810 \\ \hline 125290 \\ 84300 \\ 000000 \\ + 2810000 \\ \hline 2,919,590 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{59.} \quad \begin{array}{r} 111 \\ 11 \\ \times 4122 \\ \hline 8244 \\ 329760 \\ + 3709800 \\ \hline 4,047,804 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{60.} \quad \begin{array}{r} 13 \\ 1 \\ 24 \\ \times 7026 \\ \hline 56208 \\ 140520 \\ + 3513000 \\ \hline 3,709,728 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{61.} \quad \begin{array}{r} 600 \rightarrow 6 \mid 00 \\ \times 40 \rightarrow \times 4 \mid 0 \\ \hline 24 \mid 000 = 24,000 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{62.} \quad \begin{array}{r} 900 \rightarrow 9 \mid 00 \\ \times 50 \rightarrow \times 5 \mid 0 \\ \hline 45 \mid 000 = 45,000 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{63.} \quad \begin{array}{r} 3000 \rightarrow 3 \mid 000 \\ \times 700 \rightarrow \times 7 \mid 00 \\ \hline 21 \mid 00000 = 2,100,000 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{64.} \quad \begin{array}{r} 4000 \rightarrow 4 \mid 000 \\ \times 400 \rightarrow \times 4 \mid 00 \\ \hline 16 \mid 00000 = 1,600,000 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{65.} \quad \begin{array}{r} 8000 \rightarrow 8 \mid 000 \\ \times 9000 \rightarrow \times 9 \mid 000 \\ \hline 72 \mid 000000 = 72,000,000 \end{array}
 \end{array}$$

Section 1.5 Multiplication of Whole Numbers and Area

$$66. \begin{array}{r} 1000 \\ \times 2000 \\ \hline \end{array} \rightarrow \begin{array}{r} 1 \mid 000 \\ \times 2 \mid 000 \\ \hline 2 \mid 000000 \end{array} = 2,000,000$$

$$67. \begin{array}{r} 90,000 \\ \times 400 \\ \hline \end{array} \rightarrow \begin{array}{r} 9 \mid 0000 \\ \times 4 \mid 00 \\ \hline 36 \mid 000000 \end{array} = 36,000,000$$

$$68. \begin{array}{r} 50,000 \\ \times 6,000 \\ \hline \end{array} \rightarrow \begin{array}{r} 5 \mid 0000 \\ \times 6 \mid 000 \\ \hline 30 \mid 0000000 \end{array} = 300,000,000$$

$$69. \begin{array}{r} 11,784 \\ \times 5201 \\ \hline \end{array} \rightarrow \begin{array}{r} 12,000 \\ \times 5,000 \\ \hline 60,000,000 \end{array}$$

$$70. \begin{array}{r} 45,046 \\ \times 7812 \\ \hline \end{array} \rightarrow \begin{array}{r} 45,000 \\ \times 8,000 \\ \hline 360,000,000 \end{array}$$

$$71. \begin{array}{r} 82,941 \\ \times 29,740 \\ \hline \end{array} \rightarrow \begin{array}{r} 80,000 \\ \times 30,000 \\ \hline 2,400,000,000 \end{array}$$

$$72. \begin{array}{r} 630,229 \\ \times 71,907 \\ \hline \end{array} \rightarrow \begin{array}{r} 630,000 \\ \times 70,000 \\ \hline 44,100,000,000 \end{array}$$

$$73. \begin{array}{r} \$189 \\ \times 5 \\ \hline \end{array} \rightarrow \begin{array}{r} \$200 \\ \times 5 \\ \hline \$1000 \end{array}$$

$$74. \begin{array}{r} \$129 \\ \times 28 \\ \hline \end{array} \rightarrow \begin{array}{r} \$130 \\ \times 30 \\ \hline \$3,900 \end{array}$$

$$75. \begin{array}{r} 10,256 \\ \times \$137 \\ \hline \end{array} \rightarrow \begin{array}{r} 1 \mid 0000 \\ \times 137 \mid \\ \hline 137 \mid 0000 \end{array} =$$

\$1,370,000

$$76. \begin{array}{r} 48 \\ \times 12 \\ \hline \end{array} \rightarrow \begin{array}{r} 5 \mid 0 \\ \times 1 \mid 0 \\ \hline 5 \mid 00 \end{array}$$

500
 $\times 7$
\$3500 per week

$$77. \begin{array}{r} 1000 \\ \times 4 \\ \hline 4000 \end{array}$$

4000 minutes can be stored.

$$78. \begin{array}{r} 700 \\ \times 15 \\ \hline 3500 \\ + 7000 \\ \hline 10,500 \end{array}$$

15 CD's hold 10,500 MB of data

$$79. \begin{array}{r} \frac{1}{3} \\ \$45 \\ \times 37 \\ \hline 315 \\ + 1350 \\ \hline \$1,665 \end{array}$$

$$80. \begin{array}{r} \frac{1}{55} \\ \times 20 \\ \hline 00 \\ + 1100 \\ \hline 1100 \end{array}$$

It can go 1100 miles on 20 gallons of gas.

$$81. \begin{array}{r} 12 \\ \times 12 \\ \hline 24 \\ + 120 \\ \hline 144 \end{array}$$

A case contains 144 fl oz.

$$82. \begin{array}{r} 1 \\ 16 \\ \times 3 \\ \hline 48 \end{array}$$

The class meets for 48 hours.

$$83. \begin{array}{r} 2 \qquad 32 \\ 115 \qquad 575 \\ \times 5 \qquad \times 5 \mid 00 \\ \hline 575 \qquad 287,500 \end{array}$$

287,500 sheets of paper are delivered.

$$84. \begin{array}{r} 4 \\ 14 \qquad 28 \\ \times 2 \qquad \times 6 \\ \hline 28 \qquad 168 \end{array}$$

She gets 168 g of protein.

$$\begin{array}{r} 85. \quad 31 \\ \times 12 \\ \hline 62 \\ + 310 \\ \hline 372 \end{array}$$

He can travel 372 miles.

$$\begin{array}{r} 86. \quad 23 \\ \times 32 \\ \hline 46 \\ + 690 \\ \hline 736 \end{array}$$

Sherica schedules 736 hr.

$$\begin{array}{l} 87. \quad A = l \times w \\ A = (23 \text{ ft}) \times (12 \text{ ft}) \\ \begin{array}{r} 23 \\ \times 12 \\ \hline 46 \\ + 230 \\ \hline 276 \end{array} \end{array}$$

The area is 276 ft².

$$\begin{array}{l} 88. \quad A = l \times w \\ A = (31 \text{ m}) \times (2 \text{ m}) = 62 \text{ m}^2 \end{array}$$

$$\begin{array}{l} 89. \quad A = l \times w \\ A = (73 \text{ cm}) \times (73 \text{ cm}) \\ \begin{array}{r} 73 \\ \times 73 \\ \hline 219 \\ + 5110 \\ \hline 5329 \end{array} \end{array}$$

The area is 5329 cm².

$$\begin{array}{l} 90. \quad A = l \times w \\ A = (41 \text{ yd}) \times (41 \text{ yd}) \\ \begin{array}{r} 41 \\ \times 41 \\ \hline 1640 \\ + 1640 \\ \hline 1681 \end{array} \end{array}$$

The area is 1681 yd².

$$\begin{array}{l} 91. \quad A = l \times w \\ A = (390 \text{ mi}) \times (270 \text{ mi}) \end{array}$$

$$\begin{array}{r} 1 \\ 6 \\ 390 \\ \times 270 \\ \hline 000 \\ 27300 \\ + 78000 \\ \hline 105,300 \end{array}$$

The area is 105,300 mi².

$$\begin{array}{l} 92. \quad A = l \times w \\ A = (130 \text{ yd}) \times (150 \text{ yd}) \\ \begin{array}{r} 130 \\ \times 150 \\ \hline 000 \\ 6500 \\ + 13000 \\ \hline 19,500 \end{array} \end{array}$$

The area is 19,500 yd².

$$\begin{array}{l} 93. \quad (a) \quad A = l \times w \\ A = (40 \text{ in.}) \times (60 \text{ in.}) \\ \begin{array}{r} 40 \\ \times 60 \\ \hline 00 \\ + 2400 \\ \hline 2400 \text{ in.}^2 \end{array} \end{array}$$

$$\begin{array}{l} (b) \quad \begin{array}{r} 14 \\ \times 3 \\ \hline 42 \end{array} \\ \text{There are 42 windows.} \end{array}$$

$$\begin{array}{l} (c) \quad \begin{array}{r} 2400 \\ \times 42 \\ \hline 4800 \\ + 96000 \\ \hline 100,800 \end{array} \\ \text{The total area is 100,800 in.}^2 \end{array}$$

94. $A = l \times w$

$$A = (50 \text{ ft.}) \times (30 \text{ ft.})$$

$$\begin{array}{r} 50 \\ \times 30 \\ \hline 000 \\ + 1500 \\ \hline 1500 \end{array}$$

The area is 1500 ft^2 .

95. $A = l \times w$

$$A = (8 \text{ ft}) \times (16 \text{ ft})$$

$$\begin{array}{r} 16 \\ \times 8 \\ \hline 128 \end{array}$$

The area is 128 ft^2 .

96. $A = l \times w$

$$A = (10 \text{ yd}) \times (15 \text{ yd}) = 150 \text{ yd}^2.$$

Section 1.6 Division of Whole Numbers

Section 1.6 Practice Exercises

1. (a) dividend; divisor; quotient

(b) 1

(c) 5

(d) 0

(e) undefined

(f) remainder

2. (a) $5 + 2$

(b) $5 \cdot 2$

(c) $(3 + 10) + 2$

(d) $(3 \cdot 10) \cdot 2$

3.
$$\begin{array}{r} 103 \\ \times 48 \\ \hline 824 \\ + 4120 \\ \hline 4944 \end{array}$$

4.
$$\begin{array}{r} 517 \\ \overline{) 78} \\ - 83 \\ \hline 595 \end{array}$$

5.
$$\begin{array}{r} 1008 \\ + 245 \\ \hline 1253 \end{array}$$

6.
$$\begin{array}{r} 220 \\ \times 14 \\ \hline 1880 \\ 2200 \\ \hline 3080 \end{array}$$

7.
$$\begin{array}{r} 12 \\ 5230 \\ \times 127 \\ \hline 11 \\ 36610 \\ 104600 \\ + 523000 \\ \hline 664,210 \end{array}$$

8.
$$\begin{array}{r} 11 \\ 44 \\ 789 \\ \times 25 \\ \hline 11 \\ 3945 \\ + 15780 \\ \hline 19,725 \end{array}$$

9.
$$\begin{array}{r} 318810 \\ \overline{) 888} \\ - 3988 \\ \hline 902 \end{array}$$

10.
$$\begin{array}{r} 1 \\ 38002 \\ + 3902 \\ \hline 41,904 \end{array}$$

11. $72 \div 8 = 9$ because $9 \times 8 = 72$.
dividend: 72
divisor: 8
quotient: 9

Chapter 1 Whole Numbers

12. $32 \div 4 = 8$ because $8 \times 4 = 32$.
dividend: 32
divisor: 4
quotient: 8

13. $8 \overline{)64} = 8$ because $8 \times 8 = 64$.
dividend: 64
divisor: 8
quotient: 8

14. $5 \overline{)35} = 7$ because $7 \times 5 = 35$.
dividend: 35
divisor: 5
quotient: 7

15. $\frac{45}{9} = 5$ because $5 \times 9 = 45$.
dividend: 45
divisor: 9
quotient: 5

16. $\frac{20}{5} = 4$ because $4 \times 5 = 20$.
dividend: 20
divisor: 5
quotient: 4

17. You cannot divide a number by zero (the quotient is undefined). If you divide zero by a number (other than zero), the quotient is always zero.

18. A number divided or multiplied by 1 remains unchanged.

19. $15 \div 1 = 15$ because $15 \times 1 = 15$.

20. $21 \overline{)21} = 1$ because $1 \times 21 = 21$.

21. $0 \div 10 = 0$ because $0 \times 10 = 0$.

22. $\frac{0}{3} = 0$ because $0 \times 3 = 0$.

23. $0 \overline{)9}$ is undefined because division by zero is undefined.

24. $4 \div 0$ is undefined because division by zero is undefined.

25. $\frac{20}{20} = 1$ because $1 \times 20 = 20$.

26. $1 \overline{)9} = 9$ because $9 \times 1 = 9$.

27. $\frac{16}{0}$ is undefined because division by zero is undefined.

28. $\frac{5}{1} = 5$ because $5 \times 1 = 5$.

29. $8 \overline{)0} = 0$ because $0 \times 8 = 0$.

30. $13 \div 13 = 1$ because $13 \times 1 = 13$.

31. $6 \div 3 = 2$ because $2 \times 3 = 6$.
 $3 \div 6 \neq 2$ because $2 \times 6 \neq 3$.

32. $(36 \div 12) \div 3 = 3 \div 3 = 1$ but
 $36 \div (12 \div 3) = 36 \div 4 = 9$.

33. To check a division problem without a remainder you should multiply the quotient and the divisor to get the dividend.

34. To check $0 \div 5 = 0$ we multiply $0 \times 5 = 0$ which is true. If we try to check $5 \div 0 = ?$ we need to find a number to multiply by 0 to get 5. Since no such number exists, the answer to $5 \div 0$ is undefined.

35.
$$\begin{array}{r} 13 \\ 6 \overline{)78} \\ \underline{-6} \\ 18 \\ \underline{-18} \\ 0 \end{array} \qquad \begin{array}{r} 1 \\ 13 \\ \times 6 \\ \hline 78 \end{array} \checkmark$$

36.
$$\begin{array}{r} 52 \\ 7 \overline{)364} \\ \underline{-35} \\ 14 \\ \underline{-14} \\ 0 \end{array} \qquad \begin{array}{r} 1 \\ 52 \\ \times 7 \\ \hline 364 \end{array} \checkmark$$

$$\begin{array}{r} 41 \\ 5 \overline{) 205} \\ \underline{-20} \\ 05 \\ \underline{-5} \\ 0 \end{array}$$

$$\begin{array}{r} 41 \\ \times 5 \\ \hline 205 \end{array} \checkmark$$

$$\begin{array}{r} 203 \\ 5 \overline{) 1015} \\ \underline{-10} \\ 01 \\ \underline{-0} \\ 15 \\ \underline{-15} \\ 0 \end{array}$$

$$\begin{array}{r} 1 \\ 203 \\ \times 5 \\ \hline 1015 \end{array} \checkmark$$

$$\begin{array}{r} 19 \\ 8 \overline{) 152} \\ \underline{-8} \\ 72 \\ \underline{-72} \\ 0 \end{array}$$

$$\begin{array}{r} 19 \\ \times 8 \\ \hline 152 \end{array} \checkmark$$

$$\begin{array}{r} 407 \\ 5 \overline{) 2035} \\ \underline{-20} \\ 03 \\ \underline{-0} \\ 35 \\ \underline{-35} \\ 0 \end{array}$$

$$\begin{array}{r} 3 \\ 407 \\ \times 5 \\ \hline 2035 \end{array} \checkmark$$

$$\begin{array}{r} 486 \\ 2 \overline{) 972} \\ \underline{-8} \\ 17 \\ \underline{-16} \\ 12 \\ \underline{-12} \\ 0 \end{array}$$

$$\begin{array}{r} 11 \\ 486 \\ \times 2 \\ \hline 972 \end{array} \checkmark$$

$$\begin{array}{r} 822 \\ 6 \overline{) 4932} \\ \underline{-48} \\ 13 \\ \underline{-12} \\ 12 \\ \underline{-12} \\ 0 \end{array}$$

$$\begin{array}{r} 11 \\ 822 \\ \times 6 \\ \hline 4932 \end{array} \checkmark$$

$$\begin{array}{r} 97 \\ 6 \overline{) 582} \\ \underline{-54} \\ 42 \\ \underline{-42} \\ 0 \end{array}$$

$$\begin{array}{r} 4 \\ 97 \\ \times 6 \\ \hline 582 \end{array} \checkmark$$

$$\begin{array}{r} 517 \\ 7 \overline{) 3619} \\ \underline{-35} \\ 11 \\ \underline{-7} \\ 49 \\ \underline{-49} \\ 0 \end{array}$$

$$\begin{array}{r} 14 \\ 517 \\ \times 7 \\ \hline 3619 \end{array} \checkmark$$

$$\begin{array}{r} 409 \\ 3 \overline{) 1227} \\ \underline{-12} \\ 02 \\ \underline{-0} \\ 27 \\ \underline{-27} \\ 0 \end{array}$$

$$\begin{array}{r} 2 \\ 409 \\ \times 3 \\ \hline 1227 \end{array} \checkmark$$

$$\begin{array}{r} 2 \\ 56 \\ \times 4 \\ \hline 224 \end{array} \text{ correct}$$

$$\begin{array}{r} 59 \\ 4 \overline{) 236} \\ \underline{-20} \\ 36 \\ \underline{-36} \\ 0 \end{array}$$

$$\begin{array}{r} 3 \\ 59 \\ \times 4 \\ \hline 236 \end{array} \checkmark$$

$$\begin{array}{r} 1 \\ 82 \\ \times 7 \\ \hline 574 \end{array} \text{ correct}$$

