

Solution Manual for Basic College Mathematics 3rd Edition Miller Neill
Hyde 0073384410 9780073384412

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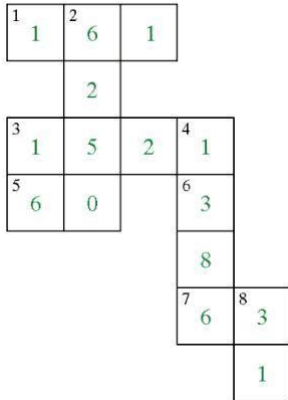
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Chapter 1 Whole Numbers

Chapter Opener Puzzle



Section 1.1 Introduction to Whole Numbers

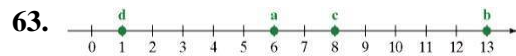
Section 1.1 Practice Exercises

- (a) periods
- hundreds
- thousands
- 1: ones
- 9: tens
- 7: hundreds
- 6: thousands
- 3: ten-thousands
- 8,213,457
- 7: ones
- 5: tens
- 4: hundreds
- 3: thousands
- 1: ten-thousands
- 2: hundred-thousands
- 8: millions
- 103,596
- 6: ones
- 9: tens
- 5: hundreds
- 3: thousands
- 0: ten-thousands
- 1: hundred-thousands
- 321 tens
- 689 tens
- 214 ones
- 738 ones
- 8,710 hundreds
- 2,293 hundreds
- 1,430 thousands
- 3,101 thousands
- 452,723 hundred-thousands
- 655,878 hundred thousands
- 1,023,676,207 billions
- 3,111,901,211 billions
- 22,422 ten-thousands
- 58,106 ten-thousands
- 51,033,201 millions
- 93,971,224 millions

Chapter 1 Whole Numbers

- 10,677,881 ten-millions
2
22. 31,820 m thousands
- 7,653,468,440 billions
- 31,000 ten-thousands
- 5 tens + 8 ones
- 7 tens + 1 one
- 5 hundreds + 3 tens + 9 ones
- 3 hundreds + 8 tens + 2 ones
- 5 hundreds + 3 ones
- 8 hundreds + 9 ones
- 1 ten-thousand + 2 hundreds + 4 tens + 1 one
- 2 ten-thousands + 8 hundreds + 7 tens + 3 ones
- 524
- 318
- 150
- 620
- 1,906
- 4,201
- 85,007
- 26,002
- ones, thousands, millions, billions
- ones, tens, hundreds, thousands
- Two hundred forty-one
- Three hundred twenty-seven
- Six hundred three
- One hundred eight
- Thirty-one thousand, five hundred thirty
- Fifty-two thousand, one hundred sixty

- One hundred thousand, two hundred thirty-four
- Four hundred thousand, one hundred ninety-nine
- Nine thousand, five hundred thirty-five
- Five hundred ninety thousand, seven hundred twelve
- Twenty thousand, three hundred twenty
- One thousand, eight hundred
- One thousand, three hundred seventy-seven
- Sixty million
- 6,005
- 4,004
- 672,000
- 248,000
- 1,484,250
- 2,647,520



- Counting on a number line, 10 is 4 units to the right of 6.
- Counting on a number line, 3 is 8 units to the left of 11.
- Counting on a number line, 4 is 3 units to the left of 7.
- Counting on a number line, 5 is 5 units to the right of 0.
- $8 > 2$
8 is greater than 2, or 2 is less than 8.
- $6 < 11$
6 is less than 11, or 11 is greater than 6.

Section 1.1 Introduction to Whole Numbers

$3 < 7$

3 is less than 7, or 7 is greater than 3.

$14 > 12$

14 is greater than 12, or 12 is less than 14.

$6 < 11$

$14 > 13$

$21 > 18$

$5 < 7$

$3 < 7$

$14 < 24$

$95 > 89$

$28 < 30$

$0 < 3$

$8 > 0$

$90 < 91$

$48 > 47$

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

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

99

999

There is no greatest whole number.

0 is the least whole number.

91. 10,000,000 7 zeros

92. 100,000,000,000 11 zeros

964

840

Section 1.2 Addition of Whole Numbers and Perimeter

Section 1.2 Practice Exercises

1. (a) addends
(b) sum
(c) commutative
(d) 4; 4
(e) associative
(f) polygon
(g) perimeter

2. 5 thousands + 2 tens + 4 ones

3. 3 hundreds + 5 tens + 1 one

4. Three hundred fifty-one

5. 1 hundred + 7 ones

6. 2004

7. 4012

8. 6206

Chapter 1 Whole Numbers

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

$5+9=14$

Addends: 5,
9 Sum: 14

$2+8=10$

Addends: 2,
8 Sum: 10

$12+5=17$

Addends: 12,
15 Sum: 17

$11+10=21$

Addends: 11,
10 Sum: 21

$1+13+4=18$

Addends: 1, 13, 4
Sum: 18

$5+8+2=15$

Addends: 5, 8,
2 Sum: 15

$42 = 4 \text{ tens} + 2 \text{ ones}$

$\underline{33} = 3 \text{ tens} + 3 \text{ ones}$

$75 = 7 \text{ tens} + 5 \text{ ones}$

$21 = 2 \text{ tens} + 1 \text{ one}$

$\underline{53} = 5 \text{ tens} + 3 \text{ ones}$

$74 = 7 \text{ tens} + 4 \text{ ones}$

$39 = 3 \text{ tens} + 9 \text{ ones}$

$\underline{20} = 2 \text{ tens} + 0 \text{ ones}$

$59 = 5 \text{ tens} + 9 \text{ ones}$

19. $15 = 1 \text{ ten} + 5 \text{ ones}$

$\underline{43} = 4 \text{ tens} + 3 \text{ ones}$

$58 = 5 \text{ tens} + 8 \text{ ones}$

$12 = 1 \text{ ten} + 2 \text{ ones}$

$15 = 1 \text{ ten} + 5 \text{ ones}$

$\underline{32} = 3 \text{ tens} + 2 \text{ ones}$

$59 = 5 \text{ tens} + 9 \text{ ones}$

21. $10 = 1 \text{ ten} + 0 \text{ ones}$

$8 = 0 \text{ tens} + 8 \text{ ones}$

$\underline{30} = 3 \text{ tens} + 0 \text{ ones}$

$48 = 4 \text{ tens} + 8 \text{ ones}$

$7 = 0 \text{ tens} + 7 \text{ ones}$

$1 = 0 \text{ tens} + 1 \text{ one}$

$\underline{+10} = 1 \text{ ten} + 0 \text{ ones}$

$38 = 3 \text{ tens} + 8 \text{ ones}$

$6 = 0 \text{ tens} + 6 \text{ ones}$

$11 = 1 \text{ ten} + 1 \text{ one}$

$\underline{2} = 0 \text{ tens} + 2 \text{ ones}$

$19 = 1 \text{ ten} + 9 \text{ ones}$

341

225

566

Chapter 1 Whole Numbers

$$\begin{array}{r} 1 \\ 331 \\ 422 \\ \underline{76} \\ 829 \end{array}$$

$$\begin{array}{r} 1 \\ 87 \\ 119 \\ \underline{630} \\ 836 \end{array}$$

$$\begin{array}{r} 11 \\ 4980 \\ 10223 \\ \hline 15,203 \end{array}$$

$$\begin{array}{r} 11 \\ 23112 \\ 892 \end{array}$$

$$\overline{24,004}$$

$$\begin{array}{r} 1 \\ 10\ 223 \\ 782 \\ \underline{4980} \\ 40,985 \end{array}$$

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

$$12+6=6+12$$

$$30+21=21+30$$

$$101+44=44+101$$

$$8+13=13+8$$

$$(4+8)+13=4+(8+13)$$

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

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

$$41+(3+22)=(41+3)+22$$

The sum of any number and 0 is that number.

$$\begin{aligned} 423+0 &= 423 \\ 0+25 &= 25 \\ 67+0 &= 67 \end{aligned}$$

$$\begin{array}{r} 1 \\ \mathbf{62.} \ 13+7 \quad 13 \\ \quad \quad \quad \underline{+7} \\ \quad \quad \quad 20 \end{array}$$

$$\begin{array}{r} \mathbf{63.} \ 100 + 42 \quad 100 \\ \quad \quad \quad \underline{+42} \\ \quad \quad \quad 142 \end{array}$$

$$\begin{array}{r} 1 \\ \mathbf{64.} \ 7+45 \quad 7 \\ \quad \quad \quad \underline{+45} \\ \quad \quad \quad 52 \end{array}$$

$$\begin{array}{r} \mathbf{65.} \ 23+81 \quad 23 \\ \quad \quad \quad \underline{+81} \\ \quad \quad \quad 104 \end{array}$$

$$\begin{array}{r} 1 \\ \mathbf{66.} \ 18+5 \quad 18 \\ \quad \quad \quad \underline{+5} \\ \quad \quad \quad 23 \end{array}$$

$$\begin{array}{r} \mathbf{67.} \ 76+2 \quad 76 \\ \quad \quad \quad \underline{+2} \\ \quad \quad \quad 78 \end{array}$$

$$\begin{array}{r} 1 \\ \mathbf{68.} \ 1523 + 90 \quad 1\ 523 \\ \quad \quad \quad \underline{+90} \\ \quad \quad \quad 1,613 \end{array}$$

$$\begin{array}{r} \mathbf{69.} \ 1320 + 448 \quad 1\ 320 \\ \quad \quad \quad \underline{+448} \\ \quad \quad \quad 1,768 \end{array}$$

$$\begin{array}{r} 1 \\ \mathbf{70.} \ 5+39+81 \quad 5 \\ \quad \quad \quad 39 \\ \quad \quad \quad \underline{+81} \\ \quad \quad \quad 125 \end{array}$$

The commutative property changes the order of the

addends, and the associative property changes the grouping.

For example: The sum of 54 and 24

For example: The sum of 33 and 15

For example: 88 added to 12

Section 1.2 Addition of Whole Numbers and Perimeter

For example: 15 added to 70

$$\begin{array}{r} 1 \\ 60 \end{array}$$

For example: The total of 4, 23, and 77

$$\begin{array}{r} 52 \\ 75 \end{array}$$

For example: The total of 11, 41, and 53

$$\begin{array}{r} \underline{58} \\ 245 \end{array}$$

For example: 10 increased by 8

The total for the checks written is \$245.

For example: 25 increased by 14

$$\begin{array}{r} 11 \\ 115 \\ 104 \\ 93 \\ \underline{111} \\ 423 \end{array}$$

103

$$\begin{array}{r} 112 \\ \underline{61} \\ 276 \end{array}$$

276 people attended the play.

423 desks were delivered.

38

$$\begin{array}{r} 3 \\ 54 \\ 44 \\ 61 \\ 397 \\ 103 \\ \underline{124} \\ 521 \end{array}$$

521 deliveries were made.

$$\begin{array}{r} 533 \\ 2787 \\ 956 \\ 991 \\ 817 \\ 567 \\ 715 \\ \underline{3705} \\ 13,538 \end{array}$$

There are 13,538 participants.

21,209,000

$$\begin{array}{r} 2 \\ 20,836,000 \\ \underline{16,448,000} \\ 58,493,000 \end{array}$$

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

$$\begin{array}{r} 11 \\ 1494 \\ 155 \\ \underline{42} \\ 1691 \end{array}$$

There are 1691 thousand teachers.

195 mi

$$\begin{array}{r} 1 \\ \underline{228 \text{ mi}} \\ 423 \text{ mi} \end{array}$$

She will travel 423 mi.

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

There are 821,024 nonteachers.

\$43,000

$$\begin{array}{r} 11 \\ \underline{2,500} \\ \$45,500 \end{array}$$

Nora earns \$45,500.

$$\begin{array}{r} 11 \\ \$7329 \\ 560 \\ 248 \\ \underline{3500} \end{array}$$

The total cost is \$21,637.

1,205,655

$$\begin{array}{r} \underline{1,000} \\ 1,206,655 \end{array}$$

1,206,655 athletes are participating.

Chapter 1 Whole Numbers

1
35 cm
35 cm
34 cm
104 cm

90 ft
90 ft
90 ft
90 ft
ft

1
27 in.
13 in.
20 in.
60 in.

$$9,084,037 + 452,903 = 9,536,940$$

$$899,382 + 9406 = 908,788$$

$$7,201,529 + 962,411 = 8,163,940$$

2
21 m
20 m
18 m
19 m
11 m
21 m
110 m

45,418
81,990
9,063
56,309
192,780

9,300,050
7,803,513

2
15 m
7 m
6 m
7 m
35 m

3,480,009
907,822
21,491,394

3,421,019
822,761
1,003,721
9,678

5,257,179

2
6 yd
10 yd
11 yd
3 yd
5 yd
7 yd
yd

64,700,000
36,500,000
24,100,000
23,200,000
\$148,500,000

200 yd
yd
yd
yd
yd
38 yd
yd

22111
65,899,660
60,932,152
128,107,616 1,275,804 votes

94 ft
ft
ft
50 ft
ft

Section 1.3 Subtraction of Whole Numbers

Section 1.3 Practice Exercises

minuend; subtrahend; difference

134

330

$$\begin{array}{r} \underline{821} \\ 1151 \end{array}$$

782

$$\begin{array}{r} 1 \\ 21 \\ \underline{1\ 046} \\ 1,849 \end{array}$$

46

$$\begin{array}{r} 1 \\ 804 \\ \underline{49} \\ 899 \end{array}$$

14 < 21

0 < 10

Twenty-two is less than twenty-five.

12 - 8 = 4

minuend: 12
subtrahend: 8
difference: 4

6 - 1 = 5

minuend: 6
subtrahend: 1
difference: 5

21 - 12 = 9

minuend: 21
subtrahend: 12
difference: 9

32 - 2 = 30

minuend: 32
subtrahend: 2
difference: 30

9

$$\begin{array}{r} \underline{6} \\ 3 \end{array}$$

minuend: 9
subtrahend: 6
difference: 3

17

$$\underline{3}$$

14 minuend:
17
subtrahend: 3
difference: 14

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

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

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

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

8 - 3 = 5 Check: 5 + 3 = 8

7 - 2 = 5 Check: 5 + 2 = 7

4 - 1 = 3 Check: 3 + 1 = 4

9 - 1 = 8 Check: 8 + 1 = 9

6 - 0 = 6 Check: 6 + 0 = 6

3 - 0 = 3 Check: 3 + 0 = 3

68 Check: 45

$$\begin{array}{r} \underline{-23} \\ 68 \end{array} \quad \begin{array}{r} \underline{+23} \\ 68 \end{array} \checkmark$$

54 Check: 23

$$\begin{array}{r} \underline{-31} \\ 23 \end{array} \quad \begin{array}{r} \underline{+31} \\ 54 \end{array} \checkmark$$

Chapter 1 Whole Numbers

$$\begin{array}{r} 88 \text{ Check: } 61 \\ -27 \quad +27 \\ \hline 88 \checkmark \end{array}$$

$$\begin{array}{r} 75 \text{ Check: } 25 \\ -50 \quad +50 \\ \hline 75 \checkmark \end{array}$$

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

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

$$\begin{array}{r} 31. \quad 1525 \quad \text{Check: } 1204 \\ -1204 \quad +321 \\ \hline 1525 \checkmark \end{array}$$

$$\begin{array}{r} 8843 \text{ Check: } 3231 \\ -5612 \quad +5612 \\ \hline 3231 \quad 8843 \checkmark \end{array}$$

$$\begin{array}{r} 12806 \text{ Check: } 10004 \\ -2802 \quad +2802 \\ \hline 10,004 \quad 12,806 \checkmark \end{array}$$

$$\begin{array}{r} 12,771 \text{ Check: } 11531 \\ -1240 \quad +1240 \\ \hline 11,531 \quad 12,771 \checkmark \end{array}$$

$$\begin{array}{r} 35. \quad 14,356 \quad \text{Check: } 1103 \\ -13,253 \quad +13,253 \\ \hline 1,103 \quad 14,356 \checkmark \end{array}$$

$$\begin{array}{r} 36. \quad 34,550 \quad \text{Check: } 3100 \\ -31,450 \quad +31,450 \\ \hline 3,100 \quad 34,550 \checkmark \end{array}$$

$$\begin{array}{r} 37. \quad \overset{6}{7} \overset{16}{\cancel{0}} \quad \text{Check: } 17 \\ -59 \quad +59 \\ \hline 17 \quad 76 \checkmark \\ \cancel{54} \quad 1 \end{array}$$

$$\begin{array}{r} 717 \quad 1 \\ \cancel{87} \text{ Check: } 49 \\ -38 \quad +38 \\ \hline 87 \checkmark \end{array}$$

$$\begin{array}{r} 814 \quad 1 \\ \cancel{94} \text{ Check: } 19 \\ -75 \quad +75 \\ \hline 94 \checkmark \end{array}$$

$$\begin{array}{r} 319 \quad 1 \\ 240 \text{ Check: } 104 \end{array}$$

$$\begin{array}{r} -136 \quad +136 \\ \hline 240 \checkmark \end{array}$$

$$\begin{array}{r} 510 \quad 1 \\ \cancel{360} \text{ Check: } 135 \\ -225 \quad +225 \\ \hline 360 \checkmark \end{array}$$

$$\begin{array}{r} 10 \quad 11 \\ \cancel{6010} \text{ Check: } 521 \\ -189 \quad +189 \end{array}$$

$$\begin{array}{r} 521 \quad 710 \checkmark \\ 410 \quad 1 \\ \cancel{850} \text{ Check: } 547 \\ -303 \quad +303 \end{array}$$

$$\begin{array}{r} 547 \quad 850 \checkmark \\ 410 \quad 1 \\ // \\ 45. \quad 4350 \quad \text{Check: } 23 \\ -4327 \quad +4327 \end{array}$$

$$\begin{array}{r} 23 \quad 4350 \checkmark \end{array}$$

$$\begin{array}{r} 813 \quad 1 \\ 46. \quad \cancel{729} \text{ Check: } 38 \\ -7255 \quad +7255 \end{array}$$

$$\begin{array}{r} 38 \quad 7293 \checkmark \\ 99 \\ 5101012 \quad 111 \\ \cancel{0002} \text{ Check: } 4764 \end{array}$$

$$\begin{array}{r} 64 \text{ Check: } 16 \end{array}$$

-48

+48

64 ✓

-1238

+ 1238

47 64

6002 ✓

Section 1.3 Subtraction of Whole Numbers

$$\begin{array}{r} 99 \\ 2101010 \\ \hline 3000 \end{array} \text{ Check: } \underline{1644}$$

$$\begin{array}{r} -2356 \\ \hline \end{array} \quad \begin{array}{r} 11 \\ +2356 \\ \hline \end{array}$$

$$\begin{array}{r} 644 \\ 10 \quad 1403 \\ \hline 9022 \end{array} \text{ Check: } \underline{10425}$$

$$\begin{array}{r} 10425 \\ \hline 1,403 \end{array} \quad \begin{array}{r} 3000 \\ \hline 10,425 \end{array} \checkmark$$

$$\begin{array}{r} 9 \\ 1138 \quad 11 \\ \hline 5023901 \end{array} \text{ Check: } \underline{+8064}$$

$$\begin{array}{r} -8064 \\ \hline 23901 \end{array} \checkmark$$

15,837

$$\begin{array}{r} 11 \\ 5110 \\ \hline 62088 \end{array} \text{ Check: } \underline{12217}$$

$$\begin{array}{r} -59871 \\ \hline 2,217 \end{array} \quad \begin{array}{r} 1 \\ +59871 \\ \hline 62,088 \end{array} \checkmark$$

2,217 62,088 ✓
111010

52.
$$\begin{array}{r} 210012 \\ \hline 32112 \end{array} \text{ Check: } \underline{13778}$$

$$\begin{array}{r} -28334 \\ \hline 3,778 \end{array} \quad \begin{array}{r} 111 \\ +28334 \\ \hline 32,112 \end{array} \checkmark$$

$$\begin{array}{r} 16 \\ 2610 \\ \hline 470 \end{array} \text{ Check: } \underline{378}$$

$$\begin{array}{r} -92 \\ \hline 378 \end{array} \quad \begin{array}{r} 11 \\ +92 \\ \hline 470 \end{array} \checkmark$$

$$\begin{array}{r} 16 \\ 5614 \\ \hline 674 \end{array} \text{ Check: } \underline{585}$$

$$\begin{array}{r} -89 \\ \hline 585 \end{array} \quad \begin{array}{r} 11 \\ +89 \\ \hline 674 \end{array} \checkmark$$

$$\begin{array}{r} 16 \\ 261010 \\ \hline 3700 \end{array} \text{ Check: } \underline{1713}$$

$$\begin{array}{r} 99 \\ 71010 \quad 10 \\ \hline 8000 \end{array} \text{ Check: } \underline{4212}$$

$$\begin{array}{r} -3788 \\ \hline \end{array} \quad \begin{array}{r} 111 \\ +3788 \\ \hline \end{array}$$