Chapter 1 Whole Numbers

$$\begin{array}{r} 1 \\ 49. \quad 253 \\ \times 3 \\ \hline 759 \end{array} \text{ incorrect}$$

$$\begin{array}{r} 253 \text{ R } 2 \\ 3 \overline{) 761} \\ \underline{-6} \\ 16 \\ \underline{-15} \\ 11 \\ \underline{-9} \\ 2 \end{array}$$

$$\begin{array}{r} 7 \text{ R } 5 \\ 55. \quad 8 \overline{) 61} \\ \underline{-56} \\ 5 \end{array}$$

$$7 \times 8 + 5 = 56 + 5 = 61 \checkmark$$

$$\begin{array}{r} 1 \\ 50. \quad 120 \\ \times 5 \\ \hline 600 \end{array} \text{ incorrect}$$

$$\begin{array}{r} 120 \text{ R } 4 \\ 5 \overline{) 604} \\ \underline{-5} \\ 10 \\ \underline{-10} \\ 04 \\ \underline{-0} \\ 4 \end{array}$$

$$\begin{array}{r} 29 \text{ R } 2 \\ 56. \quad 3 \overline{) 89} \\ \underline{-6} \\ 29 \\ \underline{-27} \\ 2 \end{array}$$

$$29 \times 3 + 2 = 87 + 2 = 89 \checkmark$$

$$\begin{array}{r} 10 \text{ R } 2 \\ 57. \quad 9 \overline{) 92} \\ \underline{-9} \\ 02 \end{array}$$

$$10 \times 9 + 2 = 90 + 2 = 92 \checkmark$$

$$\begin{array}{r} 12 \\ 51. \quad 113 \\ \times 9 \\ \hline 1017 \\ + 4 \text{ Add the remainder.} \\ \hline 1021 \end{array} \text{ Correct}$$

$$\begin{array}{r} 14 \text{ R } 4 \\ 58. \quad 5 \overline{) 74} \\ \underline{-5} \\ 24 \\ \underline{-20} \\ 4 \end{array}$$

$$14 \times 5 + 4 = 70 + 4 = 74 \checkmark$$

$$\begin{array}{r} 14 \\ 52. \quad 218 \\ \times 6 \\ \hline 1308 \\ + 3 \text{ Add the remainder.} \\ \hline 1311 \end{array} \text{ Correct}$$

$$\begin{array}{r} 27 \text{ R } 1 \\ 59. \quad 2 \overline{) 55} \\ \underline{-4} \\ 15 \\ \underline{-14} \\ 1 \end{array}$$

$$27 \times 2 + 1 = 54 + 1 = 55 \checkmark$$

$$\begin{array}{r} 4 \\ 53. \quad 25 \\ \times 8 \\ \hline 200 \\ + 6 \\ \hline 206 \end{array} \text{ incorrect}$$

$$\begin{array}{r} 25 \text{ R } 3 \\ 8 \overline{) 203} \\ \underline{-16} \\ 43 \\ \underline{-40} \\ 3 \end{array}$$

$$\begin{array}{r} 16 \text{ R } 1 \\ 60. \quad 3 \overline{) 49} \\ \underline{-3} \\ 19 \\ \underline{-18} \\ 1 \end{array}$$

$$16 \times 3 + 1 = 48 + 1 = 49 \checkmark$$

$$\begin{array}{r} 14 \\ 54. \quad 117 \\ \times 7 \\ \hline 819 \\ + 5 \\ \hline 824 \end{array} \text{ incorrect}$$

$$\begin{array}{r} 117 \text{ R } 2 \\ 7 \overline{) 821} \\ \underline{-7} \\ 12 \\ \underline{-7} \\ 51 \\ \underline{-49} \\ 2 \end{array}$$

$$\begin{array}{r} 197 \text{ R } 2 \\ 61. \quad 3 \overline{) 593} \\ \underline{-3} \\ 29 \\ \underline{-27} \\ 23 \\ \underline{-21} \\ 2 \end{array}$$

$$197 \times 3 + 2 = 591 + 2 = 593 \checkmark$$

$$\begin{array}{r}
 200 \text{ R } 1 \\
 62. \quad 4 \overline{) 801} \\
 \underline{-8} \\
 00 \\
 \underline{-00} \\
 01 \\
 \underline{-00} \\
 1
 \end{array}$$

$$200 \times 4 + 1 = 800 + 1 \\
 = 801 \checkmark$$

$$\begin{array}{r}
 751 \text{ R } 6 \\
 67. \quad 8 \overline{) 6014} \\
 \underline{-56} \\
 41 \\
 \underline{-40} \\
 14 \\
 \underline{-8} \\
 6
 \end{array}$$

$$\begin{array}{r}
 4 \\
 751 \\
 \times 8 \\
 \hline
 6008 \\
 + 6 \\
 \hline
 6014 \checkmark
 \end{array}$$

$$\begin{array}{r}
 42 \text{ R } 4 \\
 63. \quad 9 \overline{) 382} \\
 \underline{-36} \\
 22 \\
 \underline{-18} \\
 4
 \end{array}$$

$$42 \times 9 + 4 = 378 + 4 \\
 = 382 \checkmark$$

$$\begin{array}{r}
 1287 \text{ R } 4 \\
 68. \quad 7 \overline{) 9013} \\
 \underline{-7} \\
 20 \\
 \underline{-14} \\
 61 \\
 \underline{-56} \\
 53 \\
 \underline{-49} \\
 4
 \end{array}$$

$$\begin{array}{r}
 264 \\
 1287 \\
 \times 7 \\
 \hline
 9009 \\
 + 4 \\
 \hline
 9013 \checkmark
 \end{array}$$

$$\begin{array}{r}
 53 \text{ R } 4 \\
 64. \quad 8 \overline{) 428} \\
 \underline{-40} \\
 28 \\
 \underline{-24} \\
 4
 \end{array}$$

$$53 \times 8 + 4 = 424 + 4 \\
 = 428 \checkmark$$

$$\begin{array}{r}
 835 \text{ R } 2 \\
 69. \quad 6 \overline{) 5012} \\
 \underline{-48} \\
 21 \\
 \underline{-18} \\
 32 \\
 \underline{-30} \\
 2
 \end{array}$$

$$\begin{array}{r}
 23 \\
 835 \\
 \times 6 \\
 \hline
 5010 \\
 + 2 \\
 \hline
 5012 \checkmark
 \end{array}$$

$$\begin{array}{r}
 1557 \text{ R } 1 \\
 65. \quad 2 \overline{) 3115} \\
 \underline{-2} \\
 11 \\
 \underline{-10} \\
 11 \\
 \underline{-10} \\
 15 \\
 \underline{-14} \\
 1
 \end{array}$$

$$\begin{array}{r}
 111 \\
 1557 \\
 \times 2 \\
 \hline
 3114 \\
 + 1 \\
 \hline
 3115 \checkmark
 \end{array}$$

$$\begin{array}{r}
 550 \text{ R } 1 \\
 70. \quad 2 \overline{) 1101} \\
 \underline{-10} \\
 10 \\
 \underline{-10} \\
 01 \\
 \underline{00} \\
 1
 \end{array}$$

$$\begin{array}{r}
 1 \\
 550 \\
 \times 2 \\
 \hline
 1100 \\
 + 1 \\
 \hline
 1101 \checkmark
 \end{array}$$

$$\begin{array}{r}
 785 \text{ R } 5 \\
 66. \quad 6 \overline{) 4715} \\
 \underline{-42} \\
 51 \\
 \underline{-48} \\
 35 \\
 \underline{-30} \\
 5
 \end{array}$$

$$\begin{array}{r}
 53 \\
 785 \\
 \times 6 \\
 \hline
 4710 \\
 + 5 \\
 \hline
 4715 \checkmark
 \end{array}$$

$$\begin{array}{r}
 479 \text{ R } 9 \\
 71. \quad 19 \overline{) 9110} \\
 \underline{-76} \\
 151 \\
 \underline{-133} \\
 180 \\
 \underline{-171} \\
 9
 \end{array}$$

$$\begin{array}{r} 269 \text{ R } 8 \\ 72. \quad 13 \overline{) 3505} \\ \underline{-26} \\ 90 \\ \underline{-78} \\ 125 \\ \underline{-117} \\ 8 \end{array}$$

$$\begin{array}{r} 43 \text{ R } 19 \\ 73. \quad 24 \overline{) 1051} \\ \underline{-96} \\ 91 \\ \underline{-72} \\ 19 \end{array}$$

$$\begin{array}{r} 197 \text{ R } 27 \\ 74. \quad 41 \overline{) 8104} \\ \underline{-41} \\ 400 \\ \underline{-369} \\ 314 \\ \underline{-287} \\ 27 \end{array}$$

$$\begin{array}{r} 308 \\ 75. \quad 26 \overline{) 8008} \\ \underline{-78} \\ 20 \\ \underline{-0} \\ 208 \\ \underline{-208} \\ 0 \end{array}$$

$$\begin{array}{r} 612 \\ 76. \quad 15 \overline{) 9180} \\ \underline{-90} \\ 18 \\ \underline{-15} \\ 30 \\ \underline{-30} \\ 0 \end{array}$$

$$\begin{array}{r} 1259 \text{ R } 26 \\ 77. \quad 54 \overline{) 68012} \\ \underline{-54} \\ 140 \\ \underline{-108} \\ 321 \\ \underline{-270} \\ 512 \\ \underline{-486} \\ 26 \end{array}$$

$$\begin{array}{r} 2628 \text{ R } 33 \\ 78. \quad 35 \overline{) 92,013} \\ \underline{-70} \\ 220 \\ \underline{-210} \\ 101 \\ \underline{-70} \\ 313 \\ \underline{-280} \\ 33 \end{array}$$

$$\begin{array}{r} 22 \\ 79. \quad 75 \overline{) 1650} \\ \underline{-150} \\ 150 \\ \underline{-150} \\ 0 \end{array}$$

$$\begin{array}{r} 41 \\ 80. \quad 89 \overline{) 3649} \\ \underline{-356} \\ 89 \\ \underline{-89} \\ 0 \end{array}$$

$$\begin{array}{r} 35 \text{ R } 1 \\ 81. \quad 520 \overline{) 18,201} \\ \underline{-1560} \\ 2601 \\ \underline{-2600} \\ 1 \end{array}$$

$$\begin{array}{r} 21 \text{ R } 20 \\ 82. \quad 298 \overline{) 6278} \\ \underline{-596} \\ 318 \\ \underline{-298} \\ 20 \end{array}$$

$$\begin{array}{r}
 229 \text{ R } 96 \\
 83. \quad 304 \overline{) 69712} \\
 \underline{-608} \\
 891 \\
 \underline{-608} \\
 2832 \\
 \underline{-2736} \\
 96
 \end{array}$$

$$\begin{array}{r}
 231 \text{ R } 56 \\
 84. \quad 221 \overline{) 51107} \\
 \underline{-442} \\
 690 \\
 \underline{-663} \\
 277 \\
 \underline{-221} \\
 56
 \end{array}$$

$$\begin{array}{r}
 302 \\
 85. \quad 114 \overline{) 34428} \\
 \underline{-342} \\
 22 \\
 \underline{-00} \\
 228 \\
 \underline{-228} \\
 0
 \end{array}$$

$$\begin{array}{r}
 209 \\
 86. \quad 421 \overline{) 87989} \\
 \underline{-842} \\
 378 \\
 \underline{-000} \\
 3789 \\
 \underline{-3789} \\
 0
 \end{array}$$

$$\begin{array}{r}
 7 \\
 87. \quad 497 \div 71 = 7 \\
 71 \overline{) 497} \\
 \underline{-497} \\
 0
 \end{array}$$

$$\begin{array}{r}
 42 \\
 88. \quad 1890 \div 45 = 42 \\
 45 \overline{) 1890} \\
 \underline{-180} \\
 90 \\
 \underline{-90} \\
 0
 \end{array}$$

$$89. \quad 877 \div 14 = 62 \text{ R } 9$$

$$\begin{array}{r}
 62 \text{ R } 9 \\
 14 \overline{) 877} \\
 \underline{-84} \\
 37 \\
 \underline{-28} \\
 9
 \end{array}$$

$$90. \quad 722 \div 53 = 13 \text{ R } 33$$

$$\begin{array}{r}
 13 \\
 53 \overline{) 722} \\
 \underline{-53} \\
 192 \\
 \underline{-159} \\
 33
 \end{array}$$

$$91. \quad 42 \div 6 = 7$$

$$92. \quad 108 \div 9 = 12$$

$$\begin{array}{r}
 12 \\
 9 \overline{) 108} \\
 \underline{-9} \\
 18 \\
 \underline{-18} \\
 0
 \end{array}$$

$$93. \quad 28 \overline{) 392} \text{ 14 classrooms}$$

$$\begin{array}{r}
 14 \\
 28 \overline{) 392} \\
 \underline{-28} \\
 112 \\
 \underline{-112} \\
 0
 \end{array}$$

$$94. \quad 8 \overline{) 120} \text{ 15 tables}$$

$$\begin{array}{r}
 15 \\
 8 \overline{) 120} \\
 \underline{-8} \\
 40 \\
 \underline{-40} \\
 0
 \end{array}$$

$$95. \quad 32 \overline{) 168} \text{ 5 R } 8$$

$$\begin{array}{r}
 5 \text{ R } 8 \\
 32 \overline{) 168} \\
 \underline{-160} \\
 8
 \end{array}$$

5 cases; 8 cans left over

$$96. \begin{array}{r} 8 \text{ R } 9 \\ 52 \overline{) 425} \\ \underline{-416} \\ 9 \end{array}$$

Yes; \$9 left over

$$97. \begin{array}{r} 120 \\ 25 \overline{) 3000} \\ \underline{-25} \\ 50 \\ \underline{-50} \\ 0 \\ \underline{-0} \\ 0 \end{array}$$

There will be 120 classes of Beginning Algebra.

$$98. \begin{array}{r} 10560 \\ 8 \overline{) 84480} \\ \underline{-8} \\ 4 \\ \underline{-0} \\ 44 \\ \underline{-40} \\ 48 \\ \underline{-48} \\ 0 \\ \underline{-0} \\ 0 \end{array}$$

Each person will receive \$10,560.

$$99. \begin{array}{r} 9 \\ 45 \overline{) 405} \\ \underline{-405} \\ 0 \end{array}$$

There will be 9 gallons used.

$$100. \begin{array}{r} 26 \\ 52 \overline{) 1352} \\ \underline{-104} \\ 312 \\ \underline{-312} \\ 0 \end{array}$$

The couple traveled for 26 hours.

$$101. 1200 \div 20 = 60$$

$$\begin{array}{r} 60 \\ 20 \overline{) 1200} \\ \underline{-120} \\ 00 \\ \underline{-0} \\ 0 \end{array}$$

Approximately 60 words per minute

$$102. 2800 \div 400$$

$$\begin{array}{r} 7 \\ 400 \overline{) 2800} \\ \underline{-2800} \\ 0 \end{array}$$

Approximately 7 tanks of gas

$$103. \begin{array}{r} 25 \\ 18 \overline{) 450} \\ \underline{-36} \\ 90 \\ \underline{-90} \\ 0 \end{array}$$

Yes, they can all attend if they sit in the second balcony.

$$104. \begin{array}{r} 3\,000 \\ 12 \overline{) 36,000} \\ \underline{-36} \\ 0 \end{array}$$

Teacher: \$3000

$$\begin{array}{r} 5\,000 \\ 12 \overline{) 60,000} \\ \underline{-60} \\ 0 \end{array}$$

Professor: \$5,000

$$\begin{array}{r} 10,000 \\ 12 \overline{) 120,000} \\ \underline{-12} \\ 0 \end{array}$$

CEO: \$10,000

$$\begin{array}{r} 4\,000 \\ 12 \overline{) 48,000} \\ \underline{-48} \\ 0 \end{array}$$

Programmer: \$4,000

$$105. \begin{array}{r} 21,000,000 \\ \times \quad 365 \\ \hline 7,665,000,000 \text{ bbl} \end{array}$$

$$106. \begin{array}{r} 52 \\ \times \quad 5 \\ \hline 260 \\ \times \quad 50 \\ \hline 13,000 \text{ min} \end{array}$$

107. $13,360 \div 4 = 3340$
\$3340 billion

108.
$$\begin{array}{r} 34,080 \\ - 9,600 \\ \hline 24,480 \end{array}$$

 $24,480 \div 96 = 255$
Each crate weighs 255 lb.

Problem Recognition Exercises: Operations on Whole Numbers

1. (a)
$$\begin{array}{r} 96 \\ + 24 \\ \hline 120 \end{array}$$

(b)
$$\begin{array}{r} 96 \\ - 24 \\ \hline 72 \end{array}$$

(c)
$$\begin{array}{r} 96 \\ \times 24 \\ \hline 384 \\ + 1920 \\ \hline 2304 \end{array}$$

(d)
$$\begin{array}{r} 4 \\ 24 \overline{) 96} \\ \underline{-96} \\ 0 \end{array}$$

2. (a)
$$\begin{array}{r} 550 \\ + 25 \\ \hline 575 \end{array}$$

(b)
$$\begin{array}{r} 4 \ 10 \\ 5 \cancel{5} \cancel{0} \\ - 25 \\ \hline 525 \end{array}$$

(c)
$$\begin{array}{r} 550 \\ \times 25 \\ \hline 2750 \\ + 11000 \\ \hline 13,750 \end{array}$$

(d)
$$\begin{array}{r} 22 \\ 25 \overline{) 550} \\ \underline{-50} \\ 50 \\ \underline{50} \\ 0 \end{array}$$

3. (a)
$$\begin{array}{r} 612 \\ + 334 \\ \hline 946 \end{array}$$

(b)
$$\begin{array}{r} 946 \\ - 334 \\ \hline 612 \end{array}$$

4. (a)
$$\begin{array}{r} 5 \ 10 \ 12 \\ \cancel{5} \cancel{1} \cancel{2} \\ - 334 \\ \hline 278 \end{array}$$

(b)
$$\begin{array}{r} 278 \\ + 334 \\ \hline 612 \end{array}$$

5. (a)
$$\begin{array}{r} 4 \ 9 \ 10 \\ 5 \cancel{5} \cancel{0} \cancel{0} \\ - 4299 \\ \hline 1201 \end{array}$$

(b)
$$\begin{array}{r} 1201 \\ + 4299 \\ \hline 5500 \end{array}$$

$$\begin{array}{r} \text{6. (a)} \quad \begin{array}{r} 22,718 \\ + 12,137 \\ \hline 34,855 \end{array} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad \begin{array}{r} 34,8\cancel{8}\cancel{7} \\ - 12,13\cancel{7} \\ \hline 22,718 \end{array} \end{array}$$

$$\begin{array}{r} \text{7. (a)} \quad \begin{array}{r} 400 \\ \times 50 \\ \hline 000 \\ + 20000 \\ \hline 20,000 \end{array} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad \begin{array}{r} 400 \\ 50 \overline{) 20000} \\ \underline{-200} \\ 00 \\ \underline{-0} \\ 00 \\ \underline{-0} \\ 0 \end{array} \end{array}$$

$$\begin{array}{r} \text{8. (a)} \quad \begin{array}{r} 24 \\ 12 \\ 548 \\ \times 63 \\ \hline 1644 \\ + 32880 \\ \hline 34,524 \end{array} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad \begin{array}{r} 548 \\ 63 \overline{) 34524} \\ \underline{-315} \\ 302 \\ \underline{-252} \\ 504 \\ \underline{-504} \\ 0 \end{array} \end{array}$$

$$\begin{array}{r} \text{9. (a)} \quad \begin{array}{r} 230 \\ 22 \overline{) 5060} \\ \underline{-44} \\ 66 \\ \underline{-66} \\ 00 \\ \underline{-0} \\ 0 \end{array} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad \begin{array}{r} 230 \\ \times 22 \\ \hline 460 \\ + 4600 \\ \hline 5060 \end{array} \end{array}$$

$$\begin{array}{r} \text{10. (a)} \quad \begin{array}{r} 15 \\ 125 \overline{) 1875} \\ \underline{-125} \\ 625 \\ \underline{-625} \\ 0 \end{array} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad \begin{array}{r} 12 \\ 125 \\ \times 15 \\ \hline 625 \\ + 1250 \\ \hline 1875 \end{array} \end{array}$$

$$\begin{array}{r} \text{11. (a)} \quad \begin{array}{r} 328 \\ 4 \overline{) 1312} \\ \underline{-12} \\ 11 \\ \underline{-8} \\ 32 \\ \underline{32} \\ 0 \end{array} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad \begin{array}{r} 4 \\ 328 \overline{) 1312} \\ \underline{-1312} \\ 0 \end{array} \end{array}$$

$$\begin{array}{r} \text{12. (a)} \quad \begin{array}{r} 8 \\ 547 \overline{) 4376} \\ \underline{-4376} \\ 0 \end{array} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad \begin{array}{r} 547 \\ 8 \overline{) 4376} \\ \underline{-40} \\ 37 \\ \underline{-32} \\ 56 \\ \underline{56} \\ 0 \end{array} \end{array}$$

13. (a) $418 \times 10 = 4180$
 (b) $418 \times 100 = 41,800$
 (c) $418 \times 1000 = 418,000$
 (d) $418 \times 10,000 = 4,180,000$

14. (a) $350,000 \div 10 = 35,000$
 (b) $350,000 \div 100 = 3500$
 (c) $350,000 \div 1000 = 350$
 (d) $350,000 \div 10,000 = 35$

15.
$$\begin{array}{r} 11 \\ 159 \\ 224 \\ + 123 \\ \hline 506 \end{array}$$

16.
$$\begin{array}{r} 230 \text{ R } 4 \\ 22 \overline{) 5064} \\ \underline{-44} \\ 66 \\ \underline{-66} \\ 04 \\ \underline{-0} \\ 4 \end{array}$$

17.
$$\begin{array}{r} 32 \\ 843 \\ \times 27 \\ \hline 5901 \\ + 16860 \\ \hline 22,761 \end{array}$$

18.
$$\begin{array}{r} 9 9 9 9 \\ 6 \cancel{10} \cancel{10} \cancel{10} \cancel{10} \\ - 4 3 9 \\ \hline 6 5 6 1 \end{array}$$

Section 1.7 Exponents, Algebraic Expressions, and the Order of Operations

Section 1.7 Practice Exercises

1. (a) base; 4
 (b) powers
 (c) square root; 81
 (d) order; operations
 (e) variable; constants
2. False: $10 - (3 - 2) \neq (10 - 3) - 2$
3. True: $5 + 3 = 8$ and $3 + 5 = 8$
4. False: $5 - 3 = 2$, but $3 - 5 \neq 2$
5. False: $6 \times 0 = 0$
6. True: $0 \div 8 = 0$
7. True: $0 \times 8 = 0$
8. True: $5 \div 0$ is undefined
9. 9^4
10. 3^8
11. $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^6$
12. $7 \cdot 7 \cdot 7 \cdot 7 = 7^4$
13. $4 \cdot 4 \cdot 4 \cdot 4 \cdot 2 \cdot 2 \cdot 2 = 4^4 \cdot 2^3$
14. $5 \cdot 5 \cdot 5 \cdot 10 \cdot 10 \cdot 10 = 5^3 \cdot 10^3$
15. $8^4 = 8 \cdot 8 \cdot 8 \cdot 8$
16. $2^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
17. $4^8 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$
18. $6^2 = 6 \cdot 6$
19. $2^3 = 2 \cdot 2 \cdot 2 = 4 \cdot 2 = 8$
20. $4^2 = 4 \cdot 4 = 16$

21. $3^2 = 3 \cdot 3 = 9$

22. $5^2 = 5 \cdot 5 = 25$

23. $3^3 = 3 \cdot 3 \cdot 3 = 9 \cdot 3 = 27$

24. $11^2 = 11 \cdot 11 = 121$

25. $5^3 = 5 \cdot 5 \cdot 5 = 25 \cdot 5 = 125$

26. $10^3 = 10 \cdot 10 \cdot 10 = 100 \cdot 10 = 1000$

27. $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 4 \cdot 4 \cdot 2 = 16 \cdot 2 = 32$

28. $6^3 = 6 \cdot 6 \cdot 6 = 36 \cdot 6 = 216$

29. $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 9 \cdot 9 = 81$

30. $5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 25 \cdot 25 = 625$

31. $1^2 = 1 \cdot 1 = 1$; $1^3 = 1 \cdot 1 \cdot 1 = 1$;
 $1^4 = 1 \cdot 1 \cdot 1 \cdot 1 = 1$; $1^5 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$; The
 number 1 raised to any power equals 1.