4212 8000 ✓
13

$$\begin{array}{r} 1313 \\ 32,439 \\ \hline -1498 \\ \hline 30,941 \end{array} \text{ Check: } \underline{30941}$$

$$\begin{array}{r} 11 \\ +1498 \\ \hline 32,439 \end{array} \checkmark$$

58.
$$\begin{array}{r} 111 \\ \hline 21335 \end{array} \text{ Check: } \underline{+4123}$$

$$\begin{array}{r} -4123 \\ \hline 17,212 \end{array} \quad \begin{array}{r} 1 \\ +4123 \\ \hline 21,335 \end{array} \checkmark$$

17,212 21,335 ✓

$$\begin{array}{r} 9 \\ 71010 \quad 214 \\ \hline 8,007,234 \end{array} \text{ Check: } \underline{5662119}$$

$$\begin{array}{r} -2,345,115 \\ \hline 5,662,119 \end{array} \quad \begin{array}{r} 111 \\ +2,345,115 \\ \hline 8,007,234 \end{array} \checkmark$$

61.
$$\begin{array}{r} 9 \\ 21014 \quad 416 \\ \hline 3045567 \end{array} \text{ Check: } \underline{1174072}$$

$$\begin{array}{r} -1871495 \\ \hline 1,174,072 \end{array} \quad \begin{array}{r} 111 \\ +1,871,495 \\ \hline 3,045,567 \end{array} \checkmark$$

$$\begin{array}{r} 78 \\ -23 \\ \hline 55 \end{array}$$

62.
$$\begin{array}{r} 315 \\ \hline 45 \\ \hline -17 \\ \hline 28 \end{array}$$

$$\begin{array}{r} -2987 \\ \hline 713 \end{array} \quad \begin{array}{r} +2987 \\ \hline 3700 \end{array} \checkmark$$

63. 78

- 6

72

1

5⁰

0

1

2

8

4

2

2

1

0

0

3

2

2

—

//

Chapter 1 Whole Numbers

89

$$\begin{array}{r} 42 \\ 47 \end{array}$$

$$\begin{array}{r} 8 \ 10 \\ 109 \cancel{0} / \\ \underline{72} \end{array}$$

1018

$$\begin{array}{r} 11 \\ 311 \cancel{1} / \\ \underline{60} \end{array}$$

3051

10

$$\begin{array}{r} 5 \ 0 \ / \ / \\ \underline{13} \\ 7 \end{array}$$

405

$$\begin{array}{r} 103 \\ 302 \end{array}$$

$$\begin{array}{r} 13 \\ 103 \ / \\ \underline{35} \\ 8 \end{array}$$

$$\begin{array}{r} 11 \\ 91 \ / \\ \underline{14} \\ 7 \end{array}$$

For example: 93 minus 27

For example: 80 decreased by 20

For example: Subtract 85 from 165.

For example: 42 less than 171

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 .

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 $(10 - 6) - 2$.

$$\begin{array}{r} 4 \ 10 \\ \$5 \cancel{0} / \\ \underline{17} \\ \$3 \ 3 \end{array}$$

\$33 change was received.

$$\begin{array}{r} 4 \ 15 \\ 5 \ 5 \ / \ / \\ \underline{39} \\ 1 \ 6 \end{array}$$

16 DVDs are left.

$$\begin{array}{r} 11 \\ 1 \ / \ \cancel{1}8 \\ - \underline{63} \end{array}$$

55

Lennon and McCartney had 55 more hits.

$$\begin{array}{r} 10 \\ 5 \ 0 \ \cancel{5} / \\ \underline{200} \\ 3 \ 0 \ 5 \end{array}$$

305 ft more

$$\begin{array}{r} 16 \\ 2 \ 6 \ / \ / \\ \underline{18} \\ 8 \end{array}$$

Lily needs 8 more plants.

$$\begin{array}{r} \$50 \\ \underline{37} \\ \$13 \end{array}$$

\$13 more is needed.

$$\begin{array}{r} 13 \\ 40 \ \cancel{1}4 \\ 51 \ \cancel{4}9 \ / \\ \underline{2670} \\ 2479 \end{array}$$

The Lion King had been performed 2,479 more times.

$$\begin{array}{r} 13 \\ 32344 \ / \\ \underline{30646} \\ 698 \end{array}$$

Brees needs 1698 more yd.

Section 1.3 Subtraction of Whole Numbers

87. $14 \text{ m} \quad 39 \text{ m}$
 $\begin{array}{r} + 12 \text{ m} \\ \hline 26 \text{ m} \end{array} \quad \begin{array}{r} - 26 \text{ m} \\ \hline 13 \text{ m} \end{array}$
 The missing length is 13 m.

88. $\begin{array}{r} 11 \\ 139 \text{ cm} \\ 87 \text{ cm} \end{array} \quad \begin{array}{r} 547 \text{ cm} \\ - 427 \text{ cm} \\ \hline 120 \text{ cm} \end{array}$
 The missing length is 120 cm.

89. $4 \quad 56 \text{ yd}$
 $\begin{array}{r} 14 \\ \hline 14 \end{array} \quad \begin{array}{r} - 46 \text{ yd} \\ \hline 10 \text{ yd} \end{array}$
 $\begin{array}{r} + 10 \\ \hline 46 \text{ yd} \end{array}$
 The missing side is 10 yd long.

6
 $\begin{array}{r} 5 \\ \hline 11 \\ 15 \text{ ft} \\ - 11 \text{ ft} \\ \hline 4 \text{ ft} \end{array}$

The missing side is 4 ft long.

2279000
 $\begin{array}{r} 2249000 \\ \hline 30,000 \end{array}$
 The difference is 30,000 marriages.

$\begin{array}{r} 14 \\ 2,249,000 \\ \hline 2,160,000 \\ \hline 89,000 \end{array}$
 The decrease is 89,000 marriages.

2279000
 $\begin{array}{r} 2160000 \\ \hline 119,000 \end{array}$
 The difference is 119,000 marriages.

$\begin{array}{r} 10 \\ 2,205,000 \\ \hline 2,160,000 \\ \hline 45,000 \end{array}$

The greatest increase occurred between Year 5 and Year 6; the increase was 45,000.

$\begin{array}{r} 4,905,620 \\ - 458,318 \\ \hline 4,447,302 \end{array}$
 $\begin{array}{r} 953,400,415 \\ \hline 56,341,902 \\ \hline 897,058,513 \end{array}$

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

$\begin{array}{r} 103,718 \text{ mi}^2 \\ \hline 54,310 \text{ mi}^2 \\ \hline 49,408 \text{ mi}^2 \\ \hline 41,217 \text{ mi}^2 \\ \hline 24,078 \text{ mi}^2 \\ \hline 17,139 \text{ mi} \end{array}$

$\begin{array}{r} 103,718 \text{ mi}^2 \\ \hline 1,045 \text{ mi}^2 \\ \hline 102,673 \text{ mi}^2 \end{array}$
 The difference in land area between Colorado and Rhode Island is $102,673 \text{ mi}^2$.

$\begin{array}{r} 54,310 \text{ mi}^2 \\ \hline 41,217 \text{ mi}^2 \\ \hline 13,093 \text{ mi}^2 \end{array}$

Wisconsin has $13,093 \text{ mi}^2$ more than Tennessee.

Section 1.4 Rounding and Estimating

Section 1.4 Practice Exercises

rounding

30 ft

59

$$\begin{array}{r} \underline{33} \\ 26 \end{array}$$

$$\begin{array}{r} 01210 \\ 1 \overline{)30} \\ \underline{98} \\ 32 \end{array}$$

$$\begin{array}{r} 11 \\ 4009 \\ \underline{998} \\ 5,007 \end{array}$$

$$\begin{array}{r} 12,033 \\ \underline{23,441} \\ 35,474 \end{array}$$

Ten-thousands

Hundreds

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.

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.

$$342 \approx 340$$

$$834 \approx 830$$

$$725 \approx 730$$

$$445 \approx 450$$

$$9384 \approx 9400$$

$$8363 \approx 8400$$

$$8539 \approx 8500$$

$$9817 \approx 9800$$

$$34,992 \approx 35,000$$

$$76,831 \approx 77,000$$

$$2578 \approx 3000$$

$$3511 \approx 4000$$

$$9982 \approx 10000$$

$$7974 \approx 8000$$

$$109,337 \approx 109,000$$

$$437,208 \approx 437,000$$

$$489,090 \approx 490,000$$

$$388,725 \approx 390,000$$

$$\$77,025,481 \approx \$77,000,000$$

$$\$33,050 \approx \$33,000$$

$$238,863 \text{ mi} \approx 239,000 \text{ mi}$$

$$492,000 \text{ m}^2 \approx 500,000 \text{ m}^2$$

$$\begin{array}{r} 33. \quad 57 \rightarrow 60 \\ \quad 82 \rightarrow 80 \\ \quad \underline{+ 21} \rightarrow \underline{+ 20} \\ \quad \quad 160 \end{array}$$

$$\begin{array}{r} 34. \quad 33 \rightarrow 30 \\ \quad 78 \rightarrow 80 \\ \quad \underline{+ 41} \rightarrow \underline{+ 40} \\ \quad \quad 150 \end{array}$$

$$\begin{array}{r} 35. \quad 41 \rightarrow 40 \\ \quad 12 \rightarrow 10 \\ \quad \underline{+ 129} \rightarrow \underline{+ 130} \\ \quad \quad 180 \end{array}$$

Section 1.4 Rounding and Estimating

$$\begin{array}{r} 36. \quad 29 \rightarrow 130 \\ \quad 73 \rightarrow 70 \\ \hline + 113 \rightarrow + 110 \\ \hline 210 \end{array}$$

$$\begin{array}{r} 37. \quad 898 \rightarrow 900 \\ \hline - 422 \rightarrow - 400 \\ \hline 500 \end{array}$$

$$\begin{array}{r} 38. \quad 731 \rightarrow 700 \\ \hline - 584 \rightarrow - 600 \\ \hline 100 \end{array}$$

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

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

$$\begin{array}{r} 41. \quad 97,404,576 \rightarrow 97,000,000 \\ \hline + 53,695,428 \rightarrow + 54,000,000 \\ \hline 151,000,000 \end{array}$$

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

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

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

$$\begin{array}{r} 43. \quad 71,339,710 \rightarrow 71,000,000 \\ \hline 59,684,076 \rightarrow = 60,000,000 \\ \hline 11,000,000 \end{array}$$

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

$$\begin{array}{r} 44. \quad 63,640 \rightarrow 64,000 \\ \hline 43,130 \rightarrow = 43,000 \\ \hline 21,000 \end{array}$$

A California teacher makes about \$21,000 more.

$$\begin{array}{r} 45. \quad \$3,316,897 \rightarrow \$3,300,000 \\ \hline 3,272,028 \rightarrow 3,300,000 \\ \hline 3,360,289 \rightarrow + 3,400,000 \end{array}$$

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

(a) Year 4; \$3,470,295 → \$3,500,000

(b) Year 6; \$1,970,380 → \$2,000,000

$$\begin{array}{r} \$3,500,000 \\ \hline 2,000,000 \\ \hline \$1,500,000 \end{array}$$

Massachusetts; 78,815 → 79,000 students

Vermont; 8059 → 8000 students

$$\begin{array}{r} 79,000 \\ \hline 8,000 \\ \hline 71,000 \end{array}$$

The difference is 71,000 students.

$$\begin{array}{r} 52. \quad 45,879 \rightarrow 46,000 \\ \quad 9137 \rightarrow 9,000 \\ \quad 16,756 \rightarrow 17,000 \\ \quad 78,815 \rightarrow 79,000 \\ \quad 17,422 \rightarrow 17,000 \\ \quad 13,172 \rightarrow 13,000 \\ \hline + 8059 \rightarrow + 8,000 \\ \hline 189,000 \end{array}$$

The total is 189,000 students.

Answers may vary.

Thousands place

$$\begin{aligned} 4208 - 932 + 1294 &\approx 4000 - 1000 + 1000 \\ &\approx 3000 + 1000 \\ &\approx 4000 \end{aligned}$$

$$\begin{array}{r} 55. \quad 3045 \text{ mm} \rightarrow 3000 \text{ mm} \\ \quad 1892 \text{ mm} \rightarrow 2000 \text{ mm} \\ \quad 3045 \text{ mm} \rightarrow 3000 \text{ mm} \\ \hline + 1892 \text{ mm} \rightarrow + 2000 \text{ mm} \\ \hline 10,000 \text{ mm} \end{array}$$

$$\begin{array}{r} 1782 \text{ cm} \rightarrow 2000 \text{ cm} \\ 1851 \text{ cm} \rightarrow 2000 \text{ cm} \end{array}$$

$$+ 1782 \text{ cm} \rightarrow + 2000 \text{ cm}$$

$$\begin{array}{r}
 57. \quad 05 \text{ in.} \rightarrow 110 \text{ in.} \\
 \quad 57 \text{ in.} \rightarrow 60 \text{ in.} \\
 \quad 57 \text{ in.} \rightarrow 60 \text{ in.} \\
 \quad 105 \text{ in.} \rightarrow 110 \text{ in.} \\
 \quad 57 \text{ in.} \rightarrow 60 \text{ in.} \\
 \quad \underline{+ 57 \text{ in.}} \rightarrow \underline{+ 60 \text{ in.}} \\
 \quad \quad \quad 460 \text{ in.}
 \end{array}$$

$$\begin{array}{r}
 58. \quad 182 \text{ ft} \rightarrow 200 \text{ ft} \\
 \quad 121 \text{ ft} \rightarrow 100 \text{ ft} \\
 \quad 182 \text{ ft} \rightarrow 200 \text{ ft} \\
 \quad 169 \text{ ft} \rightarrow 200 \text{ ft} \\
 \quad \underline{+ 169 \text{ ft}} \rightarrow \underline{+ 200 \text{ ft}} \\
 \quad \quad \quad 900 \text{ ft}
 \end{array}$$

Section 1.5 Multiplication of Whole Numbers and Area

Section 1.5 Practice Exercises

1. (a) factors; product

(b) commutative

(c) associative

(d) 0; 0

(e) 7; 7

(f) distributive

(g) area

(h) $l \times w$

2. 13,000

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

$$\begin{array}{r}
 4. \quad 907,801 \rightarrow 900,000 \\
 \quad \underline{- 413,560} \rightarrow \underline{- 400,000} \\
 \quad \quad \quad 500,000
 \end{array}$$

$$\begin{array}{r}
 5. \quad 8821 \rightarrow 8800 \\
 \quad \underline{- 3401} \rightarrow \underline{- 3400} \\
 \quad \quad \quad 5400
 \end{array}$$

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

Section 1.5 Multiplication of Whole Numbers and Area

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

$$2+2+2+2+2+2+2+2+2=9 \times 2$$

18

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

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

$$13 \times 42=546$$

factors: 13, 42; product: 546

$$26 \times 9=234$$

factors: 26, 9; product: 234

$$3 \cdot 5 \cdot 2=30$$

factors: 3, 5, 2; product: 30

$$4 \cdot 3 \cdot 8=96$$

factors: 4, 3, 8; product: 96

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

For example: 23×14 ; $23 \cdot 14$;

$23(14)$ d

a

e

b

c

a

$$14 \times 8=8 \times 14$$

$$3 \times 9=9 \times 3$$

$$6 \times (2 \times 10)=(6 \times 2) \times 10$$

$$(4 \times 15) \times 5=4 \times (15 \times 5)$$

$$5(7+4)=(5 \times 7)+(5 \times 4)$$

$$3(2+6)=(3 \times 2)+(3 \times 6)$$

24

$$\begin{array}{r} 6 \\ \hline \underline{120} \end{array} \begin{array}{l} \text{Multiply } 6 \times 4. \\ \text{Multiply } 6 \times 20. \\ \text{Add.} \end{array}$$

18

$$\begin{array}{r} 5 \\ \hline \underline{50} \end{array} \begin{array}{l} \text{Multiply } 5 \times 8. \\ \text{Multiply } 5 \times 10. \\ \text{Add.} \end{array}$$

26

$$\begin{array}{r} 2 \\ \hline \underline{40} \end{array} \begin{array}{l} \text{Multiply } 2 \times 6. \\ \text{Multiply } 2 \times 20. \\ \text{Add.} \end{array}$$

71

$$\begin{array}{r} 3 \\ \hline \underline{210} \\ 213 \end{array} \begin{array}{l} \text{Multiply } 3 \times 1. \\ \text{Multiply } 3 \times 70. \\ \text{Add.} \end{array}$$

131

$$\begin{array}{r} 5 \\ \hline \underline{500} \end{array} \begin{array}{l} \text{Multiply } 5 \times 1. \\ \text{Multiply } 5 \times 30. \\ \text{Multiply } 5 \times 100. \\ \text{Add.} \end{array}$$

725

$$\begin{array}{r} 3 \\ \hline \underline{2100} \\ 2175 \end{array} \begin{array}{l} \text{Multiply } 3 \times 0. \\ \text{Multiply } 3 \times 20. \\ \text{Multiply } 3 \times 700. \\ \text{Add.} \end{array}$$

344

$$\begin{array}{r} 4 \\ \hline \underline{1200} \\ 1376 \end{array} \begin{array}{l} \text{Multiply } 4 \times 4. \\ \text{Multiply } 4 \times 40. \\ \text{Multiply } 4 \times 300. \\ \text{Add.} \end{array}$$

105

$$\begin{array}{r} 9 \\ \hline \underline{900} \end{array} \begin{array}{l} \text{Multiply } 9 \times 5. \\ \text{Multiply } 9 \times 0. \\ \text{Multiply } 9 \times 100. \\ \text{Add.} \end{array}$$

3

1410

8

11,280

Chapter 1 Whole Numbers

$$\begin{array}{r} 2016 \\ \underline{\quad 6} \\ 12,096 \end{array}$$

$$\begin{array}{r} 3312 \\ \underline{\quad 7} \\ 23,184 \end{array}$$

$$\begin{array}{r} 4801 \\ \underline{\quad 5} \\ 24,005 \end{array}$$

$$\begin{array}{r} 42,014 \\ \underline{\quad 9} \\ 378,126 \end{array}$$

$$\begin{array}{r} 51,006 \\ \underline{\quad 8} \\ 408,048 \end{array}$$

$$\begin{array}{r} 32 \\ \underline{14} \\ 128 \\ \underline{320} \\ 448 \end{array}$$

$$\begin{array}{r} 41 \\ \underline{21} \\ 41 \\ \underline{820} \\ 861 \end{array}$$

$$\begin{array}{r} 68 \\ \underline{24} \\ 172 \\ \underline{1360} \\ 1632 \end{array}$$

$$\begin{array}{r} 55 \\ \underline{41} \\ 55 \\ \underline{2200} \\ 2255 \end{array}$$

$$\begin{array}{r} 72 \\ \underline{12} \\ 144 \\ + 720 \\ \hline 864 \end{array}$$

$$\begin{array}{r} 1 \\ 1 \\ 13 \\ \underline{46} \\ 78 \\ \underline{520} \\ 598 \end{array}$$

$$\begin{array}{r} 32 \\ 143 \\ 17 \\ \hline 1001 \\ + 1430 \\ \hline 2431 \end{array}$$

$$\begin{array}{r} 50. \\ \times \quad 28 \\ \hline 111 \\ 5776 \\ + 14440 \\ \hline 20,216 \end{array}$$

$$\begin{array}{r} 48 \\ 349 \\ 19 \\ \hline 3141 \\ + 3490 \\ \hline 6631 \end{array}$$

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

$$\begin{array}{r} 1 \\ 3 \\ 151 \\ 127 \\ \hline 1057 \\ 3020 \\ + 15100 \\ \hline 19,177 \end{array}$$

Section 1.5 Multiplication of Whole Numbers and Area

$$\begin{array}{r}
 1 \\
 1 \\
 703 \\
 \hline
 146 \\
 4\ 218 \\
 28\ 120 \\
 \underline{70\ 300} \\
 102,638
 \end{array}$$

$$\begin{array}{r}
 1\ 1 \\
 222 \\
 \hline
 841 \\
 1 \\
 11\ 222 \\
 8\ 880 \\
 \underline{177\ 600} \\
 186,702
 \end{array}$$

$$\begin{array}{r}
 4\ 3 \\
 387 \\
 \hline
 506 \\
 \underline{2\ 322}
 \end{array}$$

$$\begin{array}{r}
 \underline{193\ 500} \\
 195,822
 \end{array}$$

$$\begin{array}{r}
 2\ 1 \\
 3532 \\
 \hline
 6014 \\
 14\ 128 \\
 35\ 320 \\
 000\ 000
 \end{array}$$

$$\begin{array}{r}
 \underline{21192\ 000} \\
 21,241,448
 \end{array}$$

$$\begin{array}{r}
 2 \\
 7 \\
 2810 \\
 \hline
 1039 \\
 \underline{25\ 290} \\
 84\ 300 \\
 000\ 000
 \end{array}$$

$$2,919,590$$

$$\begin{array}{r}
 1\ 1\ 1 \\
 1 \\
 4122 \\
 \hline
 982 \\
 244 \\
 760 \\
 \underline{3\ 709\ 800} \\
 4,047,804
 \end{array}$$

$$\begin{array}{r}
 3 \\
 1 \\
 4 \\
 7026 \\
 \hline
 528 \\
 208 \\
 520 \\
 \underline{3513\ 000} \\
 3,709,728
 \end{array}$$

$$\begin{array}{r}
 61. \quad 600 \rightarrow \begin{array}{r} 6 \\ \hline 24 \end{array} \begin{array}{l} | \\ 00 \\ \hline 000 \end{array} = 24,000 \\
 \underline{40} \rightarrow \times 40
 \end{array}$$

$$\begin{array}{r}
 62. \quad 900 \rightarrow \begin{array}{r} 9 \\ \hline 45 \end{array} \begin{array}{l} | \\ 00 \\ \hline 000 \end{array} = 45,000 \\
 \underline{50} \rightarrow \times 50
 \end{array}$$

$$\begin{array}{r}
 63. \quad 3000 \rightarrow \begin{array}{r} 3 \\ \hline 21 \end{array} \begin{array}{l} | \\ 000 \\ \hline 00000 \end{array} = 2,100,000 \\
 \underline{700} \rightarrow \times 700
 \end{array}$$