32. $10^2 = 10 \cdot 10 = 100$

33. $10^3 = 10 \cdot 10 \cdot 10 = 1000$

34. $10^4 = 10 \cdot 10 \cdot 10 \cdot 10 = 10,000$

35. $10^5 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 100,000$

36. 10^9 simplifies to a 1 followed by 9 zeros:
 1,000,000,000.

37. $\sqrt{4} = 2$ because $2 \cdot 2 = 4$.

38. $\sqrt{9} = 3$ because $3 \cdot 3 = 9$.

39. $\sqrt{36} = 6$ because $6 \cdot 6 = 36$.

40. $\sqrt{81} = 9$ because $9 \cdot 9 = 81$.

41. $\sqrt{100} = 10$ because $10 \cdot 10 = 100$.

42. $\sqrt{49} = 7$ because $7 \cdot 7 = 49$.

43. $\sqrt{0} = 0$ because $0 \cdot 0 = 0$.

44. $\sqrt{16} = 4$ because $4 \cdot 4 = 16$.

45. No, addition and subtraction should be performed in the order in which they appear from left to right.

46. No, multiplication and division should be performed in the order in which they appear from left to right.

47. $6 + 10 \cdot 2 = 6 + 20 = 26$

48. $4 + 3 \cdot 7 = 4 + 21 = 25$

49. $10 - 3^2 = 10 - 9 = 1$

50. $11 - 2^2 = 11 - 4 = 7$

51. $(10 - 3)^2 = 7^2 = 49$

52. $(11 - 2)^2 = 9^2 = 81$

53. $36 \div 2 \div 6 = 18 \div 6 = 3$

54. $48 \div 4 \div 2 = 12 \div 2 = 6$

55. $15 - (5 + 8) = 15 - 13 = 2$

56. $41 - (13 + 8) = 41 - 21 = 20$

57. $(13 - 2) \cdot 5 - 2 = 11 \cdot 5 - 2 = 55 - 2 = 53$

58. $(8 + 4) \cdot 6 + 8 = 12 \cdot 6 + 8 = 72 + 8 = 80$

59. $4 + 12 \div 3 = 4 + 4 = 8$

60. $9 + 15 \div \sqrt{25} = 9 + 15 \div 5 = 9 + 3 = 12$

61. $30 \div 2 \cdot \sqrt{9} = 30 \div 2 \cdot 3 = 15 \cdot 3 = 45$

62. $55 \div 11 \cdot 5 = 5 \cdot 5 = 25$

63. $7^2 - 5^2 = 49 - 25 = 24$

64. $3^3 - 2^3 = 27 - 8 = 19$

65. $(7 - 5)^2 = 2^2 = 4$

66. $(3 - 2)^3 = 1^3 = 1$

Section 1.7 Exponents, Algebraic Expressions, and the Order of Operations

$$67. 100 \div 5 \cdot 2 = 20 \cdot 2 = 40$$

$$68. 60 \div 3 \cdot 2 = 20 \cdot 2 = 40$$

$$69. 20 - 5(11 - 8) = 20 - 5(3) = 20 - 15 = 5$$

$$70. 38 - 6(10 - 5) = 38 - 6(5) = 38 - 30 = 8$$

$$\begin{aligned} 71. \sqrt{36+64} + 2(9-1) &= \sqrt{100} + 2(8) \\ &= 10 + 2(8) \\ &= 10 + 16 \\ &= 26 \end{aligned}$$

$$\begin{aligned} 72. \sqrt{16+9} + 3(8-3) &= \sqrt{25} + 3(5) \\ &= 5 + 3(5) \\ &= 5 + 15 \\ &= 20 \end{aligned}$$

$$73. \frac{36}{2^2+5} = \frac{36}{4+5} = \frac{36}{9} = 4$$

$$74. \frac{42}{3^2-2} = \frac{42}{9-2} = \frac{42}{7} = 6$$

$$75. 80 - 20 \div 4 \cdot 6 = 80 - 5 \cdot 6 = 80 - 30 = 50$$

$$\begin{aligned} 76. 300 - 48 \div 8 \cdot 40 &= 300 - 6 \cdot 40 \\ &= 300 - 240 \\ &= 60 \end{aligned}$$

$$77. \frac{42-26}{4^2-8} = \frac{42-26}{16-8} = \frac{16}{8} = 2$$

$$78. \frac{22+14}{2^2 \cdot 3} = \frac{22+14}{4 \cdot 3} = \frac{22+14}{12} = \frac{36}{12} = 3$$

$$\begin{aligned} 79. (18-5) - (23-\sqrt{100}) &= 13 - (23-10) \\ &= 13-13 \\ &= 0 \end{aligned}$$

$$\begin{aligned} 80. (\sqrt{36}+11) - (31-16) &= (6+11) - 15 \\ &= 17-15 \\ &= 2 \end{aligned}$$

$$\begin{aligned} 81. 80 \div (9^2 - 7 \cdot 11)^2 &= 80 \div (81 - 7 \cdot 11)^2 \\ &= 80 \div (81 - 77)^2 \\ &= 80 \div 4^2 \\ &= 80 \div 16 \\ &= 5 \end{aligned}$$

$$\begin{aligned} 82. 108 \div (3^3 - 6 \cdot 4)^2 &= 108 \div (27 - 6 \cdot 4)^2 \\ &= 108 \div (27 - 24)^2 \\ &= 108 \div 3^2 \\ &= 108 \div 9 \\ &= 12 \end{aligned}$$

$$\begin{aligned} 83. 22 - 4(\sqrt{25} - 3)^2 &= 22 - 4(5 - 3)^2 \\ &= 22 - 4(2)^2 \\ &= 22 - 4 \cdot 4 \\ &= 22 - 16 \\ &= 6 \end{aligned}$$

$$\begin{aligned} 84. 17 + 3(7 - \sqrt{9})^2 &= 17 + 3(7 - 3)^2 \\ &= 17 + 3(4)^2 \\ &= 17 + 3 \cdot 16 \\ &= 17 + 48 \\ &= 65 \end{aligned}$$

$$\begin{aligned} 85. 96 - 3(42 \div 7 \cdot 6 - 5) &= 96 - 3(6 \cdot 6 - 5) \\ &= 96 - 3(36 - 5) \\ &= 96 - 3(31) \\ &= 96 - 93 \\ &= 3 \end{aligned}$$

$$\begin{aligned} 86. 50 - 2(36 \div 12 \cdot 2 - 4) &= 50 - 2(3 \cdot 2 - 4) \\ &= 50 - 2(6 - 4) \\ &= 50 - 2(2) \\ &= 50 - 4 \\ &= 46 \end{aligned}$$

$$\begin{aligned} 87. 16 + 5(20 \div 4 \cdot 8 - 3) &= 16 + 5(5 \cdot 8 - 3) \\ &= 16 + 5(40 - 3) \\ &= 16 + 5(37) \\ &= 16 + 185 \\ &= 201 \end{aligned}$$

$$\begin{aligned} 88. \quad 3[4 + (6 - 3)^2] - 15 &= 3[4 + 3^2] - 15 \\ &= 3[4 + 9] - 15 \\ &= 3[13] - 15 \\ &= 39 - 15 \\ &= 24 \end{aligned}$$

$$\begin{aligned} 89. \quad 2[5(4 - 1) + 3] \div 6 &= 2[5(3) + 3] \div 6 \\ &= 2[15 + 3] \div 6 \\ &= 2[18] \div 6 \\ &= 36 \div 6 \\ &= 6 \end{aligned}$$

$$\begin{aligned} 90. \quad 8^2 - 5[12 - (8 - 6)] &= 8^2 - 5[12 - 2] \\ &= 8^2 - 5[10] \\ &= 64 - 5(10) \\ &= 64 - 50 \\ &= 14 \end{aligned}$$

$$\begin{aligned} 91. \quad 3^3 - 2[15 - (2 + 1)^2] &= 3^3 - 2[15 - 3^2] \\ &= 3^3 - 2[15 - 9] \\ &= 3^3 - 2[6] \\ &= 27 - 2(6) \\ &= 27 - 12 \\ &= 15 \end{aligned}$$

$$\begin{aligned} 92. \quad 3[(10 - 4) - (5 - 1)]^2 &= 3[6 - 4]^2 \\ &= 3[2]^2 \\ &= 3[4] \\ &= 12 \end{aligned}$$

$$\begin{aligned} 93. \quad 10[(6 + 4) - (8 - 5)^2] &= 10[10 - 3^2] \\ &= 10[10 - 9] \\ &= 10[1] \\ &= 10 \end{aligned}$$

$$\begin{aligned} 94. \quad 5\{21 - [3^2 - (4 - 2)]\} &= 5\{21 - [3^2 - 2]\} \\ &= 5\{21 - [9 - 2]\} \\ &= 5\{21 - 7\} \\ &= 5\{14\} \\ &= 70 \end{aligned}$$

$$\begin{aligned} 95. \quad 4\{18 - [(10 - 8) + 2^3]\} &= 4\{18 - [2 + 2^3]\} \\ &= 4\{18 - [2 + 8]\} \\ &= 4\{18 - 10\} \\ &= 4\{8\} \\ &= 32 \end{aligned}$$

$$96. \quad 10y - z = 10(4) - 25 = 40 - 25 = 15$$

$$97. \quad 8w - 4x = 8(9) - 4(12) = 72 - 48 = 24$$

$$\begin{aligned} 98. \quad 3x + 6y + 9w &= 3(12) + 6(4) + 9(9) \\ &= 36 + 24 + 81 \\ &= 60 + 81 \\ &= 141 \end{aligned}$$

$$\begin{aligned} 99. \quad 9y - 4w + 3z &= 9(4) - 4(9) + 3(25) \\ &= 36 - 36 + 75 \\ &= 0 + 75 \\ &= 75 \end{aligned}$$

$$\begin{aligned} 100. \quad (z - x - y)^2 &= (25 - 12 - 4)^2 \\ &= (13 - 4)^2 \\ &= 9^2 \\ &= 81 \end{aligned}$$

$$\begin{aligned} 101. \quad (y + z - w)^2 &= (4 + 25 - 9)^2 \\ &= (29 - 9)^2 \\ &= 20^2 \\ &= 400 \end{aligned}$$

$$102. \quad \sqrt{z} = \sqrt{25} = 5$$

$$103. \quad \sqrt{w} = \sqrt{9} = 3$$

$$104. \quad 156^2 = 24,336$$

$$105. \quad 418^2 = 174,724$$

$$106. \quad 12^5 = 248,832$$

$$107. \quad 35^4 = 1,500,625$$

$$108. \quad 43^3 = 79,507$$

109. $71^3 = 357,911$

110. $8126 - 54,978 \div 561 = 8126 - 98 = 8028$

111. $92,168 + 6954 \times 29 = 92,168 + 201,666$
 $= 293,834$

112. $(3548 - 3291)^2 = 257^2 = 66,049$

113. $(7500 \div 625)^3 = 12^3 = 1728$

114. $\frac{89,880}{384 + 2184} = \frac{89,880}{2568} = 35$

115. $\frac{54,137}{3393 - 2134} = \frac{54,137}{1259} = 43$

Section 1.8 Mixed Applications and Computing Mean

Section 1.8 Practice Exercises

1. mean

2. $20 - 15$; 5

3. $71 + 14 = 85$

4. $42 + 16 = 58$

5. $2 \cdot 14 = 28$

6. $93 - 79 = 14$

7. $102 - 32 = 70$

8. $60 \div 12 = 5$

9. $10 \cdot 13 = 130$

10. $12 + 14 + 15 = 41$

11. $24 \div 6 = 4$

12. $78 - 41 = 37$

13. $5 + 13 + 25 = 43$

14. *Given:* total price: \$16,540
 down payment: \$2500
 payment plan: 36 months
Find: Amount of monthly payments

Operations

(1) Subtract

$$\begin{array}{r} 16,540 \\ - 2,500 \\ \hline 14,040 \end{array}$$

(2) Divide

$$\begin{array}{r} 390 \\ 36 \overline{) 14040} \\ \underline{- 108} \\ 324 \\ \underline{- 324} \\ 00 \end{array}$$

Jackson's monthly payments were \$390.

15. *Given:* total cost: 1170
 down payment: 150
 payment plan: 12 months
Find: Amount of monthly payments

Operations:

(1) Subtract

$$\begin{array}{r} 1170 \\ - 150 \\ \hline 1020 \end{array}$$

(2) Divide

$$\begin{array}{r} 85 \\ 12 \overline{) 1020} \\ \underline{- 96} \\ 60 \\ \underline{- 60} \\ 0 \end{array}$$

Lucio's monthly payment was \$85.

16. *Given:* Distance for each route and speed traveled

Find: Time required for each route

Operations

(1) Watertown to Utica direct

Divide $80 \div 40 = 2$ hr

Chapter 1 Whole Numbers

- (2) Watertown to Syracuse to Utica
Add distances $70 + 50 = 120$ mi
Divide $120 \div 60 = 2$ hr

Each trip will take 2 hours.

- 17.** *Given:* Distance for each route and speed traveled

Find: Time required for each route

Operations

- (1) Interstate:

Divide $220 \div 55 = 4$ hr

- (2) Back roads:

Divide $200 \div 40 = 5$ hr

The interstate will take 4 hours and the back roads will take 5 hours. The interstate will take less time.

- 18.** The distance around a figure is the perimeter.

- 19.** The amount of space covered is the area.

- 20.** *Given:* The dimensions of a room and cost per foot of molding

Find: Total cost

Operations:

- (1) Add to find the perimeter, subtract doorway.

$$\begin{array}{r} 11 \\ 12 \\ 11 \\ + 12 \\ \hline 46 \end{array} \qquad \begin{array}{r} 46 \\ - 3 \\ \hline 43 \text{ ft} \end{array}$$

- (2) Multiply to find the total cost.

$$\begin{array}{r} 43 \\ \times 2 \\ \hline 86 \end{array}$$

The cost will be \$86.

- 21.** *Given:* The dimensions of a yard and the cost per foot of fence

Find: Total cost

Operations

- (1) Add to find perimeter

$$\begin{array}{r} 1 \\ 75 \\ 90 \\ 75 \\ + 90 \\ \hline 330 \text{ ft} \end{array}$$

- (2) Multiply the perimeter by cost per foot.

$$\begin{array}{r} 1 \\ 330 \\ \times 5 \\ \hline 1650 \end{array}$$

It will cost \$1650.

- 22.** *Given:* dimensions of room and cost per square yard

Find: total cost

Operations

- (1) Multiply to find area

$$6 \times 5 = 30 \text{ yd}^2$$

- (2) Multiply to find total cost

$$\begin{array}{r} 1 \\ 34 \\ \times 30 \\ \hline 1020 \end{array}$$

The total cost is \$1020.

- 23.** *Given:* Dimensions of room and cost per foot

Find: Total cost

Operations

- (1) Multiply to find area.

$$\begin{array}{r} 12 \\ \times 20 \\ \hline 240 \text{ ft}^2 \end{array}$$

- (2) Multiply to find total cost.

$$\begin{array}{r} 1 \\ 240 \\ \times 3 \\ \hline 720 \end{array}$$

The total cost is \$720.

- 24.** *Given:* Starting balance in account and individual checks written

Find: Remaining balance in account

Operations

- (1) Add the individual checks

$$\begin{array}{r} 1 \\ 82 \\ 159 \\ + 101 \\ \hline \$242 \end{array}$$

- (2) Subtract \$242 from the initial balance

$$\begin{array}{r} 278 \\ - 242 \\ \hline 36 \end{array}$$

There will be \$36 left in Gina's account.

- 25.** *Given:* Initial balance in account and individual checks written

Find: The remaining balance

Operations

- (1) Add the individual checks.

$$\begin{array}{r} 11 \\ 587 \\ 36 \\ + 156 \\ \hline \$779 \end{array}$$

- (2) Subtract \$779 from the initial balance.

$$\begin{array}{r} 2\ 13\ 14\ 15 \\ \cancel{2}\ \cancel{1}\ \cancel{3}\ 5 \\ - 7\ 7\ 9 \\ \hline 2\ 6\ 7\ 6 \end{array}$$

There will be \$2676 left in Jose's account.

- 26.** *Given:* Number of computers and printers purchased and the cost of each

Find: The total bill

Operations

- (1) Multiply to find the amount spent on computers, then printers.

$$\begin{array}{r} 1\ 5 \\ 1 \\ 2118 \\ \times 72 \\ \hline 1 \\ 4\ 236 \\ 148\ 260 \\ \hline \$152,496 \end{array}$$

- (2) Add to find the total bill.

$$\begin{array}{r} 1\ 11 \\ 152,496 \\ + 1\ 536 \\ \hline 154,032 \end{array}$$

The total bill was \$154,032.

- 27.** *Given:* Price for children and adults, and the number of children and adults

Find: Total cost for the trip

Operations

- (1) Multiply to find the amount for children and for adults.

$$\begin{array}{r} 2 \\ 33 \\ \times 27 \\ \hline 231 \\ + 660 \\ \hline \$891 \end{array}$$

- (2) Add to find the total.

$$\begin{array}{r} 1 \\ 891 \\ + 222 \\ \hline \$1113 \end{array}$$

The amount of money required is \$1113.

- 28.** *Given:* Amount to sell used CDs, amount to buy used CDs and number of CDs sold

- (a) *Find:* Money from selling 16 CDs

Operation: Multiply

$$\begin{array}{r} 16 \\ \times 3 \\ \hline 48 \end{array}$$

Latayne will receive \$48.

- (b) *Find:* Number of used CDs to buy for \$48.

Operation: Division

$$48 \div 8 = 6$$

She can buy 6 CDs.

- 29.** *Given:* Wage per hour and number of hours worked

- (a) *Find:* Amount of weekly paycheck

Operation: Multiply

$$\begin{array}{r} 40 \\ \times 12 \\ \hline 480 \end{array}$$

Shevona's paycheck is worth \$480.

Chapter 1 Whole Numbers

- (b) *Given:* Ticket price and number of tickets
Find: Amount left over from paycheck
Operations

$$\begin{array}{r} (1) \text{ Multiply } 1 \\ 89 \\ \times 2 \\ \hline 178 \end{array}$$

$$\begin{array}{r} (2) \text{ Subtract } 710 \\ 4\cancel{8}\cancel{0} \\ - 178 \\ \hline 302 \end{array}$$

She will have \$302 left.