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

$$\begin{array}{r}
 65. \quad 8000 \rightarrow \begin{array}{r} 8 \\ \hline 72 \end{array} \begin{array}{l} | \\ 000 \\ \hline 000000 \end{array} = 72,000,000 \\
 \underline{\times 9000} \rightarrow \times 9000
 \end{array}$$

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

$$\begin{array}{r}
 67. \quad 90,000 \rightarrow \begin{array}{r} 9 \\ \hline 36 \end{array} \begin{array}{l} | \\ 0000 \\ \hline 000000 \end{array} = 36,000,000 \\
 \underline{400} \rightarrow \times 400
 \end{array}$$

Chapter 1 Whole Numbers

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

$$\begin{array}{r} 69. \quad 11,784 \rightarrow 12,000 \\ \times 5,201 \rightarrow \times 5,000 \\ \hline 60,000,000 \\ 4 \end{array}$$

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

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

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

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

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

$$\begin{array}{r} 75. \quad 10,256 \rightarrow \begin{array}{r} 1 \mid 0000 \\ \times 272 \rightarrow \times 272 \mid \\ \hline 272 \mid 0000 = \\ \$2,720,000 \end{array} \end{array}$$

$$\begin{array}{r} 76. \quad 48 \rightarrow \begin{array}{r} 5 \mid 0 \\ \times 12 \rightarrow \times 1 \mid 0 \\ \hline 5 \mid 00 \\ 500 \\ 7 \\ \hline \$3500 \text{ per week} \end{array} \end{array}$$

$$\begin{array}{r} 1000 \\ 4 \\ \hline 4000 \\ 4000 \text{ minutes can be stored.} \end{array}$$

$$\begin{array}{r} 700 \\ 15 \\ \hline 3500 \\ 7000 \\ \hline 10,500 \\ 15 \text{ CDs hold } 10,500 \text{ MB of data} \end{array}$$

$$\begin{array}{r} 1 \\ 3 \\ \hline \$45 \end{array}$$

$$\begin{array}{r} 37 \\ 315 \\ \hline 1350 \\ \$1,665 \end{array}$$

$$\begin{array}{r} 12 \\ 12 \\ \hline 24 \\ 120 \end{array}$$

$$\begin{array}{r} 144 \\ \text{A case contains } 144 \text{ fl oz.} \end{array}$$

$$\begin{array}{r} 81. \quad 115 \\ \times 5 \\ \hline 575 \end{array}$$

$$\begin{array}{r} 32 \\ 5 \mid 00 \\ \hline 287,500 \\ 287,500 \text{ sheets of paper are delivered.} \end{array}$$

$$\begin{array}{r} 82. \quad 14 \quad 28 \end{array}$$

$$\begin{array}{r} \times 2 \quad \times 6 \\ 28 \quad 168 \\ \hline \text{She gets } 168 \text{ g of protein.} \end{array}$$

$$\begin{array}{r} 31 \\ 12 \\ \hline 62 \\ 310 \\ 372 \\ \hline \text{He can travel } 372 \text{ miles.} \end{array}$$

$$\begin{array}{r} 23 \\ 32 \\ \hline 46 \\ 690 \end{array}$$

7
3
6

Sherica schedules 736 hr.

Section 1.5 Multiplication of Whole Numbers and Area

$$A = l \times w$$

$$A = (23 \text{ ft}) \times (12 \text{ ft})$$

$$\begin{array}{r} 23 \\ \times 12 \\ \hline 46 \\ 230 \\ \hline 276 \end{array}$$

The area is 276 ft^2 .

$$A = l \times w$$

$$A = (31 \text{ m}) \times (2 \text{ m}) = 62 \text{ m}^2$$

$$A = l \times w$$

$$A = (73 \text{ cm}) \times (73 \text{ cm})$$

$$\begin{array}{r} 73 \\ \times 73 \\ \hline 219 \\ 5110 \\ \hline 5329 \end{array}$$

The area is 5329 cm^2 .

$$A = l \times w$$

$$A = (41 \text{ yd}) \times (41 \text{ yd})$$

$$\begin{array}{r} 41 \\ \times 41 \\ \hline 41 \\ 1640 \\ \hline 1681 \end{array}$$

The area is 1681 yd^2 .

$$A = l \times w$$

$$A = (390 \text{ mi}) \times (270 \text{ mi})$$

$$\begin{array}{r} 390 \\ \times 270 \\ \hline 2700 \\ 78000 \\ \hline 105300 \end{array}$$

The area is $105,300 \text{ mi}^2$.

$$A = l \times w$$

$$A = (130 \text{ yd}) \times (150 \text{ yd})$$

$$\begin{array}{r} 130 \\ \times 150 \\ \hline 6500 \\ 13000 \\ \hline 19500 \end{array}$$

The area is $19,500 \text{ yd}^2$.

91. (a) $A = l \times w$

$$A = (40 \text{ in.}) \times (60 \text{ in.})$$

$$\begin{array}{r} 40 \\ \times 60 \\ \hline 2400 \end{array}$$

2400 in.^2

$$\begin{array}{r} 1 \\ 14 \\ \times 3 \\ \hline 42 \end{array}$$

There are 42 windows.

$$\begin{array}{r} 2400 \\ \times 42 \\ \hline 800 \\ 96000 \\ \hline 100800 \end{array}$$

The total area is $100,800 \text{ in.}^2$

$$A = l \times w$$

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

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

The area is 1500 ft^2 .

Chapter 1 Whole Numbers

$$A = l \times w$$

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

$$\begin{array}{r} 4 \\ 16 \\ 8 \\ \hline 128 \end{array}$$

The area is 128 ft^2 .

$$A = l \times w$$

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

Section 1.6 Division of Whole Numbers

Section 1.6 Practice Exercises

(a) dividend; divisor; quotient

1
5
0
undefined
remainder

(a) $5 + 2$

$5 \cdot 2$
 $(3+10)+2$
 $(3 \cdot 10) \cdot 2$

$$\begin{array}{r} 1 \\ 2 \\ 103 \\ \hline 48 \\ \hline 824 \\ 4120 \\ \hline 4,944 \end{array}$$

$$\begin{array}{r} 17 \\ 678 \overline{) 83} \\ \hline 595 \end{array}$$

5.
$$\begin{array}{r} 1 \\ 1008 \\ + 245 \\ \hline 1253 \end{array}$$

$$\begin{array}{r} 220 \\ \hline 14 \\ 880 \\ \hline 200 \\ 3,080 \end{array}$$

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

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

$$\begin{array}{r} 318810 \\ \del{4890} \\ \hline 3988 \\ 902 \end{array}$$

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

Dividend: 72
divisor: 8
quotient: 9

Dividend: 32
divisor: 4
quotient: 8

Dividend: 64
divisor: 8
quotient: 8

Section 1.6 Division of Whole Numbers

Dividend: 35
divisor: 5
quotient: 7

Dividend: 45
divisor: 9
quotient: 5

Dividend: 20
divisor: 5
quotient: 4

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.

A number divided or multiplied by 1 remains unchanged.

$$15 \div 1 = 15 \text{ because } 15 \times 1 = 15.$$

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

$$0 \div 10 = 0 \text{ because } 0 \times 10 = 0.$$

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

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

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

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

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

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

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

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

$$13 \div 13 = 1 \text{ because } 13 \times 1 = 13.$$

$$6 \div 3 = 2 \text{ because } 2 \times 3 = 6.$$

$$3 \div 6 \neq 2 \text{ because } 2 \times 6 \neq 3.$$

$$(36 \div 12) \div 3 = 3 \div 3 = 1 \text{ but}$$

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

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

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.

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

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

$$37. \begin{array}{r} 41 \\ 5 \overline{) 205} \\ \underline{-20} \\ 05 \\ \underline{-5} \\ 0 \end{array} \qquad \begin{array}{r} 41 \\ \times 5 \\ \hline 205 \checkmark \end{array}$$

$$38. \begin{array}{r} 19 \\ 8 \overline{) 152} \\ \underline{-8} \\ 72 \\ \underline{-72} \\ 0 \end{array} \qquad \begin{array}{r} 19 \\ \times 8 \\ \hline 152 \checkmark \end{array}$$

Chapter 1 Whole Numbers

$$\begin{array}{r}
 486 \\
 39. 2 \overline{) 972} \\
 \underline{-8} \\
 17 \\
 \underline{-16} \\
 12 \\
 \underline{-12} \\
 0
 \end{array}$$

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

$$\begin{array}{r}
 822 \\
 6 \overline{) 4932} \\
 \underline{-48} \\
 13 \\
 \underline{-1} \\
 2 \\
 12 \\
 \underline{-12} \\
 0
 \end{array}$$

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

$$\begin{array}{r}
 97 \\
 40. 6 \overline{) 582} \\
 \underline{-54}
 \end{array}$$

$$\begin{array}{r}
 4 \\
 97 \\
 \times \underline{6}
 \end{array}$$

$$\begin{array}{r}
 517 \\
 7 \overline{) 3619}
 \end{array}$$

$$\begin{array}{r}
 14 \\
 517 \\
 \underline{7}
 \end{array}$$

$$\begin{array}{r}
 42 \\
 \underline{-42} \\
 0
 \end{array}$$

$$582$$

$$\begin{array}{r}
 \overline{-35} \\
 1 \\
 1 \\
 \underline{-7} \\
 49 \\
 \underline{-49} \\
 0
 \end{array}$$

$$3619 \checkmark$$

$$\begin{array}{r}
 409 \\
 41. 5 \overline{) 2045} \\
 \underline{-12} \\
 02 \\
 \underline{-0} \\
 27 \\
 \underline{-27} \\
 0
 \end{array}$$

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

$$\begin{array}{r}
 2 \\
 47. 56 \\
 \times \underline{4} \\
 224 \text{ correct}
 \end{array}$$

$$\begin{array}{r}
 59 \\
 42. 4 \overline{) 236} \\
 \underline{-20} \\
 36 \\
 \underline{-36} \\
 0
 \end{array}$$

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

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

$$\begin{array}{r}
 R2 \\
 3 \overline{) 761} \\
 \underline{-6} \\
 16 \\
 \underline{-15} \\
 11
 \end{array}$$

$$203$$

$$1$$

$$\begin{array}{r}
 1 \\
 49. 253 \\
 \times \underline{3} \\
 759
 \end{array}$$

incorrect

$$\begin{array}{r}
 -9 \\
 \underline{2}
 \end{array}$$

$$\begin{array}{r}
 1015 \\
 43. 5 \overline{) 5075} \\
 \underline{-10}
 \end{array}$$

$$\begin{array}{r}
 203 \\
 \times \underline{5}
 \end{array}$$

$$\begin{array}{r}
 01 \\
 \underline{-0} \\
 15 \\
 \underline{-15} \\
 0
 \end{array}$$

$$1015$$

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

$$\begin{array}{r}
 R4 \\
 5 \overline{) 604} \\
 \underline{-5} \\
 10 \\
 \underline{-10} \\
 04 \\
 \underline{-0} \\
 4
 \end{array}$$

$$\begin{array}{r}
 407 \\
 44. 5 \overline{) 2035} \\
 \underline{-20} \\
 03 \\
 \underline{-0} \\
 35 \\
 \underline{-35} \\
 0
 \end{array}$$

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

Section 1.6 Division of Whole Numbers

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

$$\begin{array}{r} 5 \overline{)74} \text{ R4} \\ \underline{-5} \\ 24 \\ \underline{-20} \\ 4 \end{array} \quad 14 \times 5 + 4 = 70 + 4 = 74 \checkmark$$

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

$$\begin{array}{r} 2 \overline{)55} \text{ R1} \\ \underline{-4} \\ 15 \\ \underline{-14} \\ 1 \end{array} \quad 27 \times 2 + 1 = 54 + 1 = 55 \checkmark$$

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

$$8 \overline{)203} \text{ R3}$$

$$\begin{array}{r} \underline{-16} \\ 43 \\ \underline{-40} \\ 3 \end{array}$$

$$\begin{array}{r} 3 \overline{)49} \text{ R1} \\ \underline{-3} \\ 19 \\ \underline{-18} \\ 1 \end{array} \quad 16 \times 3 + 1 = 48 + 1 = 49 \checkmark$$

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

$$7 \overline{)821} \text{ R2}$$

$$\begin{array}{r} \underline{-7} \\ 12 \\ \underline{-7} \\ 51 \\ \underline{-49} \\ 2 \end{array}$$

$$\begin{array}{r} 3 \overline{)593} \text{ R2} \\ \underline{-3} \\ 29 \\ \underline{-27} \\ 23 \\ \underline{-21} \\ 2 \end{array} \quad 197 \times 3 + 2 = 591 + 2 = 593 \checkmark$$

55. $\begin{array}{r} \overline{)61} \text{ R5} \\ \underline{-56} \\ 5 \\ \underline{-29} \text{ R2} \end{array}$

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

$$\begin{array}{r} \overline{)801} \text{ R1} \\ \underline{-8} \\ 001 \\ 200 \times 4 + 1 = 800 + 1 = 801 \checkmark \end{array}$$

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

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

$$\begin{array}{r} \overline{)382} \text{ R4} \\ \underline{-36} \\ 22 \\ \underline{-18} \\ 4 \end{array} \quad 42 \times 9 + 4 = 378 + 4 = 382 \checkmark$$

57. $\begin{array}{r} \overline{)92} \text{ R2} \\ \underline{-90} \\ 2 \end{array}$

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

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

$$\frac{-9}{02}$$

$$=92\checkmark$$

$$\begin{array}{r} 8 \overline{)428} \quad R4 \\ \underline{-40} \\ 28 \\ \underline{-24} \\ 4 \end{array}$$

$$=428\checkmark$$

Chapter 1 Whole Numbers

$$\begin{array}{r}
 65.2 \overline{) 1557} \text{ R1} \\
 \underline{-2} \\
 11 \\
 \underline{-10} \\
 11 \\
 \underline{-10} \\
 15 \\
 \underline{-14} \\
 1
 \end{array}$$

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

$$\begin{array}{r}
 70.2 \overline{) 1101} \text{ R1} \\
 \underline{-10} \\
 10 \\
 \underline{-10} \\
 01 \\
 \underline{00} \\
 1
 \end{array}$$

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

$$\begin{array}{r}
 \text{R9} \\
 19 \overline{) 9110}
 \end{array}$$

$$\begin{array}{r}
 \underline{-76} \\
 151 \\
 \underline{-133} \\
 180 \\
 \underline{-171} \\
 9
 \end{array}$$

$$\begin{array}{r}
 66.6 \overline{) 785} \text{ R5} \\
 \underline{-42} \\
 51 \\
 \underline{-4} \\
 8 \\
 \underline{35} \\
 \underline{-30} \\
 5
 \end{array}$$

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

$$\begin{array}{r}
 \text{R8} \\
 13 \overline{) 3505}
 \end{array}$$

$$\begin{array}{r}
 \underline{-26} \\
 90 \\
 \underline{-78} \\
 125 \\
 \underline{-117} \\
 8
 \end{array}$$

$$\begin{array}{r}
 67.8 \overline{) 751} \text{ R6} \\
 \underline{-56} \\
 41 \\
 \underline{-40} \\
 14 \\
 \underline{-8} \\
 6
 \end{array}$$

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

$$\begin{array}{r}
 \text{R19} \\
 24 \overline{) 1051}
 \end{array}$$

$$\begin{array}{r}
 91 \\
 \underline{-72} \\
 19
 \end{array}$$

$$\begin{array}{r}
 68.7 \overline{) 1287} \text{ R4} \\
 \underline{-7} \\
 20 \\
 \underline{-14} \\
 61 \\
 \underline{-56} \\
 53 \\
 \underline{-49} \\
 4
 \end{array}$$

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

$$\begin{array}{r}
 \text{R27} \\
 41 \overline{) 8104}
 \end{array}$$

$$\begin{array}{r}
 \underline{-41} \\
 400 \\
 \underline{-369} \\
 314 \\
 \underline{-287} \\
 27
 \end{array}$$

$$\begin{array}{r}
 69.6 \overline{) 835} \text{ R2} \\
 \underline{-48} \\
 21 \\
 \underline{-18} \\
 32
 \end{array}$$

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

$$\frac{-30}{5012}$$

✓

2

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

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

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

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

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

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

$$\begin{array}{r} 302 \\ 114 \overline{) 34428} \\ \underline{-342} \\ 22 \\ 8 \\ \underline{-228} \\ 0 \end{array}$$

$$\begin{array}{r} 209 \\ 421 \overline{) 87989} \\ \underline{-842} \\ 3789 \\ \underline{-3789} \\ 0 \end{array}$$

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

$$\begin{array}{r} 890 \div 45 = 42 \\ 45 \overline{) 1890} \\ \underline{-180} \\ 90 \\ \underline{-90} \\ 0 \end{array}$$

$$\begin{array}{r} 877 \div 14 = 62 \text{ R}9 \\ 14 \overline{) 877} \\ \underline{-84} \\ 28 \\ \underline{-28} \\ 0 \end{array}$$

Chapter 1 Whole Numbers

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

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

$$42 \div 6 = 7$$

$$108 \div 9 = 12$$

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

_____ classrooms

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

_____ tables

$$\begin{array}{r} 8 \overline{) 20} \\ \underline{-8} \\ 40 \\ \underline{-40} \\ 0 \end{array}$$

R8

$$\begin{array}{r} 32 \overline{) 158} \\ \underline{-160} \\ 8 \end{array}$$

5 cases; 8 cans left over

R9

$$\begin{array}{r} 52 \overline{) 425} \\ \underline{-416} \\ 9 \end{array}$$

Yes; \$9 left over

_____ mph

$$\begin{array}{r} 6 \overline{) 312} \\ \underline{-30} \\ 12 \\ \underline{-12} \\ 0 \end{array}$$

$$\begin{array}{r} 48 \\ 3 \overline{) 144} \\ \underline{-12} \\ 24 \\ \underline{-24} \\ 0 \end{array}$$

\$48 per room

_____ lb

$$\begin{array}{r} 100 \overline{) 2200} \\ \underline{-200} \\ 200 \\ \underline{-200} \\ 0 \end{array}$$

_____ acres

$$\begin{array}{r} 260 \overline{) 7280} \\ \underline{-520} \\ 2080 \\ \underline{-2080} \\ 0 \end{array}$$

$$1200 \div 20 = 60$$

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

Approximately 60 words per minute

$$2800 \div 400$$

$$\underline{ 7}$$

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

Approximately 7 tanks of gas

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

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

$$\begin{array}{r} 3\ 000 \\ 100. \ 12 \overline{) 36,000} \\ \underline{-36} \\ 0 \end{array}$$

Teacher: \$3000

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

CEO: \$10,000

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

Professor: \$5,000

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

Programmer: \$4,000

117 cars are waiting in line.

21,000,000

~~x 200~~

7,665,000,000 bbl

52

$$\begin{array}{r} 5 \\ \underline{-260} \\ 50 \end{array}$$

13,000 min

101. (a)

$$\begin{array}{r} 12\ R2 \\ \overline{) 50} \\ \underline{-4} \\ 10 \\ \underline{-8} \\ 2 \end{array}$$

12 loads can be done.

2 ounces of detergent are left over.

$$26 \div 2 = 13$$

$$\begin{array}{r} 2 \\ 13 \\ \underline{9} \\ 117 \end{array}$$

$$3552 \div 4 = 888$$

\$888 billion

34,080

9 600

24,480

$$24,480 \div 96 = 255$$

Each crate weighs 255 lb.