30. *Given:* Number of field goals, three-point shots and free throws and point values
Find: Total points scored
Operations

(1) Multiply	field goals	three-point shots
	1	2
	12,192	581
	$\times 2$	$\times 3$
	<u>24,384</u>	<u>1743</u>

$$\begin{array}{r} (2) \text{ Add } \\ 1111 \\ 24384 \\ 1743 \\ + 7327 \\ \hline 33,454 \end{array}$$

Michael Jordan scored 33,454 points with the Bulls.

31. *Given:* Width of each picture and width of the matte frame
Find: Space between each picture
Operations

(1) Multiply $5 \times 5 = 25$

(2) Subtract $37 - 25 = 12$

(3) Divide $12 \div 6 = 2$

There will be 2 in of matte between the pictures.

32. *Given:* Number of milliliters in the bottle and the dosage

- (a) *Find:* Days the bottle will last
Operation: Divide
 $60 \div 2 = 30$
 One bottle will last for 30 days.

- (b) *Find:* Date to reorder
Operation: Subtract
 $30 - 2 = 28$
 The owner should order a refill no later than September 28.

33. *Given:* Number of male and female doctors

- (a) *Find:* Difference between male and female doctors
Operation: Subtract

$$\begin{array}{r} 9 \\ 2\cancel{10}13 \\ 6\cancel{3}\cancel{0},300 \\ - 205,900 \\ \hline 424,400 \end{array}$$

The difference between the number of male and female doctors is 424,400.

- (b) *Find:* The total number of doctors
Operation: Add

$$\begin{array}{r} 1 \\ 630,300 \\ + 205,900 \\ \hline 836,200 \end{array}$$

The total number of doctors is 836,200.

34. *Given:* Scale on a map

- (a) *Find:* Actual distance between Las Vegas and Salt Lake City
Operation: Multiply

$$\begin{array}{r} 60 \\ \times 6 \\ \hline 360 \end{array}$$

The distance is 360 mi.

- (b) *Find:* Distance on map between Madison and Dallas

Operation: Divide

$$\begin{array}{r} 14 \\ 60 \overline{) 840} \\ \underline{-60} \\ 240 \\ \underline{-240} \\ 0 \end{array}$$

14 in. represents 840 mi.

35. *Given:* Scale on a map

- (a) *Find:* Actual distance between Wichita and Des Moines

Operation: Multiply

$$\begin{array}{r} 40 \\ \times 8 \\ \hline 320 \end{array}$$

The distance is 320 mi..

- (b) *Find:* The distance between Seattle and Sacramento on the map.

Operation: Divide

$$\begin{array}{r} 15 \\ 40 \overline{) 600} \\ \underline{-40} \\ 200 \\ \underline{-200} \\ 0 \end{array}$$

15 in. represents 600 mi.

36. *Given:* Number of books per box and number of books ordered

Find: Number of boxes completely filled and number of books left over

Operation: Divide and find remainder

$$\begin{array}{r} 104 \text{ R } 2 \\ 12 \overline{) 1250} \\ \underline{-12} \\ 050 \\ \underline{-48} \\ 2 \end{array}$$

104 boxes will be filled completely with 2 books left over.

37. *Given:* Number of eggs in a container and total number of eggs

Find: Number of containers filled and number of eggs left over

Operation: Divide and find remainder

$$\begin{array}{r} 354 \text{ R } 9 \\ 12 \overline{) 4257} \\ \underline{-36} \\ 65 \\ \underline{-60} \\ 57 \\ \underline{-48} \\ 9 \end{array}$$

354 containers will be filled completely with 9 eggs left over.

38. *Given:* Total cost of dinner and type of bill used

- (a) *Find:* Number of \$20 bills needed

Operation: Division

$$\begin{array}{r} 4 \text{ R } 4 \\ 20 \overline{) 84} \\ \underline{-80} \\ 4 \end{array}$$

Four \$20 bills are not enough so Marc needs five \$20 bills.

- (b) *Find:* How much change

Operations: Multiply and subtract

$$\begin{array}{r} 20 100 \\ \times 5 - 84 \\ \hline 100 16 \end{array}$$

He will receive \$16 in change.

39. *Given:* total cost of CDs and type of bill used

- (a) *Find:* How many \$10 bills needed

Operation: Divide

$$\begin{array}{r} 5 \text{ R } 4 \\ 10 \overline{) 54} \\ \underline{-50} \\ 4 \end{array}$$

Five \$10 bills are not enough so Byron needs six \$10 bills.

- (b) *Find:* How much change

Operations: Multiply and subtract

$$\begin{array}{r} 10 60 \\ \times 6 - 54 \\ \hline 60 6 \end{array}$$

He will receive \$6 in change.

Chapter 1 Whole Numbers

- 40.** *Given:* Hourly wage and number of hours worked

Find: Amount earned per week

Operations

- (1) Multiply to find amount per job.

$$30 \times 4 = 120$$

$$10 \times 16 = 160$$

$$8 \times 30 = 240$$

- (2) Add to find total.

$$\begin{array}{r} 1 \\ 120 \\ 160 \\ + 240 \\ \hline 520 \end{array}$$

He earned \$520.

- 41.** *Given:* Hourly wage and number of hours worked

Find: Total paid to all four workers

Operations

- (1) Multiply to find amount per worker

$$36 \times 18 = 648$$

$$26 \times 24 = 624$$

$$28 \times 15 = 420$$

$$22 \times 48 = 1056$$

- (2) Add to find total paid.

$$\begin{array}{r} 111 \\ 648 \\ 420 \\ 624 \\ + 1056 \\ \hline 2748 \end{array}$$

The total amount paid was \$2748.

$$\mathbf{42.} \text{ Mean} = \frac{19 + 21 + 18 + 21 + 16}{5} = \frac{95}{5} = 19$$

$$\mathbf{43.} \text{ Mean} = \frac{105 + 114 + 123 + 101 + 100 + 111}{6} = \frac{654}{6} = 109$$

$$\mathbf{44.} \text{ Mean} = \frac{1480 + 1102 + 1032 + 1002}{4} = \frac{4616}{4} = 1154$$

$$\mathbf{45.} \text{ Average} = \frac{19 + 20 + 18 + 19 + 18 + 14}{6} = \frac{108}{6} = 18$$

$$\mathbf{46.} \text{ Average} = \frac{83 + 95 + 87 + 91}{4} = \frac{356}{4} = 89$$

$$\mathbf{47.} \text{ Average} = \frac{42 + 41 + 31 + 30}{4} = \frac{144}{4} = 36 \text{ mpg}$$

$$\mathbf{48.} \text{ Average} = \frac{49 + 30 + 34 + 31 + 26}{5} = \frac{170}{5} = 34 \text{ mpg}$$

$$\mathbf{49.} \text{ Average} = \frac{118 + 123 + 122}{3} = \frac{363}{3} = 121 \text{ mm per month}$$

$$\mathbf{50.} \text{ Average} = \frac{9 + 20 + 22 + 16 + 13}{5} = \frac{80}{5} = 16 \text{ in. per month}$$

Chapter 1 Review Exercises

Section 1.2

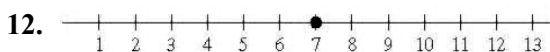
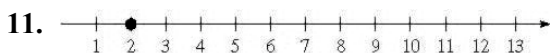
1. 10,024 Ten-thousands
2. 821,811 Hundred-thousands
3. 92,046

4. 503,160
5. 3 millions + 4 hundred-thousand
+ 8 hundreds + 2 tens
6. 3 ten-thousands + 5 hundreds + 5 tens
+ 4 ones

7. Two hundred forty-five
 8. Thirty-thousand, eight hundred sixty-one

9. 3602

10. 800,039



13. $3 < 10$ True

14. $10 > 12$ False

Section 1.3

15. Addends: 105, 119; sum: 224

16. Addends: 53, 21; sum: 74

$$\begin{array}{r} 2 \\ 18 \\ 24 \\ + 29 \\ \hline 71 \end{array}$$

$$\begin{array}{r} 2 \\ 27 \\ 9 \\ + 18 \\ \hline 54 \end{array}$$

$$\begin{array}{r} 1 \\ 8\,403 \\ + 9\,007 \\ \hline 17,410 \end{array}$$

$$\begin{array}{r} 1 \\ 68,421 \\ + 2,221 \\ \hline 70,642 \end{array}$$

21. (a) The order changed so it is the commutative property.

(b) The grouping changed so it is the associative property.

(c) The order changed so it is the commutative property.

22. minuend: 14
 subtrahend: 8
 difference: 6

23. minuend: 102
 subtrahend: 78
 difference: 24

$$\begin{array}{r} 37 \\ - 11 \\ \hline 26 \end{array} \qquad \underline{26} + 11 = 37$$

$$\begin{array}{r} 61 \\ - 41 \\ \hline 20 \end{array} \qquad \underline{20} + 41 = 61$$

$$\begin{array}{r} 9 \\ 1\cancel{0}10 \\ - 1\cancel{8}84 \\ \hline 1\,21 \end{array}$$

$$\begin{array}{r} 218 \\ 1\cancel{3}89 \\ - 299 \\ \hline 1090 \end{array}$$

$$\begin{array}{r} 9\,9 \\ 5\cancel{0}\cancel{0}10 \\ - 54\,9\,8\,1 \\ \hline 31,0\,1\,9 \end{array}$$

$$\begin{array}{r} 9\,9 \\ 6\cancel{0}\cancel{0}10 \\ - 32\,8\,1\,2 \\ \hline 34,1\,8\,8 \end{array}$$

30. $403 + 79 = 482$

$$\begin{array}{r} 1 \\ 403 \\ + 79 \\ \hline 482 \end{array}$$

31. $44 + 92 = 136$

$$\begin{array}{r} 92 \\ + 44 \\ \hline 136 \end{array}$$

32. $38 - 31 = 7$

33. $111 - 15 = 96$

$$\begin{array}{r} 10 \\ 0 \cancel{0} 11 \\ \cancel{1} \cancel{1} 1 \\ - 15 \\ \hline 96 \end{array}$$

34. $36 + 7 = 43$

35. $23 + 6 = 29$

36. $251 - 42 = 209$

$$\begin{array}{r} 411 \\ 2\cancel{5} \cancel{1} \\ - 42 \\ \hline 209 \end{array}$$

37. $90 - 52 = 38$

$$\begin{array}{r} 810 \\ \cancel{9} \cancel{0} \\ - 52 \\ \hline 38 \end{array}$$

38. (a) Add the numbers for AA Auto.

$$\begin{array}{r} 31 \\ 25 \\ + 40 \\ \hline 96 \end{array}$$

(b) Add the numbers of Fords.

$$\begin{array}{r} 21 \\ 25 \\ + 20 \\ \hline 66 \end{array}$$

39. $\begin{array}{r} 35,377 \\ + 10,420 \\ \hline 45,797 \end{array}$ thousand seniors

40. $\begin{array}{r} 10 \\ 7 \cancel{0} 14 \cancel{2} 10 \\ \cancel{8} \cancel{1}, \cancel{4} \cancel{2} \cancel{0} \\ - 73 \cancel{7} \cancel{2} \cancel{1} \\ \hline 7 \cancel{7} \cancel{0} \cancel{9} \end{array}$ thousand people

41. $\begin{array}{r} 16 \\ 710 \cancel{3} \cancel{13} \\ \cancel{8} \cancel{0}, \cancel{4} \cancel{7} \cancel{3} \\ - 35 \cancel{3} \cancel{7} \cancel{7} \\ \hline 45,096 \end{array}$ thousand people

42. $\begin{array}{r} 1018 \\ 4 \cancel{0} \cancel{8} 12 \\ \cancel{9\cancel{8}}, \cancel{1} \cancel{0} 2,000 \\ - 23, \cancel{2} \cancel{9} \cancel{9},000 \\ \hline 71,893,000 \end{array}$ tons

43. $\begin{array}{r} 115 \\ \cancel{2\cancel{8}}, 800,000 \\ - 18,600,000 \\ \hline \$7,200,000 \end{array}$

44. $\begin{array}{r} 1 \\ 30 \\ 44 \\ 25 \\ 53 \\ + 25 \\ \hline 177 \end{array}$ m

Section 1.4

45. $\begin{array}{r} 5, \cancel{2} 34,446 \\ 5,000,000 \end{array}$

46. $\begin{array}{r} 9,33 \cancel{2},945 \\ 9,330,000 \end{array}$

47. $\begin{array}{r} 894,004 \rightarrow 900,000 \\ - 123,883 \rightarrow -100,000 \\ \hline 800,000 \end{array}$

48. $\begin{array}{r} 330 \rightarrow 300 \\ 489 \rightarrow 500 \\ 123 \rightarrow 100 \\ + 571 \rightarrow 600 \\ \hline 1500 \end{array}$

49. $\begin{array}{r} 310 \\ 140,041,247 \rightarrow 1\cancel{4}0,000,000 \\ - 127,078,679 \rightarrow -127,000,000 \\ \hline 13,000,000 \end{array}$

13,000,000 people

$$\begin{array}{rcl} 50. & 96,050 & \rightarrow \\ & + 66,517 & \rightarrow \\ \hline & & \begin{array}{r} 1 \\ 96,000 \\ + 67,000 \\ \hline 163,000 \text{ m}^3 \end{array} \end{array}$$

$$\begin{array}{r} 62. \quad \begin{array}{r} 3 \\ 551 \\ \times 7 \\ \hline 3857 \end{array} \qquad \begin{array}{r} 111 \\ 3857 \\ \times 2 \\ \hline 7714 \text{ lb} \end{array} \end{array}$$

Section 1.5

51. Factors: 33, 40
Product: 1320

52. (a) Yes

(b) Yes

(c) No

53. c

54. e

55. d

56. a

57. b

$$\begin{array}{r} 58. \quad \begin{array}{r} 1 \\ 142 \\ \times 43 \\ \hline 11 \\ 426 \\ + 5680 \\ \hline 6106 \end{array} \end{array}$$

$$\begin{array}{r} 59. \quad \begin{array}{r} 12 \\ 1024 \\ \times 51 \\ \hline 1024 \\ + 51200 \\ \hline 52,224 \end{array} \end{array}$$

$$\begin{array}{r} 60. \quad \begin{array}{r|l} 6 & 000 \\ 5 & 00 \\ \hline 30 & 00000 \\ \hline & 3,000,000 \end{array} \end{array}$$

$$\begin{array}{r} 61. \quad \begin{array}{r} 26 \\ + 13 \\ \hline 39 \end{array} \qquad \begin{array}{r} 39 \\ \times 11 \\ \hline 1 \\ 39 \\ 390 \\ \hline \$429 \end{array} \end{array}$$

Section 1.6

63. $42 \div 6 = 7$
divisor: 6, dividend: 42, quotient: 7

64. $4 \overline{)52} = 13$
divisor: 4, dividend: 52, quotient: 13

65. $3 \div 1 = 3$ because $1 \times 3 = 3$.

66. $3 \div 3 = 1$ because $1 \times 3 = 3$.

67. $3 \div 0$ is undefined.

68. $0 \div 3 = 0$ because $0 \times 3 = 0$.

69. To check a division problem with no remainder you multiply the quotient by the divisor to get the dividend.

70. To check a division problem with a remainder you multiply the whole number part of the quotient by the divisor and add the remainder to get the dividend.

$$\begin{array}{r} 71. \quad \begin{array}{r} 58 \\ 6 \overline{)348} \\ \underline{-30} \\ 48 \\ \underline{-48} \\ 0 \end{array} \qquad \begin{array}{r} 4 \\ 58 \\ \times 6 \\ \hline 348 \checkmark \end{array} \end{array}$$

$$\begin{array}{r} 72. \quad \begin{array}{r} 41 \text{ R } 7 \\ 11 \overline{)458} \\ \underline{-44} \\ 18 \\ \underline{-11} \\ 7 \end{array} \qquad \begin{array}{r} 41 \\ \times 11 \\ \hline 41 \\ 451 \\ + 7 \\ \hline 458 \checkmark \end{array} \end{array}$$

$$\begin{array}{r}
 52 \text{ R } 3 \\
 73. \quad 20 \overline{) 1043} \\
 \underline{-100} \\
 43 \\
 \underline{-40} \\
 3
 \end{array}
 \qquad
 \begin{array}{r}
 52 \\
 \times 20 \\
 \hline
 1040 \\
 + 3 \\
 \hline
 1043 \checkmark
 \end{array}$$

$$74. \quad \frac{72}{4} = 18$$

$$\begin{array}{r}
 12 \\
 75. \quad 9 \overline{) 108} \\
 \underline{-9} \\
 18 \\
 \underline{-18} \\
 0
 \end{array}$$

76. Divide 105 by 4.

$$\begin{array}{r}
 26 \text{ R } 1 \\
 4 \overline{) 105} \\
 \underline{-8} \\
 25 \\
 \underline{-24} \\
 1
 \end{array}$$

26 photos with 1 left over

77. (a) Divide 60 by 15.

$$60 \div 15 = 4 \text{ T-shirts}$$

(b) Divide 60 by 12.

$$60 \div 12 = 5 \text{ hats}$$

Section 1.7

$$78. \quad 8 \cdot 8 \cdot 8 \cdot 8 \cdot 8 = 8^5$$

$$79. \quad 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5 = 2^4 \cdot 5^3$$

$$80. \quad 5^3 = 5 \times 5 \times 5 = 25 \times 5 = 125$$

$$81. \quad 4^4 = 4 \times 4 \times 4 \times 4 = 16 \times 16 = 256$$

$$82. \quad 1^7 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$$

$$83. \quad 10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1,000,000$$

$$84. \quad \sqrt{64} = 8 \text{ because } 8 \times 8 = 64.$$

$$85. \quad \sqrt{144} = 12 \text{ because } 12 \times 12 = 144.$$

$$86. \quad 14 \div 7 \cdot 4 - 1 = 2 \cdot 4 - 1 = 8 - 1 = 7$$

$$87. \quad 10^2 - 5^2 = 100 - 25 = 75$$

$$\begin{aligned}
 88. \quad 90 - 4 + 6 \div 3 \cdot 2 &= 90 - 4 + 2 \cdot 2 \\
 &= 90 - 4 + 4 \\
 &= 86 + 4 \\
 &= 90
 \end{aligned}$$

$$\begin{aligned}
 89. \quad 2 + 3 \cdot 12 \div 2 - \sqrt{25} &= 2 + 3 \cdot 12 \div 2 - 5 \\
 &= 2 + 36 \div 2 - 5 \\
 &= 2 + 18 - 5 \\
 &= 20 - 5 \\
 &= 15
 \end{aligned}$$

$$\begin{aligned}
 90. \quad 6^2 - [4^2 + (9 - 7)^3] &= 6^2 - [4^2 + 2^3] \\
 &= 36 - [16 + 8] \\
 &= 36 - 24 \\
 &= 12
 \end{aligned}$$

$$\begin{aligned}
 91. \quad 26 - 2(10 - 1) + (3 + 4 \cdot 11) &= 26 - 2(9) + (3 + 44) \\
 &= 26 - 2(9) + 47 \\
 &= 26 - 18 + 47 \\
 &= 8 + 47 \\
 &= 55
 \end{aligned}$$

$$92. \quad \frac{5 \cdot 3^2}{7 + 8} = \frac{5 \cdot 9}{7 + 8} = \frac{45}{15} = 3$$

$$\begin{aligned}
 93. \quad a + b + 2c &= 20 + 10 + 2(6) \\
 &= 20 + 10 + 12 \\
 &= 30 + 12 \\
 &= 42
 \end{aligned}$$

$$\begin{aligned}
 94. \quad 5a - b^2 &= 5(20) - 10^2 \\
 &= 5(20) - 100 \\
 &= 100 - 100 \\
 &= 0
 \end{aligned}$$

$$95. \quad \sqrt{b + c} = \sqrt{10 + 6} = \sqrt{16} = 4$$

$$96. \quad (a - b)^2 = (20 - 10)^2 = 10^2 = 100$$

Section 1.8

97. *Given:* The distance traveled and the number of trips

- (a) *Find:* Number of miles traveled in one week

Operations: Multiplication and addition

$$\begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array} \quad \begin{array}{r} 15 \\ + 6 \\ \hline 21 \end{array} \text{ miles per week}$$

- (b) *Find:* Number of miles traveled in 10 months with 4 weeks a month

Operation: Multiplication

$$\begin{array}{r} 21 \\ \times 4 \\ \hline 84 \end{array} \text{ miles/month} \quad \begin{array}{r} 84 \\ \times 10 \\ \hline 840 \end{array} \text{ miles/year}$$

98. *Given:* Contract: 252,000,000

Time period: 9 years

taxes: 75,600,000

Find: Amount per year after taxes

Operations

- (1) Subtract

$$\begin{array}{r} 1411 \\ 14110 \\ \cancel{252},000,000 \\ - 75,600,000 \\ \hline 176,400,000 \end{array}$$

- (2) Divide

$$\begin{array}{r} 19,600,000 \\ 9 \overline{)176,400,000} \\ \underline{-9} \\ 86 \\ \underline{-81} \\ 54 \\ \underline{-54} \\ 0 \end{array}$$

He received \$19,600,000 per year.

99. *Given:* dimensions of a rectangular garden and size of division for plants

- (a) *Find:* Number of plants

Operations

- (1) Multiply

$$12 \times 8 = 96$$

- (2) Divide

$$96 \div 2 = 48$$

She should purchase 48 plants.

- (b) *Find:* Cost of plants for \$3 each

Operation: Multiply

$$\begin{array}{r} 2 \\ 48 \\ \times 3 \\ \hline 144 \end{array}$$

The plants will cost \$144.

- (c) *Find:* Perimeter of garden and cost of fence

Operations

- (1) Add

$$12 + 8 + 12 + 8 = 40$$

- (2) Multiply

$$40 \times 2 = \$80$$

The fence costs \$80.

- (d) *Find:* Total cost of garden

Operations: Add

$$\begin{array}{r} 144 \\ + 80 \\ \hline 224 \end{array}$$

Aletha's total cost will be \$224.

$$\begin{aligned} 100. \text{ mean} &= \frac{7+6+12+5+7+6+13}{7} \\ &= \frac{56}{7} = 8 \end{aligned}$$

$$\begin{aligned} 101. \text{ Average} &= \frac{80+78+101+92+94}{5} \\ &= \frac{445}{5} \\ &= \$89 \end{aligned}$$

$$\begin{aligned} 102. \text{ Average} &= \frac{6+9+11+13+5+4}{6} \\ &= \frac{48}{6} \\ &= 8 \text{ houses per month} \end{aligned}$$

Chapter 1 Test

1. (a) 492 hundreds(b) 23,441 thousands(c) 2,340,711 millions(d) 340,592 ten-thousands

2. (a) 4,365,000

(b) Twenty-five million, six hundred
seventy-five thousand(c) Twelve million, seven hundred fifty
thousand

(d) 753,000

(e) Thirteen million, five hundred twenty
thousand3. (a) $14 > 6$ (b) $72 < 81$

$$\begin{array}{r} 51 \\ + 78 \\ \hline 129 \end{array}$$

$$\begin{array}{r} 82 \\ \times 4 \\ \hline 328 \end{array}$$

$$\begin{array}{r} 154 \\ - 41 \\ \hline 113 \end{array}$$

$$\begin{array}{r} 227 \\ 4 \overline{) 908} \\ \underline{-8} \\ 10 \\ \underline{-8} \\ 28 \\ \underline{-28} \\ 0 \end{array}$$

$$\begin{array}{r} 3 \\ 7 \\ 8. \quad 58 \\ \times 49 \\ \hline 522 \\ 2320 \\ \hline 2842 \end{array}$$

$$\begin{array}{r} 11 \\ 9. \quad 149 \\ + 298 \\ \hline 447 \end{array}$$

$$\begin{array}{r} 21 \text{ R } 9 \\ 10. \quad 15 \overline{) 324} \\ \underline{-30} \\ 24 \\ \underline{-15} \\ 9 \end{array}$$

$$\begin{array}{r} 9 9 \\ 2 \cancel{10} \cancel{10} 12 \\ 11. \quad \cancel{3} \cancel{0} \cancel{0} \cancel{2} \\ - 2 4 5 6 \\ \hline 5 4 6 \end{array}$$

$$\begin{array}{r} 010 \\ 12. \quad \cancel{10},984 \\ - 2 881 \\ \hline 8 103 \end{array}$$

$$\begin{array}{r} 20 \\ 13. \quad 42 \overline{) 840} \\ \underline{-84} \\ 00 \end{array}$$

$$\begin{array}{r} 5 | 00000 \\ \times 3 | 000 \\ \hline 1,500,000,000 \end{array}$$

$$\begin{array}{r} 21 \\ 15. \quad 34 \\ 89 \\ 191 \\ + 22 \\ \hline 336 \end{array}$$

16. $403(0) = 0$

17. $0 \overline{) 16}$ is undefined.

18. (a) $(11 \cdot 6) \cdot 3 = 11 \cdot (6 \cdot 3)$
The associative property of
multiplication; the expression shows a
change in grouping.

(b) $(11 \cdot 6) \cdot 3 = 3 \cdot (11 \cdot 6)$
The commutative property of

multiplication; the expression shows a change in the order of the factors.

19. (a) $4,8\overline{5}0 \rightarrow 4,900$

(b) $12,\overline{4}93 \rightarrow 12,000$

(c) $7,9\overline{6}3,126 \rightarrow 8,000,000$

$$\begin{array}{r} 20. \quad 690,951 \rightarrow 690,000 \\ + 739,117 \rightarrow 740,000 \\ \hline 1,430,000 \end{array}$$

There were approximately 1,430,000 people.

21. $8^2 \div 2^4 = 64 \div 16 = 4$

$$\begin{aligned} 22. \quad 26 \cdot \sqrt{4} - 4(8-1) &= 26 \cdot \sqrt{4} - 4 \cdot 7 \\ &= 26 \cdot 2 - 4 \cdot 7 \\ &= 52 - 28 \\ &= 24 \end{aligned}$$

23. $36 \div 3(14-10) = 36 \div 3(4) = 12(4) = 48$

$$\begin{aligned} 24. \quad 65 - 2(5 \cdot 3 - 11)^2 &= 65 - 2(15 - 11)^2 \\ &= 65 - 2(4)^2 \\ &= 65 - 2 \cdot 16 \\ &= 65 - 32 \\ &= 33 \end{aligned}$$

$$\begin{aligned} 25. \quad x^2 + 2y &= 5^2 + 2(16) \\ &= 25 + 2(16) \\ &= 25 + 32 \\ &= 57 \end{aligned}$$

26. $x + \sqrt{y} = 5 + \sqrt{16} = 5 + 4 = 9$

27. *Given:* Quiz scores and number of quizzes for Brittany and Jennifer

Find: Who has the higher average

Operations: Find the average of each group.

Brittany:

$$\frac{29 + 28 + 24 + 27 + 30 + 30}{6} = \frac{168}{6} = 28$$

Jennifer:

$$\frac{30 + 30 + 29 + 28 + 28}{5} = \frac{145}{5} = 29$$

Jennifer has the higher average of 29.

Brittany has an average of 28.

28. (a) Subtract to find the change from Year 2 to Year 3.

$$\begin{array}{r} 2 \quad 911 \\ 21\cancel{8}, \cancel{0}\cancel{1}5 \\ - 212,573 \\ \hline 442 \text{ thousand pizzas} \end{array}$$

(b) The greatest increase was from Year 3 to Year 4. The increase was 15,430.

$$\begin{array}{r} 228,445 \\ - 213,015 \\ \hline 15,430 \end{array}$$

29. Divide the number of calls by the number of weeks.

North: $80 \div 16 = 5$

South: $72 \div 18 = 4$

East: $84 \div 28 = 3$

The North Side Fire Department is the busiest with 5 calls per week.

30. Add the sides.

$$\begin{array}{r} 1 \\ 15 \\ 31 \\ 32 \\ 15 \\ 32 \\ + 31 \\ \hline 156 \text{ mm} \end{array}$$

31. Add to find the perimeter.

$$\begin{array}{r} 13 \\ 47 \\ 128 \\ 47 \\ + 128 \\ \hline 350 \text{ ft} \end{array}$$

Multiply to find the area.

$$\begin{array}{r} 13 \\ 15 \\ 128 \\ \times 47 \\ \hline 11 \\ 896 \\ 5120 \\ \hline 6016 \text{ ft}^2 \end{array}$$

$$\begin{array}{rcl}
 \mathbf{32.} & 2379 & \rightarrow \\
 & \times 1872 & \rightarrow \\
 & \hline
 & & \begin{array}{r}
 ^3 \\
 2400 \\
 \times 1900 \\
 \hline
 2160\,000 \\
 2400\,000 \\
 \hline
 4,560,000 \text{ m}^2
 \end{array}
 \end{array}$$

Chapter 2 Integers and Algebraic Expressions

Review Your Skills

A. $12 - 10 - 1 + 4 = 2 - 1 + 4 = 1 + 4 = 5$

B. $22 - 3 \cdot 6 - 1 = 22 - 18 - 1 = 4 - 1 = 3$

C. $24 \div 8 \cdot 2 = 3 \cdot 2 = 6$

D. $2^2 = 4$

E. $32 \div 4 \div 2 = 8 \div 2 = 4$

F. $9^2 - 4(30 - 2 \cdot 5) = 9^2 - 4(30 - 10)$
 $= 9^2 - 4(20)$
 $= 81 - 4(20)$
 $= 81 - 80$
 $= 1$

G. $13 - 8 \div 2 \cdot 3 = 13 - 4 \cdot 3 = 13 - 12 = 1$

H. $\sqrt{16 - 3 \cdot 4} = \sqrt{16 - 12} = \sqrt{4} = 2$

I. $\sqrt{10^2 - 8^2} = \sqrt{100 - 64} = \sqrt{36} = 6$

J. $50 \div 2 \div 5 = 25 \div 5 = 5$

K. $18 \div 9 \cdot 3 = 2 \cdot 3 = 6$

L. $\frac{50 - 40}{5 - 3} = \frac{10}{2} = 5$

M. $\sqrt{5^2 - 3^2} = \sqrt{25 - 9} = \sqrt{16} = 4$

1	^A 5	2	^B 3	6	4
^C 6	3	^D 4	2	5	1
^E 4	2	3	5	^F 1	6
5	^G 1	6	4	3	^H 2
3	4	1	^I 6	2	^J 5
2	^K 6	^L 5	1	^M 4	3

Section 2.1 Integers, Absolute Value, and Opposite

Section 2.1 Practice Exercises

1. (a) positive; negative

(b) integers

(c) absolute

(d) opposites

2. -340 ft

3. -86 m

4. -\$45

5. \$3800

6. 5

7. -\$500

8. \$23

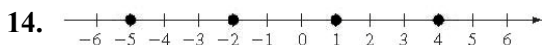
9. -14 lb

10. -2000 ft

11. 1,400,000

12. -\$20,000

Chapter 2 Integers and Algebraic Expressions



15. -2

16. 8

17. $0 > -3$

18. $-1 < 0$

19. $-8 > -9$

20. $-5 < -2$

21. $8 < 9$

22. $5 > 2$

23. $-226 < 198$

24. $408 > -416$

25. $|-2| = 2$

26. $|-9| = 9$

27. $|2| = 2$

28. $|9| = 9$

29. $|-427| = 427$

30. $|-615| = 615$

31. $|100,000| = 100,000$

32. $|64,000| = 64,000$

33. (a) -8

(b) $|-12|$

34. (a) -14

(b) $|-20|$

35. (a) 7

(b) $|7|$

36. (a) 4

(b) $|4|$

37. $|-5|$

38. $|-9|$

39. Neither, they are equal.

40. Neither, they are equal.

41. -5

42. -31

43. 12

44. 25

45. 0

46. -1

47. 1

48. 612

49. $-(-15) = 15$

50. $-(-4) = 4$

51. $-|-15| = -(15) = -15$

52. $-|-4| = -(4) = -4$

53. $-|15| = -(15) = -15$

54. $-|4| = -(4) = -4$

55. $|-15| = 15$

56. $|-4| = 4$

57. $-(-36) = 36$

58. $-(-19) = 19$

59. $-|-107| = -(107) = -107$

60. $-|-26| = -(26) = -26$

61. (a) $|-6| = 6$

(b) $-(-6) = 6$

(c) $-|6| = -(6) = -6$

(d) $|6| = 6$

(e) $-|-6| = -(6) = -6$

62. (a) $-(-12) = 12$

(b) $|12| = 12$

(c) $|-12| = 12$

(d) $-|-12| = -(12) = -12$

(e) $-|12| = -(12) = -12$

63. (a) $-|8| = -(8) = -8$

(b) $|8| = 8$

(c) $-|-8| = -(8) = -8$

(d) $-(-8) = 8$

(e) $|-8| = 8$

64. (a) $-|-1| = -(1) = -1$

(b) $-(-1) = 1$

(c) $|1| = 1$

(d) $|-1| = 1$

(e) $-|1| = -(1) = -1$

65. -6

66. -23

67. $-(-2)$

68. $-(-9)$

69. $|7|$

70. $|11|$

71. $|-3|$

72. $|-10|$

73. $-|14|$

74. $-|42|$

75. $|-12| = 12$; $|12| = 12$; so $|-12| = |12|$

76. $-(-4) = 4$; $-|-4| = -4$;
so $-(-4) > -|-4|$

77. $|-22| = 22$; $-(22) = -22$;
so $|-22| > -(22)$

78. $-8 > -10$

79. $-44 > -54$

80. $-|0| = 0$; $-|1| = -1$; so $-|0| > -|1|$

81. $|-55| = 55$; $-(-65) = 65$;
so $|-55| < -(-65)$

82. $-(82) = -82$; $|46| = 46$;
so $-(82) < |46|$

83. $-|32| = -32$; $|0| = 0$; so $-|32| < |0|$

84. $-|22| = -22$; $0 = 0$; so $-|22| < 0$

85. Portland is between 20° and 30° ; about 25°F

86. Atlanta is between 40° and 50° ; about 42°F

87. Bismark is between -20° and -30° ; about -22°F

88. Denver is between 0° and -10° ; about -8°F

89. Eugene is between 0° and -10° ; about -2°F

90. Orlando is about 50°F

91. Dallas is between 40° and 50° ; about 44°F

Chapter 2 Integers and Algebraic Expressions

92. June is the greatest amount below average;
-6 in.

93. September is the greatest amount above
average.

94. August had the average amount of rainfall.

95. $-|-46| = -46$

$$-(-24) = 24$$

$$-60$$

$$5^2 = 25$$

$$|-12| = 12$$

$$-60, -|-46|, |-12|, -(-24), 5^2$$

96. -15

$$-(-18) = 18$$

$$-|20| = -20$$

$$4^2 = 16$$

$$|-3|^2 = 3^2 = 9$$

$$-|20|, -15, |-3|^2, 4^2, -(-18)$$

97. Positive

98. Positive

99. Negative

100. Negative

Section 2.2 Addition of Integers

Section 2.2 Practice Exercises

1.(a) 0

(b) negative; positive

(c) To find the sum of two numbers with different signs, subtract the smaller absolute value from the larger absolute value. The sum takes the sign of the addend with the greater absolute value.

2. $-6 < -5$

3. $-33 > -44$

4. $|-4| = 4$; $-|4| = -4$; so $|-4| > -|4|$

5. $|6| = 6$; $|-6| = 6$; so $|6| = |-6|$

6. $0 > -6$

7. $-|-10| = -10$; $10 = 10$; so $-|-10| < 10$

8. $-(-2) = 2$; $2 = 2$; so $-(-2) = 2$

9. $-3 + 5 = 2$

10. $-6 + 3 = -3$

11. $2 + (-4) = -2$

12. $5 + (-1) = 4$

13. $-4 + (-4) = -8$

14. $-2 + (-5) = -7$

15. $-3 + 9 = 6$

16. $-1 + 5 = 4$

17. $0 + (-7) = -7$

18. $(-5) + 0 = -5$

19. $-1 + (-3) = -4$

20. $-4 + (-3) = -7$

21. To add two numbers with the same sign, add their absolute values and apply the common sign.

22. $23 + 12 = 35$

23. $12 + 3 = 15$

24. $-8 + (-3) = -11$

25. $-10 + (-6) = -16$

26. $-7 + (-9) = -16$

27. $-100 + (-24) = -124$

28. $23 + 50 = 73$

29. $44 + 45 = 89$

30. To add two numbers with different signs, subtract the smaller absolute value from the larger absolute value. Then apply the sign of the number having the larger absolute value.

31. $7 + (-10) = -3$

32. $-8 + 2 = -6$

33. $12 + (-7) = 5$

34. $-3 + 9 = 6$

35. $-90 + 66 = -24$

36. $-23 + 49 = 26$

37. $78 + (-33) = 45$

38. $10 + (-23) = -13$

39. $2 + (-2) = 0$

40. $-6 + 6 = 0$

41. $-13 + 13 = 0$

42. $45 + (-45) = 0$

43. $12 + (-3) = 9$

44. $-33 + (-1) = -34$

45. $-23 + (-3) = -26$

46. $-5 + 15 = 10$

47. $4 + (-45) = -41$

48. $-13 + (-12) = -25$

49. $(-103) + (-47) = -150$

50. $119 + (-59) = 60$

51. $0 + (-17) = -17$

52. $-29 + 0 = -29$

53. $-19 + (-22) = -41$

54. $-300 + (-24) = -324$

55. $-222 + 751 = 529$

56. $620 + (-818) = -198$

57. $1158 + (-378) = 780$

58. $-2022 + 997 = -1025$

59. $6 + (-12) + 8 = -6 + 8 = 2$

60. $20 + (-12) + (-5) = 8 + (-5) = 3$

61. $-33 + (-15) + 18 = -48 + 18 = -30$

62. $3 + 5 + (-1) = 8 + (-1) = 7$

63. $7 + (-3) + 6 = 4 + 6 = 10$

64. $12 + (-6) + (-9) = 6 + (-9) = -3$

65. $-10 + (-3) + 5 = -13 + 5 = -8$

$$\begin{aligned}
 66. \quad & -23 + (-4) + (-12) + (-5) \\
 & = -27 + (-12) + (-5) \\
 & = -39 + (-5) \\
 & = -44
 \end{aligned}$$

67. $-18 + (-5) + 23 = -23 + 23 = 0$

$$\begin{aligned}
 68. \quad & 14 + (-15) + 20 + (-42) = -1 + 20 + (-42) \\
 & = 19 + (-42) \\
 & = -23
 \end{aligned}$$

Chapter 2 Integers and Algebraic Expressions

$$\begin{aligned}
 69. \quad & 4 + (-12) + (-30) + 16 + 10 \\
 & = -8 + (-30) + 16 + 10 \\
 & = -38 + 16 + 10 \\
 & = -22 + 10 \\
 & = -12
 \end{aligned}$$

$$70. \quad 24 + (-5) + (-19) = 19 + (-19) = 0$$

$$71. \quad -79 + (-356) + 244 = -435 + 244 = -191$$

$$\begin{aligned}
 72. \quad & 620 + (-949) + 758 = 620 + 758 + (-949) \\
 & = 1378 + (-949) = 429
 \end{aligned}$$

$$73. \quad -23 + 49 = 26$$

$$74. \quad 89 + (-11) = 78$$

$$75. \quad 3 + (-10) + 5 = -7 + 5 = -2$$

$$\begin{aligned}
 76. \quad & -2 + (-4) + 14 + 20 = -6 + 14 + 20 \\
 & = 8 + 20 \\
 & = 28
 \end{aligned}$$

$$77. \quad (-8 + 6) + (-5) = -2 + (-5) = -7$$

$$78. \quad (-25 + 7) + (-15) = -18 + (-15) = -33$$

$$\begin{aligned}
 79. \quad & -6 + (-1) + 10 + 6 + (-2) \\
 & = -7 + 10 + 6 + (-2) \\
 & = 3 + 6 + (-2) \\
 & = 9 + (-2) \\
 & = 7 \text{ in.}
 \end{aligned}$$