Problem Recognition Exercises: Operations on Whole Numbers

1. (a)

$$\begin{array}{r} 52 \\ + 13 \\ \hline 65 \end{array}$$

(b)

$$\begin{array}{r} 52 \\ \times 13 \\ \hline 156 \end{array}$$

(c)

$$\begin{array}{r} +520 \\ 676 \\ 412 \\ \hline 52 \\ - 13 \\ \hline 39 \end{array}$$

(d)

$$\begin{array}{r} 4 \\ 13 \overline{) 52} \\ \underline{52} \\ 0 \end{array}$$

2. (a)

$$17 \overline{) 102} \begin{array}{r} 6 \\ 102 \\ \hline 0 \end{array}$$

(b)

$$102 \begin{array}{r} 912 \end{array}$$

(c)

$$\begin{array}{r} - 17 \\ 85 \\ \hline 1 \end{array}$$

(d)

$$\begin{array}{r} 102 \\ \times 17 \\ \hline 714 \end{array}$$

(e)

$$\begin{array}{r} + 1020 \\ 1734 \end{array}$$

(f)

$$102$$

$$\begin{array}{r} + 17 \\ 119 \end{array}$$

Chapter 1 Whole Numbers

3. (a) 5064
 58
 40512
 253200

293,712
 5064

58
 5122

 87 R18
 58 $\overline{)5064}$
 -464
 424
 406
 18

14

5064 /
 58
5006

(a) 1226
 -114
 1112

10 R86

114 $\overline{)1226}$
 -114
 86
 0
 86

 1
 1226
 114
 1340

12

 1226
 114
 4904
 12260
 122600
 139,764

(a) 156
 41

197

(b) 197

-41

156

(a) 6004

221

6225

(b) 6004

-221

6004

4,180

41,800

418,000

4,180,000

35,000

3,500

350

35

246,000

2,820,000

20,000

540,000

Section 1.7 Exponents, Square Roots, and the Order of Operations**Section 1.7 Practice Exercises**

- (a) base; 4
 powers
 square root; 81
 order; operations
 variable; constants
 mean

False

True: $5 + 3 = 8$ and $3 + 5 = 8$

False: $5 - 3 = 2$, but $3 - 5 \neq 2$

False: $6 \times 0 = 0$

True: $0 \div 8 = 0$

True: $0 \times 8 = 0$

True: $5 \div 0$ is undefined.

$$9^4$$

$$3^8$$

$$2^7$$

$$6^5$$

$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^7$$

$$7 \cdot 7 \cdot 7 \cdot 7 = 7^4$$

$$4 \cdot 4 \cdot 4 \cdot 4 \cdot 2 \cdot 2^4 \cdot 2^3 = 4^7 \cdot 2^7$$

$$5 \cdot 5 \cdot 5 \cdot 10 \cdot 10 \cdot 10^3 \cdot 10^3 = 5^3 \cdot 10^6$$

$$8^4$$

$$8^4 = 8 \cdot 8 \cdot 8 \cdot 8$$

$$2^6$$

$$2^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$$

$$4^8$$

$$4^8 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$$

$$6^2$$

$$6^2 = 6 \cdot 6$$

$$2^3 = 2 \cdot 2 \cdot 2 = 4 \cdot 2 = 8$$

$$4^2 = 4 \cdot 4 = 16$$

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

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

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

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

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

$$4^3 = 4 \cdot 4 \cdot 4 = 16 \cdot 4 = 64$$

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

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

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

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

$$1^2 = 1 \cdot 1 = 1$$

$$1^3 = 1 \cdot 1 \cdot 1 = 1$$

$$1^4$$

$$1^4 = 1 \cdot 1 \cdot 1 \cdot 1 = 1$$

$$1^5 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$$

The number 1 raised to any power equals 1.

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

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

$$10^4$$

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

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

Chapter 1 Whole Numbers

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

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

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

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

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

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

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

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

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

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

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

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

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

$$10-3 \cdot 2=10-6=4$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$90 \div 3 \cdot 3 = 30 \cdot 3 = 90$$

$$80 \div 2 \cdot 2 = 40 \cdot 2 = 80$$

$$77. \sqrt{-81} + \frac{2(9-1)}{2 \cdot 8} = \sqrt{-81} + \frac{9+2 \cdot 8}{9+16} = \frac{8}{25}$$

$$78. \sqrt{121} + 3(8-3) = \sqrt{121} + 3 \cdot 5 = \frac{11+3 \cdot 5}{11+15} = \frac{26}{26}$$

$$36 \div (2^2 + 5) = 36 \div (4+5) = 36 \div 9 = 4$$

$$42 \div (3^2 - 2) = 42 \div (9-2) = 42 \div 7 = 6$$

$$80 - (20 \div 4) + 6 = 80 - 5 + 6 = 75 + 6 = 81$$

$$120 - (48 \div 8) - 40 = 120 - 6 - 40 = 114 - 40 = 74$$

Section 1.7 Exponents, Square Roots, and the Order of Operations

$$(43-26) \cdot 2 - 4^2 = 17 \cdot 2 - 4^2$$

$$17 \cdot 2 - 16$$

$$34 - 16$$

$$18$$

$$50 - 2(36 \div 12 \cdot 2 - 4) = 50 - 2(3 \cdot 2 - 4)$$

$$50 - 2(6 - 4)$$

$$50 - 2(2)$$

$$50 - 4$$

$$46$$

$$(51 - 48) \cdot 3 + \frac{2}{7} = 3 \cdot 3 + \frac{2}{7}$$

$$3 \cdot 3 + 49$$

$$9 + 49$$

$$58$$

$$16 + 5(20 \div 4 \cdot 8 - 3) = 16 + 5(5 \cdot 8 - 3)$$

$$16 + 5(40 - 3)$$

$$16 + 5(37)$$

$$16 + 185$$

$$201$$

$$(18 - 5) - (23 - 10) = 13 - (23 - 10)$$

$$13 - 13$$

$$0$$

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

$$(3\sqrt{11}) - (31 - 16) = (6 + 11) - 15$$

$$\frac{17 - 15}{2}$$

95. $\text{Mean} = \frac{105 + 114 + 123 + 101 + 100 + 111}{6}$

$$= \frac{654}{6} = 109$$

$$80 \div (9 - 7) \cdot 11 = 80 \div (81 - 7) \cdot 11$$

96. $\text{Mean} = \frac{1480 + 1102 + 1032 + 1002}{4}$

$$80 \div (81 - 77)$$

$$80 \div 4$$

$$80 \div 16$$

$$5$$

$$\frac{4616}{4} = 1154$$

$$108 \div (3^3 - 6 \cdot 4) = 108 \div (27 - 6 \cdot 4)$$

$$\text{Average} = \frac{19 + 20 + 18 + 19 + 18 + 14}{6}$$

$$\frac{108}{6} = 18$$

$$108 \div (27 - 24)$$

$$108 \div 3$$

$$108 \div 9$$

$$12$$

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

89. $22 - 4(25\sqrt{-3})^2 = 22 - 4(5 - 3)^2$

$$= 22 - 4(2)^2$$

$$= 22 - 4 \cdot 4$$

$$= 22 - 16$$

99. $\text{Average} = \frac{69 + 74 + 49}{3}$

$$= \frac{192}{3} = 64 \text{¢ per pound}$$

$$17 + 3(7 - 9)\sqrt{2} = 17 + 3(7 - 3)$$

$$17 + 3(4)$$

$$17 + 3 \cdot 16$$

100. $\text{Average} = \frac{7 + 10 + 8 + 7}{4} = \frac{32}{4} = 8$

4 p
 4 e
 \$ r
 8 w

$$96-3 (42 \div 7 \cdot 6-5) = 96-3 (6 \cdot 6-5)$$

$$96-3 (36-5)$$

$$96-3 (31)$$

$$96-93$$

$$3$$

ash

$$\text{Average} = \frac{118 \pm 123 \pm}{\underline{122}}_3$$

$$\frac{363}{3} = 121 \text{ mm per month}$$

$$\text{Average} = \frac{9 \pm 20 \pm 22 \pm 16 \pm 13}{5} = 16 \text{ in. per month}$$

$$3[4 + (6 - 3)^2] - 15 = 3[4 + 3^2] - 15$$

$$\begin{aligned} &3[4 + 9] - 15 \\ &3[13] - 15 \\ &39 - 15 \\ &24 \end{aligned}$$

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

$$5\{21 - [3^2 - (4 - 2)]\} = 5\{21 - [3^2 - 2]\}$$

$$\begin{aligned} &5\{21 - [9 - 2]\} \\ &5\{21 - 7\} \\ &5\{14\} \\ &70 \end{aligned}$$

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

$$156^2 = 24,336$$

$$418^2 = 174,724$$

$$12^5 = 248,832$$

$$35^4 = 1,500,625$$

$$43^3 = 79,507$$

$$71^3 = 357,911$$

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

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

$$(3548 - 3291) \frac{2}{3} = 257 \frac{2}{3} = 66,049$$

$$(7500 \div 625) \frac{3}{3} = 12 = 1728$$

$$117. \frac{89,880}{384 + 2184} = \frac{89,880}{2568} = 35$$

$$118. \frac{54,137}{3393 - 2134} = \frac{54,137}{1259} = 43$$

Section 1.8 Problem-Solving Strategies

Section 1.8 Practice Exercises

$$60 \div 12 = 5$$

$$4 \div 0$$

$$89 - 66 = 23$$

$$71 + 14 = 85$$

$$42 + 16 = 58$$

$$2 \cdot 14 = 28$$

$$93 - 79 = 14$$

$$102 - 32 = 70$$

$$10 \cdot 13 = 130$$

$$12 + 14 + 15 = 41$$

$$24 \div 6 = 4$$

$$78 - 41 = 37$$

$$5 + 13 + 25 = 43$$

Answers may vary.

For example: sum, added to,
increased by, more than, total of,
plus

For example: product, times,
multiply

Section 1.8 Problem-Solving Strategies

For example: difference, minus, decreased
by, less, subtract

For example: quotient, divide, per,
distributed equally, shared equally

Given: The height of each mountain

Find: The difference in height

Operation: Subtract

$$\begin{array}{r} 11021110 \\ \del{20,320} \\ 14,246 \\ \hline 6,074 \end{array}$$

Denali is 6,074 ft higher than White Mountain Peak.

Given: The number of yearly subscriptions

Find: The difference in subscriptions

Operation: Subtract

$$\begin{array}{r} 01111101110 \\ \del{12,712,000} \\ \underline{3,252,900} \\ 8,959,100 \end{array}$$

Reader's Digest has 8,959,100 more subscriptions than *Sports Illustrated*.

Given: Oil consumption by country.

Find: Total oil consumption for 4 countries.

Operation: Addition

$$\begin{array}{r} 8,220,000 \\ 4,360,000 \\ 4,210,000 \\ \underline{2,170,000} \\ 18,960,000 \end{array}$$

The oil consumption of China, Japan, Russia, and Canada is 18,960,000 barrels per day.