Marquette had above average snowfall.

$$\begin{aligned}
 80. \quad & 1 + (-3) + 2 + 5 + (-4) = -2 + 2 + 5 + (-4) \\
 & = 0 + 5 + (-4) \\
 & = 5 + (-4) \\
 & = 1 \text{ in.}
 \end{aligned}$$

Hilo had above average rainfall.

$$\begin{aligned}
 81. \quad & -5 + (-1) + (-5) + (-5) = -6 + (-5) + (-5) \\
 & = -11 + (-5) \\
 & = -16
 \end{aligned}$$

$$\begin{aligned}
 82. \quad & -6 + 3 + (-4) + (-2) = -3 + (-4) + (-2) \\
 & = -7 + (-2) \\
 & = -9
 \end{aligned}$$

$$83. \quad -4 + 12 = 8^\circ \text{ F}$$

$$84. \quad -14 + 10 = -4^\circ \text{ F}$$

$$85. \quad -\$56 + \$389 = \$333$$

$$86. \quad \$23 + (-\$40) = -\$17$$

$$\begin{aligned}
 87. \quad & -200 + (-400) + 1000 + (-400) + 600 \\
 & = -\$600 + \$1000 + (-\$400) + \$600 \\
 & = \$400 + (-\$400) + \$600 \\
 & = \$0 + \$600 \\
 & = \$600
 \end{aligned}$$

$$\begin{aligned}
 88. \quad & 3 + 2 + (-8) + 5 + (-2) + 4 + 21 \\
 & = 5 + (-8) + 5 + (-2) + 4 + 21 \\
 & = -3 + 5 + (-2) + 4 + 21 \\
 & = 2 + (-2) + 4 + 21 \\
 & = 0 + 4 + 21 \\
 & = 4 + 21 \\
 & = 25 \text{ yd}
 \end{aligned}$$

$$\begin{aligned}
 89. \quad & 0 + 2 + (-1) + (-1) + 0 + (-1) + 1 + 0 + 0 \\
 & = 2 + (-1) + (-1) + 0 + (-1) + 1 + 0 + 0 \\
 & = 1 + (-1) + 0 + (-1) + 1 + 0 + 0 \\
 & = 0 + 0 + (-1) + 1 + 0 + 0 \\
 & = 0 + (-1) + 1 + 0 + 0 \\
 & = -1 + 1 + 0 + 0 \\
 & = 0 + 0 + 0 \\
 & = 0
 \end{aligned}$$

$$\begin{aligned}
 90. \quad & 1 + 1 + 0 + 0 + (-1) + (-1) + 0 + 0 + 2 \\
 & = 2 + 0 + 0 + (-1) + (-1) + 0 + 0 + 2 \\
 & = 2 + (-1) + (-1) + 0 + 0 + 2 \\
 & = 1 + (-1) + 0 + 0 + 2 \\
 & = 0 + 0 + 0 + 2 \\
 & = 2
 \end{aligned}$$

91. For example: $-12 + 2$

92. For example: $-6 + (-8)$

93. For example: $-1 + (-1)$

94. For example: $5 + (-5)$

95. $302 + (-422) = -120$

96. $-900 + 334 = -566$

97. $-23,991 + (-4423) = -28,414$

98. $-1034 + (-23,291) = -24,325$

$$\begin{aligned}
 99. \quad & 23 + (-125) + 912 + (-99) \\
 & = -102 + 912 + (-99) \\
 & = 810 + (-99) \\
 & = 711
 \end{aligned}$$

100.

$$\begin{aligned}
 & 891 + 12 + (-223) + (-341) \\
 & = 903 + (-223) + (-341) \\
 & = 680 + (-341) \\
 & = 339
 \end{aligned}$$

Section 2.3 Subtraction of Integers

Section 2.3 Practice Exercises

1. (a) $(-b)$

(b) $-5 + 4$

2. $34 + (-13) = 21$

3. $-34 + (-13) = -47$

4. $-34 + 13 = -21$

5. $-|-26| = -(26) = -26$

6. $-(-32) = 32$

$$\begin{aligned}
 7. \quad & -9 + (-8) + 5 + (-3) + 7 \\
 & = -17 + 5 + (-3) + 7 \\
 & = -12 + (-3) + 7 \\
 & = -15 + 7 \\
 & = -8
 \end{aligned}$$

8. To subtract two integers, add the opposite of the second number to the first number.

9. $2 - 9 = 2 + (-9) = -7$

10. $5 - 11 = 5 + (-11) = -6$

11. $4 - (-3) = 4 + 3 = 7$

12. $12 - (-8) = 12 + 8 = 20$

13. $-3 - 15 = -3 + (-15) = -18$

14. $-7 - 21 = -7 + (-21) = -28$

15. $-11 - (-13) = -11 + 13 = 2$

16. $-23 - (-9) = -23 + 9 = -14$

17. $35 - (-17) = 35 + 17 = 52$

18. $23 - (-12) = 23 + 12 = 35$

19. $-24 - 9 = -24 + (-9) = -33$

20. $-5 - 15 = -5 + (-15) = -20$

21. $50 - 62 = 50 + (-62) = -12$

22. $38 - 46 = 38 + (-46) = -8$

23. $-17 - (-25) = -17 + 25 = 8$

Chapter 2 Integers and Algebraic Expressions

$$24. -2 - (-66) = -2 + 66 = 64$$

$$25. -8 - (-8) = -8 + 8 = 0$$

$$26. -14 - (-14) = -14 + 14 = 0$$

$$27. 120 - (-41) = 120 + 41 = 161$$

$$28. 91 - (-62) = 91 + 62 = 153$$

$$29. -15 - 19 = -15 + (-19) = -34$$

$$30. -82 - 44 = -82 + (-44) = -126$$

$$31. 3 - 25 = 3 + (-25) = -22$$

$$32. 6 - 33 = 6 + (-33) = -27$$

$$33. -13 - 13 = -13 + (-13) = -26$$

$$34. -43 - 43 = -43 + (-43) = -86$$

$$35. 24 - 25 = 24 + (-25) = -1$$

$$36. 43 - 98 = 43 + (-98) = -55$$

$$37. -6 - (-38) = -6 + 38 = 32$$

$$38. -75 - (-21) = -75 + 21 = -54$$

$$39. -48 - (-33) = -48 + 33 = -15$$

$$40. -29 - (-32) = -29 + 32 = 3$$

$$41. -320 - (-198) = -320 + 198 = -122$$

$$42. 444 - 576 = 444 + (-576) = -132$$

$$43. -1011 - (-2020) = -1011 + 2020 = 1009$$

$$44. 987 - (-337) = 987 + 337 = 1324$$

$$45. 300 - (-386) + 575 = 300 + 386 + 575 = 1261$$

$$\begin{aligned} 46. -40 + 605 - 815 &= -40 + 605 + (-815) \\ &= -40 + (-815) + 605 \\ &= -855 + 605 = -250 \end{aligned}$$

$$\begin{aligned} 47. 2 + 5 - (-3) - 10 &= 2 + 5 + 3 + (-10) \\ &= 7 + 3 + (-10) \\ &= 10 + (-10) \\ &= 0 \end{aligned}$$

$$\begin{aligned} 48. 4 - 8 + 12 - (-1) &= 4 + (-8) + 12 + 1 \\ &= -4 + 12 + 1 \\ &= 8 + 1 \\ &= 9 \end{aligned}$$

$$\begin{aligned} 49. -5 + 6 + (-7) - 4 - (-9) &= -5 + 6 + (-7) + (-4) + 9 \\ &= 1 + (-7) + (-4) + 9 \\ &= -6 + (-4) + 9 \\ &= -10 + 9 \\ &= -1 \end{aligned}$$

$$\begin{aligned} 50. -2 - 1 + (-11) + 6 - (-8) &= -2 + (-1) + (-11) + 6 + 8 \\ &= -3 + (-11) + 6 + 8 \\ &= -14 + 6 + 8 \\ &= -8 + 8 \\ &= 0 \end{aligned}$$

$$\begin{aligned} 51. 25 - 13 - (-40) &= 25 + (-13) + 40 \\ &= 12 + 40 \\ &= 52 \end{aligned}$$

$$\begin{aligned} 52. -35 + 15 - (-28) &= -35 + 15 + 28 \\ &= -20 + 28 \\ &= 8 \end{aligned}$$

53. minus, difference, decreased, less than, subtract from

54. Subtraction is not commutative.
 $3 - 7 \neq 7 - 3$

$$55. 14 - 23 = 14 + (-23) = -9$$

Section 2.3 Subtraction of Integers

56. $27 - 40 = 27 + (-40) = -13$

57. $105 - 110 = 105 + (-110) = -5$

58. $70 - 98 = 70 + (-98) = -28$

59. $320 - (-20) = 320 + 20 = 340$

60. $150 - 75 = 150 + (-75) = 75$

61. $5 - 12 = 5 + (-12) = -7$

62. $16 - 10 = 16 + (-10) = 6$

63. $-34 - 21 = -34 + (-21) = -55$

64. $-90 - 22 = -90 + (-22) = -112$

65. $-35 - 24 = -35 + (-24) = -59$

66. $175 - 189 = 175 + (-189) = -14$

67. $6000 - (-423) = 6000 + 423 = 6423^\circ \text{F}$

68. $214 - (-184) = 214 + 184 = 398^\circ \text{C}$

69. $-\$320 - \$55 = -\$320 + (-\$55) = -\$375$
His balance is $-\$375$.

70. $-\$210 + \$25 = -\$185$
His balance is $-\$185$.

71. $17,476 + 1786 - 2342 - 754 + 321 + 1597$
 $= 19,262 - 2342 - 754 + 321 + 1597$
 $= 16,920 - 754 + 321 + 1597$
 $= 16,166 + 321 + 1597$
 $= 16,487 + 1597$
 $= 18,084$
 The balance is $\$18,084$.

72. $2036 - 150 - 25 + 480 - 200 + 80$
 $= 1886 - 25 + 480 - 200 + 80$
 $= 1861 + 480 - 200 + 80$
 $= 2341 - 200 + 80$
 $= 2141 + 80$
 $= 2221$

The balance is $\$2221$.

73. $66 - (-98) = 66 + 98 = 164$

74. $16 - (-40) = 16 + 40 = 56$

75. $-56 + 66 + (-98) + 16 + (-40)$
 $= 10 + (-98) + 16 + (-40)$
 $= -88 + 16 + (-40)$
 $= -72 + (-40)$
 $= -112$

76. Because the total change is negative, the Dow was down for the week.

77. The range is $3^\circ - (-8^\circ) = 3^\circ + 8^\circ = 11^\circ$.

78. The range is $-1^\circ - (-12^\circ) = -1^\circ + 12^\circ = 11^\circ$.

79. For example: $4 - 10$

80. For example: $10 - 30$

81. $5, 1, -3, -7, -11, -15, -19$

82. $-13, -18, -23, -28, -33, -38, -43$

83. Positive

84. Negative

85. Positive

86. Positive or zero

87. Negative

88. Negative

89. Negative

90. Positive

91. $-190 - 223 = -413$

92. $-288 - 145 = -433$

93. $-23,624 - (-9001) = -14,623$

94. $-14,593 - (-34,499) = 19,906$

95. $892,904 - (-23,546) = 916,450$

96. $104,839 - (-24,938) = 129,777$

97. $29,029 - (-35,798) = 64,827$ ft

98. $4392 - (-86) = 4478$ m

Section 2.4 Multiplication and Division of Integers

Section 2.4 Practice Exercises

1. (a) positive; negative

(b) positive; negative

2. (a) $|-5| = 5$

(b) $|5| = 5$

(c) $-|5| = -5$

(d) $-|-5| = -(5) = -5$

(e) $-(-5) = 5$

3. $14 - (-5) = 14 + 5 = 19$

4. $-24 - 50 = -24 + (-50) = -74$

5. $-33 + (-11) = -44$

6. $-7 - (-23) = -7 + 23 = 16$

7. $23 - 12 + (-4) - (-10)$
 $= 23 + (-12) + (-4) + 10$
 $= 11 + (-4) + 10$
 $= 7 + 10$
 $= 17$

8. $9 + (-12) - 17 - 4 - (-15)$
 $= 9 + (-12) + (-17) + (-4) + 15$
 $= -3 + (-17) + (-4) + 15$
 $= -20 + (-4) + 15$
 $= -24 + 15$
 $= -9$

9. $-3(5) = -15$

10. $-2(13) = -26$

11. $-5(-8) = 40$

12. $-12(-2) = 24$

13. $7(-3) = -21$

14. $5(-12) = -60$

15. $-12(-4) = 48$

16. $-6(-11) = 66$

17. $-15(3) = -45$

18. $-3(25) = -75$

19. $9(-8) = -72$

20. $8(-3) = -24$

21. $-14(0) = 0$

22. $-8(0)=0$

23. $-95(-1)=95$

24. $-144(-1)=144$

25. $-3(-1)=3$

26. $-12(-4)=48$

27. $-5(3)=-15$

28. $9(-2)=-18$

29. $3(-5)=-15$

30. $-3(6)=-18$

$$\begin{aligned} 31. (-5)(-2)(-4)(-10) &= 10(-4)(-10) \\ &= -40(-10) \\ &= 400 \end{aligned}$$

$$\begin{aligned} 32. (-3)(-5)(-2)(-4) &= 15(-2)(-4) \\ &= -30(-4) \\ &= 120 \end{aligned}$$

33. $(-11)(-4)(-2)=44(-2)=-88$

34. $(-20)(-3)(-1)=60(-1)=-60$

$$\begin{aligned} 35. (24)(-2)(0)(-3) &= -48(0)(-3) \\ &= 0(-3) \\ &= 0 \end{aligned}$$

$$\begin{aligned} 36. (3)(0)(-13)(22) &= 0(-13)(22) \\ &= 0(22) \\ &= 0 \end{aligned}$$

$$\begin{aligned} 37. (-1)(-1)(-1)(-1)(-1) &= 1(-1)(-1)(-1)(-1) \\ &= -1(-1)(-1)(-1) \\ &= 1(-1)(-1) \\ &= -1(-1) \\ &= 1 \end{aligned}$$

$$\begin{aligned} 38. (-1)(-1)(-1)(-1)(-1)(-1) &= 1(-1)(-1)(-1)(-1)(-1) \\ &= -1(-1)(-1)(-1)(-1) \\ &= 1(-1)(-1)(-1) \\ &= -1(-1)(-1) \\ &= 1(-1) \\ &= -1 \end{aligned}$$

$$\begin{aligned} 39. (-2)(2)(2)(-2)(2) &= -4(2)(-2)(2) \\ &= -8(-2)(2) \\ &= 16(2) \\ &= 32 \end{aligned}$$

$$\begin{aligned} 40. (2)(-2)(2)(2) &= -4(2)(2) \\ &= -8(2) \\ &= -16 \end{aligned}$$

41. $-10^2 = -(10)(10) = -10(10) = -100$

42. $-8^2 = -(8)(8) = -8(8) = -64$

43. $(-10)^2 = (-10)(-10) = 100$

44. $(-8)^2 = (-8)(-8) = 64$

$$\begin{aligned} 45. -10^3 &= -(10)(10)(10) \\ &= -10(10)(10) \\ &= -100(10) \\ &= -1000 \end{aligned}$$

$$\begin{aligned} 46. -8^3 &= -(8)(8)(8) \\ &= -8(8)(8) \\ &= -64(8) \\ &= -512 \end{aligned}$$

$$\begin{aligned} 47. \quad (-10)^3 &= (-10)(-10)(-10) \\ &= 100(-10) \\ &= -1000 \end{aligned}$$

$$48. \quad (-8)^3 = (-8)(-8)(-8) = 64(-8) = -512$$

$$\begin{aligned} 49. \quad -5^4 &= -(5)(5)(5)(5) \\ &= -5(5)(5)(5) \\ &= -25(5)(5) \\ &= -125(5) \\ &= -625 \end{aligned}$$

$$\begin{aligned} 50. \quad -4^4 &= -(4)(4)(4)(4) \\ &= -4(4)(4)(4) \\ &= -16(4)(4) \\ &= -64(4) \\ &= -256 \end{aligned}$$

$$\begin{aligned} 51. \quad (-5)^4 &= (-5)(-5)(-5)(-5) \\ &= 25(-5)(-5) \\ &= -125(-5) \\ &= 625 \end{aligned}$$

$$\begin{aligned} 52. \quad (-4)^4 &= (-4)(-4)(-4)(-4) \\ &= 16(-4)(-4) \\ &= -64(-4) \\ &= 256 \end{aligned}$$

$$53. \quad (-1)^2 = (-1)(-1) = 1$$

$$54. \quad (-1)^3 = (-1)(-1)(-1) = 1(-1) = -1$$

$$\begin{aligned} 55. \quad -1^4 &= -(1)(1)(1)(1) \\ &= -1(1)(1)(1) \\ &= -1(1)(1) \\ &= -1(1) \\ &= -1 \end{aligned}$$

$$\begin{aligned} 56. \quad -1^5 &= -(1)(1)(1)(1)(1) \\ &= -(1)(1)(1)(1) \\ &= -1(1)(1)(1) \\ &= -1(1)(1) \\ &= -1(1) \\ &= -1 \end{aligned}$$

$$57. \quad 60 \div (-3) = -20$$

$$58. \quad 46 \div (-2) = -23$$

$$59. \quad \frac{-56}{-8} = 7$$

$$60. \quad \frac{-48}{-3} = 16$$

$$61. \quad \frac{-15}{5} = -3$$

$$62. \quad \frac{30}{-6} = -5$$

$$63. \quad -84 \div (-4) = 21$$

$$64. \quad -48 \div (-6) = 8$$

$$65. \quad \frac{-13}{0} = \text{Undefined}$$

$$66. \quad \frac{-41}{0} = \text{Undefined}$$

$$67. \quad \frac{0}{-18} = 0$$

$$68. \quad \frac{0}{-6} = 0$$

$$69. \quad (-20) \div (-5) = 4$$

$$70. \quad (-10) \div (-2) = 5$$

$$71. \quad \frac{204}{-6} = -34$$

Section 2.4 Multiplication and Division of Integers

$$72. \frac{300}{-2} = -150$$

$$73. (-100) \div (20) = -5$$

$$74. (46) \div (-23) = -2$$

$$75. (-64) \div (-32) = 2$$

$$76. (-108) \div (-4) = 27$$

$$77. (-52) \div (13) = -4$$

$$78. (-45) \div (-15) = 3$$

$$79. (-60) \div (10) = -6 \text{ ft/min}$$

$$80. (-27) \div (3) = -9^\circ \text{F}$$

$$81. -25 - 40 = -65$$

$$(-65) \div (5) = -13^\circ \text{F}$$

$$82. -1804 - (-528) = -1804 + 528 = -1276$$

$$(-1276) \div (2) = -638 \text{ m}$$

$$83. 5(225) = 1125$$

$$890 - 1125 = -\$235$$

$$84. 2(150) + 82 = 300 + 82 = 382$$

$$320 - 382 = -\$62$$

$$85. -3(6) = -18 \text{ ft}$$

$$86. -9(5) = -45 \text{ in}$$

$$87. 18(-6) = -108$$

$$88. 24(-2) = -48$$

$$89. 18 \div (-6) = -3$$

$$90. 24 \div (-2) = -12$$

$$91. (-9)(-12) = 108$$

$$92. -36 \div (-12) = 3$$

$$93. -90 \div (-6) = 15$$

$$94. (-5)(-4) = 20$$

$$95. \frac{0}{-2} = 0$$

$$96. -24 \div 0 = \text{Undefined}$$

$$97. -90 \div 0 = \text{Undefined}$$

$$98. \frac{0}{-5} = 0$$

$$99. (-2)(-5)(4) = 10(4) = 40$$

$$100. (10)(-2)(-3)(-5) = -20(-3)(-5)$$

$$= 60(-5)$$

$$= -300$$

$$101. (-7)^2 = (-7)(-7) = 49$$

$$102. -7^2 = -(7)(7) = -7(7) = -49$$

$$103. \text{(a)} -35 \div (-5) = 7$$

$$\text{(b)} 35 \div (-5) = -7$$

$$104. \text{(a)} -36 \div (-4) = 9$$

$$\text{(b)} 36 \div (-4) = -9$$

$$105. 1(+1) + 0(-1) = 1 + 0 = +1$$

$$106. 17(+1) + 18(-1) = 17 + (-18) = -1$$

$$107. 8(+1) + 10(-1) = 8 + (-10) = -2$$

$$108. 20(+1) + 18(-1) = 20 + (-18) = +2$$

$$109. a \cdot b = (\text{positive})(\text{negative}) = \text{negative}$$

$$110. b \div a = (\text{negative}) \div (\text{positive}) = \text{negative}$$

$$111. |a| \div b = (\text{positive}) \div (\text{negative}) = \text{negative}$$

112. $a \cdot |b| = (\text{positive})(\text{positive}) = \text{positive}$

113. $-a \div b = (\text{negative}) \div (\text{negative}) = \text{positive}$

114. $a(-b) = (\text{positive})(\text{positive}) = \text{positive}$

115. $(-413)(871) = -359,723$

116. $(-6125)(-97) = 594,125$

117. $\frac{-576,828}{-10,682} = 54$

118. $5,945,308 \div (-9452) = -629$

Problem Recognition Exercises: Operations on Integers

1. (a) $(-24)(-2) = 48$

(b) $(-24) - (-2) = -24 + 2 = -22$

(c) $(-24) + (-2) = -26$

(d) $(-24) \div (-2) = 12$

2. (a) $12(-3) = -36$

(b) $12 - (-3) = 12 + 3 = 15$

(c) $12 + (-3) = 9$

(d) $12 \div (-3) = -4$

3. $-5 + (-3) = -8$

4. $9(-5) = -45$

5. $-3 - (-7) = -3 + 7 = 4$

6. $\frac{28}{-4} = -7$

7. $-23(-2) = 46$

8. $-4 - 18 = -4 + (-18) = -22$

9. $\frac{42}{-2} = -21$

10. $-18 + (-13) = -31$

11. $10 - (-12) = 10 + 12 = 22$

12. $\frac{-21}{-7} = 3$

13. $-6(-9) = 54$

14. $-7 + 4 + 8 + (-16) + (-5)$

$= -3 + 8 + (-16) + (-5)$

$= 5 + (-16) + (-5)$

$= -11 + (-5)$

$= -16$

15. (a) $15 - (-5) = 15 + 5 = 20$

(b) $15(-5) = -75$

(c) $15 + (-5) = 10$

(d) $15 \div (-5) = -3$

16. (a) $-36(-2) = 72$

(b) $-36 - (-2) = -36 + 2 = -34$

(c) $\frac{-36}{-2} = 18$

(d) $-36 + (-2) = -38$

17. (a) $20(-4) = -80$

(b) $-20(-4) = 80$

(c) $-20(4) = -80$

(d) $20(4) = 80$

18. (a) $|-50| = 50$

(b) $-(-50) = 50$

(c) $|50| = 50$

(d) $-|-50| = -(50) = -50$

$$\begin{aligned} 19. \text{ (a) } -5 - 9 - 2 &= -5 + (-9) + (-2) \\ &= -14 + (-2) \\ &= -16 \end{aligned}$$

$$\text{ (b) } -5(-9)(-2) = 45(-2) = -90$$

$$20. \text{ (a) } 10 + (-3) + (-12) = 7 + (-12) = -5$$

$$\begin{aligned} \text{ (b) } 10 - (-3) - (-12) &= 10 + 3 + 12 \\ &= 13 + 12 \\ &= 25 \end{aligned}$$

$$\begin{aligned} 21. \text{ (a) } (-1)(-2)(-3)(-4) &= 2(-3)(-4) \\ &= -6(-4) \\ &= 24 \end{aligned}$$

$$\begin{aligned} \text{ (b) } (-1)(-2)(-3)(4) &= 2(-3)(4) \\ &= -6(4) \\ &= -24 \end{aligned}$$

$$\begin{aligned} 22. \text{ (a) } (5)(-2)(-6)(1) &= (-10)(-6)(1) \\ &= 60(1) \\ &= 60 \end{aligned}$$

$$\begin{aligned} \text{ (b) } (-5)(-2)(6)(-1) &= 10(6)(-1) \\ &= 60(-1) \\ &= -60 \end{aligned}$$

$$23. \frac{0}{-8} = 0$$

$$24. -55 \div 0 = \text{Undefined}$$

$$25. -615 - (-705) = -615 + 705 = 90$$

$$26. -184 - 409 = -184 + (-409) = -593$$

$$27. 420 \div (-14) = -30$$

$$28. -3600 \div (-90) = 40$$

$$29. -44 - (-44) = -44 + 44 = 0$$

$$30. -37 - (-37) = -37 + 37 = 0$$

$$31. (-9)^2 = (-9)(-9) = 81$$

$$\begin{aligned} 32. (-2)^5 &= (-2)(-2)(-2)(-2)(-2) \\ &= 4(-2)(-2)(-2) \\ &= -8(-2)(-2) \\ &= 16(-2) \\ &= -32 \end{aligned}$$

$$33. -9^2 = -(9)(9) = -9(9) = -81$$

$$\begin{aligned} 34. -2^5 &= -(2)(2)(2)(2)(2) \\ &= -2(2)(2)(2)(2) \\ &= -4(2)(2)(2) \\ &= -8(2)(2) \\ &= -16(2) \\ &= -32 \end{aligned}$$

$$35. \frac{-46}{0} = \text{Undefined}$$

$$36. 0 \div (-16) = 0$$

$$37. -15,042 + 4893 = -10,149$$

$$38. -84,506 + (-542) = -85,048$$

Section 2.5 Order of Operations and Algebraic Expressions

Section 2.5 Practice Exercises

$$1. -7 \div 0 \text{ is undefined.}$$

$$2. 0 \div -7 = 0$$

$$3. -100 \div (-4) = 25$$

$$4. -100 - (-4) = -100 + 4 = -96$$

$$5. -100(-4) = 400$$

$$6. -100 + (-4) = -104$$

7. $(-12)^2 = (-12)(-12) = 144$
8. $-12^2 = -(12)(12) = -12(12) = -144$
9. $-1 - 5 - 8 - 3 = -1 + (-5) + (-8) + (-3)$
 $= -6 + (-8) + (-3)$
 $= -14 + (-3)$
 $= -17$
10. $-2 - 6 - 3 - 10 = -2 + (-6) + (-3) + (-10)$
 $= -8 + (-3) + (-10)$
 $= -11 + (-10)$
 $= -21$
11. $(-1)(-5)(-8)(-3) = 5(-8)(-3)$
 $= -40(-3)$
 $= 120$
12. $(-2)(-6)(-3)(-10) = 12(-3)(-10)$
 $= -36(-10)$
 $= 360$
13. $5 + 2(3 - 5) = 5 + 2(3 + (-5))$
 $= 5 + 2(-2)$
 $= 5 + (-4)$
 $= 1$
14. $6 - 4(8 - 10) = 6 + (-4)(8 + (-10))$
 $= 6 + (-4)(-2)$
 $= 6 + 8$
 $= 14$
15. $-2(3 - 6) + 10 = -2(3 + (-6)) + 10$
 $= -2(-3) + 10$
 $= 6 + 10$
 $= 16$
16. $-4(1 - 3) - 8 = -4(1 + (-3)) + (-8)$
 $= -4(-2) + (-8)$
 $= 8 + (-8)$
 $= 0$
17. $-8 - 6^2 = -8 - 36 = -8 + (-36) = -44$
18. $-10 - 5^2 = -10 - 25 = -10 + (-25) = -35$
19. $120 \div (-4)(5) = -30(5) = -150$
20. $36 \div (-2)(3) = -18(3) = -54$
21. $40 - 32 \div (-4)(2) = 40 - (-8)(2)$
 $= 40 - (-16)$
 $= 40 + 16$
 $= 56$
22. $48 - 36 \div (6)(-2) = 48 - 6(-2)$
 $= 48 - (-12)$
 $= 48 + 12$
 $= 60$
23. $100 - 2(3 - 8) = 100 - 2(3 + (-8))$
 $= 100 - 2(-5)$
 $= 100 - (-10)$
 $= 100 + 10$
 $= 110$
24. $55 - 3(2 - 6) = 55 - 3(2 + (-6))$
 $= 55 - 3(-4)$
 $= 55 - (-12)$
 $= 55 + 12$
 $= 67$
25. $|-10 + 13| - |-6| = |3| - |-6|$
 $= 3 - 6$
 $= 3 + (-6)$
 $= -3$
26. $|4 - 9| - |-10| = |-5| - |-10|$
 $= 5 - 10$
 $= -5$

$$\begin{aligned}
 27. \quad \sqrt{100-36} - 3\sqrt{16} &= \sqrt{64} - 3\sqrt{16} \\
 &= 8 - 3(4) \\
 &= 8 - 12 \\
 &= -4
 \end{aligned}$$

$$\begin{aligned}
 28. \quad \sqrt{36-11} + 2\sqrt{9} &= \sqrt{25} + 2\sqrt{9} \\
 &= 5 + 2(3) \\
 &= 5 + 6 \\
 &= 11
 \end{aligned}$$

$$29. \quad 5^2 - (-3)^2 = 5 \cdot 5 - (-3)(-3) = 25 - 9 = 16$$

$$\begin{aligned}
 30. \quad 6^2 - (-4)^2 &= 6 \cdot 6 - (-4)(-4) \\
 &= 36 - 16 \\
 &= 20
 \end{aligned}$$

$$\begin{aligned}
 31. \quad -3 + 2(5-9)^2 &= -3 + 2(-4)^2 \\
 &= -3 + 2(-4)(-4) \\
 &= -3 + 2(16) \\
 &= -3 + 32 \\
 &= 29
 \end{aligned}$$

$$\begin{aligned}
 32. \quad -5 + 4(8-10)^2 &= -5 + 4(-2)^2 \\
 &= -5 + 4(-2)(-2) \\
 &= -5 + 4(4) \\
 &= -5 + 16 \\
 &= 11
 \end{aligned}$$

$$\begin{aligned}
 33. \quad 12 + (14-16)^2 \div (-4) &= 12 + (-2)^2 \div (-4) \\
 &= 12 + (-2)(-2) \div (-4) \\
 &= 12 + 4 \div (-4) \\
 &= 12 + (-1) \\
 &= 11
 \end{aligned}$$

$$\begin{aligned}
 34. \quad -7 + (1-5)^2 \div 4 &= -7 + (-4)^2 \div 4 \\
 &= -7 + (-4)(-4) \div 4 \\
 &= -7 + 16 \div 4 \\
 &= -7 + 4 \\
 &= -3
 \end{aligned}$$

$$35. \quad -48 \div 12 \div (-2) = -4 \div (-2) = 2$$

$$36. \quad -100 \div (-5) \div (-5) = 20 \div (-5) = -4$$

$$\begin{aligned}
 37. \quad 90 \div (-3) \cdot (-1) \div (-6) &= -30 \cdot (-1) \div (-6) \\
 &= 30 \div (-6) \\
 &= -5
 \end{aligned}$$

$$\begin{aligned}
 38. \quad 64 \div (-4) \cdot 2 \div (-16) &= -16 \cdot 2 \div (-16) \\
 &= -32 \div (-16) \\
 &= 2
 \end{aligned}$$

$$\begin{aligned}
 39. \quad [7^2 - 9^2] \div (-5+1) & \\
 &= [49 - 81] \div (-5+1) \\
 &= -32 \div (-4) \\
 &= 8
 \end{aligned}$$

$$\begin{aligned}
 40. \quad [(-8)^2 - 5^2] \div (-4+1) & \\
 &= [64 - 25] \div (-4+1) \\
 &= 39 \div (-3) \\
 &= -13
 \end{aligned}$$

$$\begin{aligned}
 41. \quad 2 + 2^2 - 10 - 12 &= 2 + 4 - 10 - 12 \\
 &= 2 + 4 + (-10) + (-12) \\
 &= 6 + (-10) + (-12) \\
 &= -4 + (-12) \\
 &= -16
 \end{aligned}$$

$$\begin{aligned}
 42. \quad 14 - 4^2 + 2 - 10 &= 14 - 16 + 2 - 10 \\
 &= 14 + (-16) + 2 + (-10) \\
 &= -2 + 2 + (-10) \\
 &= 0 + (-10) \\
 &= -10
 \end{aligned}$$

$$43. \quad \frac{3^2 - 27}{-9 + 6} = \frac{9 - 27}{-9 + 6} = \frac{-18}{-3} = 6$$

$$44. \quad \frac{8 + (-2)^2}{-5 + (-1)} = \frac{8 + 4}{-5 + (-1)} = \frac{12}{-6} = -2$$

$$\begin{aligned} 45. \quad \frac{13-(2)(4)}{-1-2^2} &= \frac{13-(2)(4)}{-1-4} \\ &= \frac{13-8}{-1-4} \\ &= \frac{5}{-5} \\ &= -1 \end{aligned}$$

$$\begin{aligned} 46. \quad \frac{10-(-3)(5)}{-9-4^2} &= \frac{10-(-3)(5)}{-9-16} \\ &= \frac{10-(-15)}{-9-16} \\ &= \frac{10+15}{-9-16} \\ &= \frac{25}{-25} \\ &= -1 \end{aligned}$$

$$47. \quad \frac{|-23+7|}{5^2-(-3)^2} = \frac{|-23+7|}{25-9} = \frac{|-16|}{16} = \frac{16}{16} = 1$$

$$48. \quad \frac{|10-50|}{6^2-(-4)^2} = \frac{|10-50|}{36-16} = \frac{|-40|}{20} = \frac{40}{20} = 2$$

$$\begin{aligned} 49. \quad 21-[4-(5-8)] &= 21-[4-(-3)] \\ &= 21-[4+3] \\ &= 21-7 \\ &= 14 \end{aligned}$$

$$\begin{aligned} 50. \quad 15-[10-(20-25)] &= 15-[10-(-5)] \\ &= 15-[10+5] \\ &= 15-15 \\ &= 0 \end{aligned}$$

$$\begin{aligned} 51. \quad -17-2[18 \div (-3)] &= -17-2[-6] \\ &= -17-(-12) \\ &= -17+12 \\ &= -5 \end{aligned}$$

$$\begin{aligned} 52. \quad -8-5(-45 \div 15) &= -8-5(-3) \\ &= -8-(-15) \\ &= -8+15 \\ &= 7 \end{aligned}$$

$$\begin{aligned} 53. \quad 4+2[9+(-4+12)] &= 4+2[9+8] \\ &= 4+2[17] \\ &= 4+34 \\ &= 38 \end{aligned}$$

$$\begin{aligned} 54. \quad -13+3[11+(-15+10)] &= -13+3[11+(-5)] \\ &= -13+3[6] \\ &= -13+18 \\ &= 5 \end{aligned}$$

$$\begin{aligned} 55. \quad -36 \div (-2) \div 6(-3) \cdot 2 &= 18 \div 6(-3) \cdot 2 \\ &= 3(-3) \cdot 2 \\ &= -9 \cdot 2 \\ &= -18 \end{aligned}$$

$$\begin{aligned} 56. \quad -48 \div (4) \div 2(-5) \cdot 2 &= -12 \div 2(-5) \cdot 2 \\ &= -6(-5) \cdot 2 \\ &= 30 \cdot 2 \\ &= 60 \end{aligned}$$

$$57. \quad \$15x$$

$$58. \quad \$12p$$

$$59. \quad (t+4) \text{ in.}$$

$$60. \quad (h+1) \text{ hr}$$

$$61. \quad (v-6) \text{ mph}$$

$$62. \quad (A-30) \text{ yr}$$

$$63. \quad 2g$$

$$64. \quad 2t$$

$$65. \quad -12n$$

$$66. \quad -3z$$

Section 2.5 Order of Operations and Algebraic Expressions

67. $-9 - x$

68. $-18 - p$

69. $\frac{t}{-2}$

70. $\frac{-10}{w}$

71. $y + (-14)$

72. $c + (-150)$

73. $2(c + d)$

74. $2(a + b)$

75. $x - (-8)$

76. $m - (-5)$

77. $x + 9z = -10 + 9(-3) = -10 + (-27) = -37$

78. $a + 7b = -3 + 7(-6) = -3 + (-42) = -45$

79. $x + 5y + z = -10 + 5(5) + 2$
 $= -10 + 25 + 2$
 $= 15 + 2$
 $= 17$

80. $9p + 4t + w = 9(2) + 4(6) + (-50)$
 $= 18 + 24 + (-50)$
 $= 42 + (-50)$
 $= -8$

81. $a - b + 3c = -7 - (-2) + 3(4)$
 $= -7 + 2 + 12$
 $= -5 + 12$
 $= 7$

82. $w + 2y - z = -9 + 2(10) - (-3)$
 $= -9 + 20 + 3$
 $= 11 + 3$
 $= 14$

83. $-3mn = -3(-8)(-2) = 24(-2) = -48$

84. $-5pq = -5(-4)(-2) = 20(-2) = -40$

85. $|-y| = | -(-9) | = | 9 | = 9$

86. $|-z| = | -(-18) | = | 18 | = 18$

87. $-|-w| = -| -(-4) | = -| 4 | = -4$

88. $-|-m| = -| -(-15) | = -| 15 | = -15$

89. $x^2 = (-3)^2 = (-3)(-3) = 9$

90. $n^2 = (-9)^2 = (-9)(-9) = 81$

91. $-x^2 = -(-3)^2 = -(-3)(-3) = 3(-3) = -9$

92. $-n^2 = -(-9)^2 = -(-9)(-9) = 9(-9) = -81$

93. $-4|x + 3y| = -4| 5 + 3(-6) |$
 $= -4| 5 + (-18) |$
 $= -4| -13 |$
 $= -4(13)$
 $= -52$

94. $-2|4a - b| = -2| 4(-8) - (-2) |$
 $= -2| -32 + 2 |$
 $= -2| -30 |$
 $= -2(30)$
 $= -60$

95. $6 - |m - n^2| = 6 - | -2 - 3^2 |$
 $= 6 - | -2 - 9 |$
 $= 6 - | -11 |$
 $= 6 - 11$
 $= -5$

$$\begin{aligned}
 96. \quad 4 - |c^2 - d^2| &= 4 - |3^2 - (-5)^2| \\
 &= 4 - |9 - 25| \\
 &= 4 - |9 + (-25)| \\
 &= 4 - |-16| \\
 &= 4 - 16 \\
 &= -12
 \end{aligned}$$

$$\begin{aligned}
 97. \quad \frac{-8 + (-11) + (-4) + 1 + 9 + 4 + (-5)}{7} \\
 &= \frac{-19 + (-4) + 1 + 9 + 4 + (-5)}{7} \\
 &= \frac{-23 + 1 + 9 + 4 + (-5)}{7} \\
 &= \frac{-22 + 9 + 4 + (-5)}{7} \\
 &= \frac{-13 + 4 + (-5)}{7} \\
 &= \frac{-9 + (-5)}{7} \\
 &= \frac{-14}{7} \\
 &= -2^\circ
 \end{aligned}$$

$$\begin{aligned}
 98. \quad \frac{15 + 12 + 10 + 3 + 0 + (-2) + (-3)}{7} \\
 &= \frac{27 + 10 + 3 + 0 + (-2) + (-3)}{7} \\
 &= \frac{37 + 3 + 0 + (-2) + (-3)}{7} \\
 &= \frac{40 + 0 + (-2) + (-3)}{7} \\
 &= \frac{38 + (-3)}{7} \\
 &= \frac{35}{7} \\
 &= 5^\circ
 \end{aligned}$$

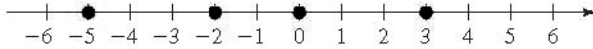
$$\begin{aligned}
 99. \quad \frac{-8 + (-8) + (-6) + (-5) + (-2) + (-3) + 3 + 3 + 0 + (-4)}{10} \\
 &= \frac{-16 + (-6) + (-5) + (-2) + (-3) + 3 + 3 + 0 + (-4)}{10} \\
 &= \frac{-22 + (-5) + (-2) + (-3) + 3 + 3 + 0 + (-4)}{10} \\
 &= \frac{-27 + (-2) + (-3) + 3 + 3 + 0 + (-4)}{10} \\
 &= \frac{-29 + (-3) + 3 + 3 + 0 + (-4)}{10} \\
 &= \frac{-32 + 3 + 3 + 0 + (-4)}{10} \\
 &= \frac{-29 + 3 + 0 + (-4)}{10} \\
 &= \frac{-26 + 0 + (-4)}{10} \\
 &= \frac{-30}{10} \\
 &= -3
 \end{aligned}$$

$$\begin{aligned}
 100. \quad \frac{-6 + (-2) + 5 + 1 + 0 + (-3) + 4 + 2 + (-7) + (-4)}{10} \\
 &= \frac{-8 + 5 + 1 + 0 + (-3) + 4 + 2 + (-7) + (-4)}{10} \\
 &= \frac{-3 + 1 + 0 + (-3) + 4 + 2 + (-7) + (-4)}{10} \\
 &= \frac{-2 + 0 + (-3) + 4 + 2 + (-7) + (-4)}{10} \\
 &= \frac{-5 + 4 + 2 + (-7) + (-4)}{10} \\
 &= \frac{-1 + 2 + (-7) + (-4)}{10} \\
 &= \frac{1 + (-7) + (-4)}{10} \\
 &= \frac{-6 + (-4)}{10} \\
 &= \frac{-10}{10} \\
 &= -1
 \end{aligned}$$

Chapter 2 Review Exercises

Section 2.1

1. -4250 ft
2. $-\$3,000,000$
3. -6 .



7. Opposite: 4; Absolute value: 4
8. Opposite: -6 ; Absolute value: 6
9. $|-3| = 3$
10. $|-1000| = 1000$
11. $|74| = 74$
12. $|0| = 0$
13. $-(-9) = 9$
14. $-(-28) = 28$
15. $-|-20| = -(20) = -20$
16. $-|-45| = -(45) = -45$
17. $-7 = -7$;
 $|-7| = 7$;
 $-7 < |-7|$
18. $-12 < -5$
19. $-(-4) = 4$;
 $-|-4| = -(4) = -4$;
 $-(-4) > -|-4|$
20. $-20 = -20$;
 $-|-20| = -(20) = -20$;
 $-20 = -|-20|$

Section 2.2

21. $6 + (-2) = 4$
22. $-3 + 6 = 3$
23. $-3 + (-2) = -5$
24. $-3 + 0 = -3$
25. To add two numbers with the same sign, add their absolute values and apply the common sign.
26. To add two numbers with different signs, subtract the smaller absolute value from the larger absolute value. Then apply the sign of the number having the larger absolute value.
27. $35 + (-22) = 13$
28. $-105 + 90 = -15$
29. $-29 + (-41) = -70$
30. $-98 + (-42) = -140$
31. $-3 + (-10) + 12 + 14 + (-10)$
 $= -13 + 12 + 14 + (-10)$
 $= -1 + 14 + (-10)$
 $= 13 + (-10)$
 $= 3$
32. $9 + (-15) + 2 + (-7) + (-4)$
 $= -6 + 2 + (-7) + (-4)$
 $= -4 + (-7) + (-4)$
 $= -11 + (-4)$
 $= -15$
33. $23 + (-35) = -12$
34. $57 + (-10) = 47$
35. $-5 + (-13) + 20 = -18 + 20 = 2$

Chapter 2 Integers and Algebraic Expressions

36. $-42 + 12 = -30$

37. $-12 + 3 = -9$

38. $-89 + (-22) = -111$

39. $-4 + 9 + (-3) + 1 + (-5)$
 $= 5 + (-3) + 1 + (-5)$
 $= 2 + 1 + (-5)$
 $= 3 + (-5)$
 $= -2$

Caribou had below average snowfall.

40. $2 + (-2) + (-1) + (-4) = 0 + (-1) + (-4)$
 $= -1 + (-4)$
 $= -5$

Section 2.3

41. To subtract two integers, add the opposite of the second number to the first number.

42. $4 - (-23) = 4 + 23 = 27$

43. $19 - 44 = 19 + (-44) = -25$

44. $-2 - (-24) = -2 + 24 = 22$

45. $-289 - 130 = -289 + (-130) = -419$

46. $2 - 7 - 3 = 2 + (-7) + (-3)$
 $= -5 + (-3)$
 $= -8$

47. $-45 - (-77) + 8 = -45 + 77 + 8$
 $= 32 + 8$
 $= 40$

48. $-16 - 4 - (-3) = -16 + (-4) + 3$
 $= -20 + 3$
 $= -17$

49. $99 - (-7) - 6 = 99 + 7 + (-6)$
 $= 106 + (-6)$
 $= 100$

50. (a) $8 - 10 = 8 + (-10) = -2$

(b) $10 - 8 = 10 + (-8) = 2$

51. For example: 14 subtracted from -2

52. For example: Subtract -7 from -25

53. $-1 - (-6) = -1 + 6 = 5$
The temperature rose 5°F .

54. $-40 + 132 = 92$
Sam's new balance is \$92.

55.
$$\frac{-3 + 4 + 0 + 9 + (-2) + (-1) + 0 + 5 + (-3)}{9}$$
$$= \frac{1 + 0 + 9 + (-2) + (-1) + 0 + 5 + (-3)}{9}$$
$$= \frac{10 + (-2) + (-1) + 0 + 5 + (-3)}{9}$$
$$= \frac{8 + (-1) + 0 + 5 + (-3)}{9}$$
$$= \frac{7 + 0 + 5 + (-3)}{9}$$
$$= \frac{12 + (-3)}{9}$$
$$= \frac{9}{9}$$
$$= 1$$

The average is 1 above par.

56. $2400 - (-1050) = 2400 + 1050 = 3450$ ft

Section 2.4

57. $6(-3) = -18$

58. $\frac{-12}{4} = -3$

59. $\frac{-900}{-60} = 15$

60. $(-7)(-8) = 56$

61. $-36 \div 9 = -4$

62. $60 \div (-5) = -12$

$$\begin{aligned}
 63. \quad (-12)(-4)(-1)(-2) &= 48(-1)(-2) \\
 &= -48(-2) \\
 &= 96
 \end{aligned}$$

$$\begin{aligned}
 64. \quad (-1)(-8)(2)(1)(-2) &= 8(2)(1)(-2) \\
 &= 16(1)(-2) \\
 &= 16(-2) \\
 &= -32
 \end{aligned}$$

65. $-15 \div 0 = \text{Undefined}$

66. $\frac{0}{-5} = 0$

$$\begin{aligned}
 67. \quad -5^3 &= -(5)(5)(5) = -5(5)(5) \\
 &= -25(5) = -125
 \end{aligned}$$

68. $(-5)^3 = (-5)(-5)(-5) = 25(-5) = -125$

69. $(-6)^2 = (-6)(-6) = 36$

70. $-6^2 = -(6)(6) = -6(6) = -36$

$$\begin{aligned}
 71. \quad (-1)^{10} &= -1(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1) \\
 &= 1(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1) \\
 &= -1(-1)(-1)(-1)(-1)(-1)(-1)(-1) \\
 &= 1(-1)(-1)(-1)(-1)(-1)(-1)(-1) \\
 &= -1(-1)(-1)(-1)(-1)(-1) \\
 &= 1(-1)(-1)(-1)(-1) \\
 &= -1(-1)(-1)(-1) \\
 &= 1(-1)(-1) \\
 &= -1(-1) \\
 &= 1
 \end{aligned}$$

72. $(-1)^{21} = -1$

73. Negative

74. Positive

75. $-45 \div (-15) = 3$

76. $-4 \cdot 19 = -76$

77. $\frac{-12}{4} = -3^\circ \text{F}$

$$\begin{aligned}
 78. \quad 550 - 4(160) &= 550 - 640 \\
 &= 550 + (-640) \\
 &= -\$90
 \end{aligned}$$

Section 2.5

$$\begin{aligned}
 79. \quad 50 - 3(6 - 2) &= 50 - 3(4) \\
 &= 50 - 12 \\
 &= 50 + (-12) \\
 &= 38
 \end{aligned}$$

$$\begin{aligned}
 80. \quad 48 - 8 \div (-2) + 5 &= 48 - (-4) + 5 \\
 &= 48 + 4 + 5 \\
 &= 52 + 5 \\
 &= 57
 \end{aligned}$$

$$\begin{aligned}
 81. \quad 28 \div (-7) \cdot 3 - (-1) &= -4 \cdot 3 - (-1) \\
 &= -12 + 1 \\
 &= -11
 \end{aligned}$$

$$\begin{aligned}
 82. \quad (-4)^2 \div 8 - (-6) &= 16 \div 8 - (-6) \\
 &= 2 + 6 \\
 &= 8
 \end{aligned}$$

83.

$$\begin{aligned}
 [10 - (-3)^2] \cdot (-11) + 4 &= [10 - 9] \cdot (-11) + 4 \\
 &= 1 \cdot (-11) + 4 \\
 &= -11 + 4 \\
 &= -7
 \end{aligned}$$

Chapter 2 Integers and Algebraic Expressions

$$\begin{aligned} 84. \quad & [-9 - (-7)]^2 \cdot 3 \div (-6) = [-9 + 7]^2 \cdot 3 \div (-6) \\ & = [-2]^2 \cdot 3 \div (-6) \\ & = 4 \cdot 3 \div (-6) \\ & = 12 \div (-6) \\ & = -2 \end{aligned}$$

$$85. \quad \frac{100 - 4^2}{(-7)(6)} = \frac{100 - 16}{(-7)(6)} = \frac{84}{-42} = -2$$

$$\begin{aligned} 86. \quad & \frac{18 - 3(-2)}{4^2 - 8} = \frac{18 - 3(-2)}{16 - 8} = \frac{18 - (-6)}{16 - 8} \\ & = \frac{18 + 6}{16 - 8} = \frac{24}{8} = 3 \end{aligned}$$

$$\begin{aligned} 87. \quad & 5 - 2[-3 + (2 - 5)] = 5 - 2[-3 + (-3)] \\ & = 5 - 2[-6] \\ & = 5 - (-12) \\ & = 5 + 12 \\ & = 17 \end{aligned}$$

$$\begin{aligned} 88. \quad & -10 + 3[4 - (-2 + 7)] = -10 + 3[4 - 5] \\ & = -10 + 3[-1] \\ & = -10 + (-3) \\ & = -13 \end{aligned}$$

$$89. \quad (a + 8) \text{ yr}$$

$$90. \quad \$3n$$

$$91. \quad -5x$$

$$92. \quad p - 12$$

$$93. \quad (a + b) + 2$$

$$94. \quad \frac{w}{4}$$

$$95. \quad y - (-8)$$

$$96. \quad 2(5 + z)$$

$$\begin{aligned} 97. \quad & 3x - 2y = 3(-5) - 2(4) \\ & = -15 - 8 \\ & = -15 + (-8) \\ & = -23 \end{aligned}$$

$$\begin{aligned} 98. \quad & 5(a - 4b) = 5(-3 - 4(2)) \\ & = 5(-3 - 8) \\ & = 5(-3 + (-8)) \\ & = 5(-11) \\ & = -55 \end{aligned}$$

$$\begin{aligned} 99. \quad & -2(x + y)^2 = -2(6 + (-9))^2 \\ & = -2(-3)^2 \\ & = -2(9) \\ & = -18 \end{aligned}$$

$$\begin{aligned} 100. \quad & -3w^2 - 2z = -3(-4)^2 - 2(-9) \\ & = -3(16) - 2(-9) \\ & = -48 - (-18) \\ & = -48 + 18 \\ & = -30 \end{aligned}$$

$$101. \quad -|x| = -|-2| = -(2) = -2$$

$$102. \quad -|-x| = -|-(5)| = -|5| = -(5) = -5$$

$$103. \quad -(-x) = -(-(-10)) = -(10) = -10$$

$$104. \quad -(-x) = -(-5) = 5$$

Chapter 2 Test

$$1. \quad -\$220$$

$$2. \quad 26$$

3. $-5 < -2$
4. $|-5| = 5$;
 $|-2| = 2$;
 $|-5| > |-2|$
5. $0 = 0$;
 $-(-2) = 2$;
 $0 < -(-2)$
6. $-|-12| = -(12) = -12$;
 $-12 = -12$;
 $-|-12| = -12$
7. $-|-9| = -(9) = -9$;
 $9 = 9$;
 $-|-9| < 9$
8. $-5^2 = -(5)(5) = -5(5) = -25$;
 $(-5)^2 = (-5)(-5) = 25$;
 $-5^2 < (-5)^2$
9. $|-10| = 10$
10. $-(-10) = 10$
11. $9 + (-14) = -5$
12. $-23 + (-5) = -28$
13. $-4 - (-13) = -4 + 13 = 9$
14. $-30 - 11 = -30 + (-11) = -41$
15. $-15 + 21 = 6$
16. $5 - 28 = 5 + (-28) = -23$
17. $6(-12) = -72$
18. $(-11)(-8) = 88$
19. $\frac{-24}{-12} = 2$
20. $\frac{54}{-3} = -18$
21. $\frac{-44}{0} = \text{Undefined}$
22. $(-91)(0) = 0$
23. $-3(-7) = 21$
24. $-13 + 8 = -5$
25. $18 - (-4) = 18 + 4 = 22$
26. $6 \div (-2) = -3$
27. $-8 + 5 = -3$
28. $-3 + 15 + (-6) + (-1) = 12 + (-6) + (-1)$
 $= 6 + (-1)$
 $= 5$
29. $-1 + 2 + (-4) + (-2) + (-2)$
 $= 1 + (-4) + (-2) + (-2)$
 $= -3 + (-2) + (-2)$
 $= -5 + (-2)$
 $= -7$ in
Atlanta had below average rainfall.
30. $\frac{-35}{5} = -7^\circ \text{F}$
31. (a) $(-8)^2 = (-8)(-8) = 64$
(b) $-8^2 = -(8)(8) = -8(8) = -64$
(c) $(-4)^3 = (-4)(-4)(-4)$
 $= 16(-4) = -64$
(d) $-4^3 = -(4)(4)(4) = -4(4)(4)$
 $= -16(4) = -64$

Chapter 2 Integers and Algebraic Expressions

$$\begin{aligned}
 32. \quad & -14 + 22 - (-5) + (-10) \\
 & = -14 + 22 + 5 + (-10) \\
 & = 8 + 5 + (-10) \\
 & = 13 + (-10) \\
 & = 3
 \end{aligned}$$

$$\begin{aligned}
 33. \quad & (-3)(-1)(-4)(-1)(-5) \\
 & = 3(-4)(-1)(-5) \\
 & = -12(-1)(-5) \\
 & = 12(-5) \\
 & = -60
 \end{aligned}$$

$$\begin{aligned}
 34. \quad & 16 - 2[5 - (1 - 4)] = 16 - 2[5 - (-3)] \\
 & = 16 - 2[5 + 3] \\
 & = 16 - 2[8] \\
 & = 16 - 16 \\
 & = 0
 \end{aligned}$$

$$\begin{aligned}
 35. \quad & -20 \div (-2)^2 + (-14) = -20 \div 4 + (-14) \\
 & = -5 + (-14) \\
 & = -19
 \end{aligned}$$

$$\begin{aligned}
 36. \quad & 12 \cdot (-6) + [20 - (-12)] - 15 \\
 & = 12 \cdot (-6) + [20 + 12] - 15 \\
 & = 12 \cdot (-6) + 32 - 15 \\
 & = -72 + 32 + (-15) \\
 & = -40 + (-15) \\
 & = -55
 \end{aligned}$$

$$\begin{aligned}
 37. \quad & \frac{24 - 2|3 - 9|}{8 - 2^2} = \frac{24 - 2|-6|}{8 - 2^2} \\
 & = \frac{24 - 2(6)}{8 - 4} \\
 & = \frac{24 - 12}{8 - 4} \\
 & = \frac{12}{4} \\
 & = 3
 \end{aligned}$$

$$38. \quad \$18m$$

$$39. \quad -x^2 + y^2 = -(4)^2 + (-1)^2 = -16 + 1 = -15$$

$$40. \quad -4m - 3n = -4(-6) - 3(4) = 24 - 12 = 12$$

Chapters 1–2 Cumulative Review Exercises

1. Ten-thousands place

2. One hundred thirty is less than two hundred forty-four.

$$\begin{array}{r}
 3. \quad \begin{array}{r} 132 \\ 589 \\ \hline 490 \end{array} \quad \begin{array}{r} 100 \\ 600 \\ \hline 500 \end{array} \\
 \quad \quad \quad 1200 \text{ ft}
 \end{array}$$

$$4. \quad 73 + 41 = 114$$

$$\begin{aligned}
 5. \quad & 71 + (-4) + 81 + (-106) = 67 + 81 + (-106) \\
 & = 148 + (-106) \\
 & = 42
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & 284 - 171 - (-84) - 393 \\
 & = 284 + (-171) + 84 + (-393) \\
 & = 113 + 84 + (-393) \\
 & = 197 + (-393) \\
 & = -196
 \end{aligned}$$

$$\begin{array}{r}
 7. \quad \begin{array}{r} 99 \\ \cancel{10}\cancel{10}11 \\ 1001 \\ -235 \\ \hline 766 \end{array}
 \end{array}$$

$$8. \quad 31 \cdot (-8) = -248$$

$$9. \quad -386 \div (-2) = 193$$

$$10. \begin{array}{r} 105 \text{ R } 2 \\ 7 \overline{) 737} \\ \underline{-7} \\ 03 \\ \underline{-0} \\ 37 \\ \underline{-35} \\ 2 \end{array}$$

$$11. \begin{array}{r} 409 \\ \times 228 \\ \hline 111 \\ 13272 \\ 8180 \\ + 81800 \\ \hline 93,252 \end{array}$$

$$12. \frac{0}{-61} = 0$$

$$13. 0 \overline{) 341} \text{ Undefined}$$

$$14. 5(28) = 140 \text{ m}^2$$

$$15. (a) -|-4| = -(4) = -4$$

$$(b) -(-4) = 4$$

$$(c) -4^2 = -(4)(4) = -4(4) = -16$$

$$(d) (-4)^2 = (-4)(-4) = 16$$

$$\begin{aligned} 16. -14 - 2(9 - 5^2) &= -14 - 2(9 - 25) \\ &= -14 - 2(9 + (-25)) \\ &= -14 - 2(-16) \\ &= -14 - (-32) \\ &= -14 + 32 \\ &= 18 \end{aligned}$$

$$17. x^2 - x + y = (-4)^2 - (-4) + 1 \\ = 16 + 4 + 1 = 20 + 1 = 21$$

$$18. |x - y| = |-4 - 1| = |-5| = 5$$

$$19. (a) 30 \cdot 4 = 120$$

$$120 \div 3 = 40 \text{ days}$$

Torie can take the herb for 40 days if she takes 3 a day

$$(b) 120 \div 2 = 60 \text{ days}$$

Torie can take the herb for 60 days if she takes 2 a day.

$$\begin{aligned} 20. \frac{-8 + (-11) + 3 + 6 + 0 + (-8) + (-10)}{7} \\ = \frac{-19 + 3 + 6 + 0 + (-8) + (-10)}{7} \\ = \frac{-16 + 6 + 0 + (-8) + (-10)}{7} \\ = \frac{-10 + 0 + (-8) + (-10)}{7} \\ = \frac{-18 + (-10)}{7} = \frac{-28}{7} = -4^\circ \text{F} \end{aligned}$$