Given: Population of each country.

Find: Total population of 4 countries.

Operation: Addition

$$\begin{array}{r} 11 \\ 1,339,000,000 \\ 127,000,000 \\ 140,000,000 \\ \underline{33,000,000} \\ 1,639,000,000 \end{array}$$

The population of China, Japan, Russia, and Canada is 1,639,000,000 people.

Given: The number of rows of pixels and the number of pixels in each row.

Find: The number of pixels on the whole screen.

Operation: Multiply

$$\begin{array}{r} 5 \\ 213 \\ 126 \\ 96 \\ \hline 756 \\ \underline{340} \\ 12,096 \end{array}$$

12,096

There are 12,096 pixels on the whole screen.

Given: The number of rows of tiles and the number of tiles in each row.

Find: The number of tiles on the whole floor.

Operation: Multiply

$$\begin{array}{r} 1 \\ 62 \\ \underline{38} \\ 11 \\ 496 \\ \underline{1860} \\ 2356 \end{array}$$

There are 2,356 tiles.

Chapter 1 Whole Numbers

Given: Number of students and the average class size.

Find: Number of classes offered

Operation: Division

$$\begin{array}{r} 120 \\ 25 \overline{) 3000} \\ \underline{-25} \\ 50 \\ \underline{-5} \\ 0 \\ 00 \end{array}$$

There will be 120 classes of Prealgebra.

Given: Inheritance amount and number of people to share equally

Find: Amount per person

Operation: Division

$$\begin{array}{r} 10\ 560 \\ 8 \overline{) 84,480} \\ \underline{-8} \\ 4 \\ \underline{-40} \\ 48 \\ \underline{-48} \\ 00 \end{array}$$

Each person will receive \$10,560.

Given: 45 miles per gallon and driving 405 miles

Find: How many gallons used

Operation: Division

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

There will be 9 gal used.

Given: 52 mph; 1352 mi

Find: How many hours

Operation: Divide

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

They will travel for 26 hours.

Given: Yearly tuition for two schools

Find: Total tuition paid

Operation: Addition

$$\begin{array}{r} 1 \\ 39,212 \\ \underline{3,024} \\ 42,236 \end{array}$$

Jeannette will pay \$42,236 for one year.

Given: Distances traveled in opposite directions

Find: Total distance traveled

Operation: Addition

$$\begin{array}{r} 11 \\ 138 \\ \underline{96} \\ 234 \end{array}$$

They are 234 mi apart.

Given: Miles per gallon and number of gallons

Find: How many miles

Operation: Multiplication

$$\begin{array}{r} 1 \\ 55 \\ \underline{20} \\ 1,100 \end{array}$$

The Prius can go 1100 mi.

Given: Hours per week and number of weeks.

Find: Total number of hours

Operation: Multiplication

$$\begin{array}{r} 1 \\ 16 \\ \underline{3} \\ 48 \end{array}$$

The class will meet for 48 hr during the semester.

Given: Number of rows and number of seats in each row.

Find: Total number of seats

Operation: Multiplication

$$\begin{array}{r} 3 \\ 45 \\ \underline{70} \\ 3150 \end{array}$$

The maximum capacity is 3150 seats.

Section 1.8 Problem-Solving Strategies

Given: Number of rows and number of boxes in each row

Find: Total number of boxes

Operation: Multiplication

$$\begin{array}{r} 8 \\ 8 \\ \hline 64 \end{array}$$

There are 64 boxes in a checkerboard.

Given: total price: \$16,540

down payment: \$2500

payment plan: 36 months

Find: Amount of monthly payments

Operations

Subtract

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

(2) Divide

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

Jackson's monthly payments were \$390.

Given: total cost: 1170

down payment: 150

payment plan: 12 months

Find: Amount of monthly payments

Operations:

Subtract

$$\begin{array}{r} 1170 \\ \underline{150} \end{array}$$

1020

(2) Divide

85

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

Lucio's monthly payment was \$85.

Given: Distance for each route and speed traveled

Find: Time required for each route

Operations

Watertown to Utica direct

$$\text{Divide } 80 \div 40 = 2 \text{ hr}$$

Watertown to Syracuse to Utica

$$\text{Add distances } 70 + 50 = 120 \text{ mi}$$

$$\text{Divide } 120 \div 60 = 2 \text{ hr}$$

Each trip will take 2 hours.

Given: Distance for each route and speed traveled

Find: Time required for each route

Operations

Interstate:

$$\text{Divide } 220 \div 55 = 4 \text{ hr}$$

Back roads:

$$\text{Divide } 200 \div 40 = 5 \text{ hr}$$

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

The distance around a figure is the perimeter.

The amount of space covered is the area.

Given: The dimensions of a room and cost per foot of molding

Find: Total cost

Operations:

Add to find the perimeter, subtract doorway.

$$\begin{array}{r} 11 \\ 12 \\ \hline \end{array}$$

11 43 ft

$$\begin{array}{r} \underline{+12} \\ 46 \end{array}$$

(2) Multiply to find the total cost.

43

$$\begin{array}{r} \underline{\times 2} \\ 86 \end{array}$$

The cost will be \$86.

Chapter 1 Whole Numbers

Given: The dimensions of a yard and the cost per foot of fence

Find: Total cost

Operations

(1) Add to find perimeter

$$\begin{array}{r} 1 \\ 75 \\ 90 \\ 75 \\ \hline 90 \end{array}$$

330 ft

Multiply the perimeter by cost per foot.

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

It will cost \$1650.

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

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

The total cost is \$1020.

Given: Dimensions of room and cost per foot

Find: Total cost

Operations

Multiply to find area.

$$\begin{array}{r} 12 \\ 20 \\ \hline 240 \end{array}$$

Multiply to find total cost.

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

The total cost is \$720.

Given: Starting balance in account and individual checks written

Find: Remaining balance in account

Operations

(1) Add the individual checks

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

Subtract \$242 from the initial balance

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

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

Given: Initial balance in account and individual checks written

Find: The remaining balance

Operations

(1) Add the individual checks.

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

Subtract \$779 from the initial balance.

$$\begin{array}{r} 131415 \\ / \cancel{5}5 \\ \hline 779 \\ 676 \end{array}$$

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

Given: Number of computers and printers purchased and the cost of each

Find: The total bill

Operations

Multiply to find the amount spent on computers, then printers.

$$\begin{array}{r} 115 \qquad 33 \\ 2118 \qquad 256 \\ \times \underline{72} \qquad \underline{\times 6} \\ 4236 \qquad \$1536 \\ 260 \\ \hline \$152,496 \end{array}$$

Add to find the total bill.

$$\begin{array}{r} 111 \\ 152,496 \\ \hline 1536 \\ 154,032 \end{array}$$

The total bill was \$154,032.

Section 1.8 Problem-Solving Strategies

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.

$$\begin{array}{r} 2 \qquad \qquad \qquad 4 \\ 33 \qquad \qquad \qquad 37 \\ \times 27 \qquad \qquad \times 6 \\ \hline 231 \qquad \qquad \qquad \$222 \\ 660 \\ \hline \$891 \end{array}$$

Add to find the total. \$ 891

$$\begin{array}{r} 222 \\ \hline \$1113 \end{array}$$

The amount of money required is \$1,113.

Given: Amount to sell used CDs, amount to buy used CDs and number of CDs sold

Find: Money from selling 16 CDs

Operation: Multiply

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

Latayne will receive \$48.

Find: Number of used CDs to buy for \$48.

Operation: Division

$$48 \div 8 = 6$$

She can buy 6 CDs.

Given: Wage per hour and number of hours worked

Find: Amount of weekly paycheck

Operation: Multiply

$$\begin{array}{r} 40 \\ \times 12 \\ \hline 80 \\ 400 \\ \hline \$480 \end{array}$$

Shevona's paycheck is worth \$480.

Given: Ticket price and number of tickets

Find: Amount left over from paycheck

Operations

$$\begin{array}{r} 710 \\ (1) \text{ Multiply } 89 \times 2 \qquad (2) \text{ Subtract } \begin{array}{r} 480 \\ -178 \\ \hline 302 \end{array} \\ \hline 178 \end{array}$$

She will have \$302 left.

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
$\times 2$	$\times 3$
$\hline 24,384$	$\hline 1,743$

(2) Add

$$\begin{array}{r} 1111 \\ 384 \\ 743 \\ \hline 7327 \\ 33,454 \end{array}$$

Michael Jordan scored 33,454 points with the Bulls.

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.

Given: Number of milliliters in the bottle and the dosage

Find: Days the bottle will last

Operation: Divide

$$60 \div 2 = 30$$

One bottle will last for 30 days.

Find: Date to reorder

Operation: Subtract

$$30 - 2 = 28$$

The owner should order a refill no later than September 28.

Chapter 1 Whole Numbers

Given: Number of male and female doctors

Find: Difference between male and female doctors

Operation: Subtract

$$\begin{array}{r} 9 \\ 210 \overline{) 13} \\ 6 \cancel{3} 0 \overline{) 300} \\ \underline{205} \\ 424 \end{array}$$

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

Find: The total number of doctors

Operation: Add

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

The total number of doctors is 836,200.

Given: Scale on a map

Find: Actual distance between Las Vegas and Salt Lake City

Operation: Multiply

$$\begin{array}{r} 60 \\ \underline{6} \\ 360 \end{array}$$

The distance is 360 mi.

Find: Distance on map between Madison and Dallas *Operation:*

Divide

$$\begin{array}{r} 14 \\ 60 \overline{) 840} \\ \underline{60} \\ 240 \\ \underline{240} \\ 00 \end{array}$$

14 in. represents 840 mi.

Given: Scale on a map

Find: Actual distance between Wichita and Des Moines

Operation: Multiply

$$\begin{array}{r} 40 \\ \underline{8} \\ 320 \end{array}$$

The distance is 320 mi.

Find: The distance between Seattle and Sacramento on the map.

Operation: Divide

$$\begin{array}{r} 15 \\ 40 \overline{) 600} \\ \underline{40} \\ 200 \\ \underline{200} \\ 00 \end{array}$$

15 in. represents 600 mi.

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

$$\begin{array}{r} 104 \text{ R}2 \\ 12 \overline{) 1250} \\ \underline{12} \\ 050 \\ \underline{48} \\ 8 \\ \underline{24} \\ 2 \end{array}$$

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

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

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

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

Given: Total cost of dinner and type of bill used

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.

Find: How much change

Operations: Multiply and subtract

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

He will receive \$16 in change.

Given: total cost of CDs and type of bill used

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 Shawn needs six \$10 bills.

Find: How much change

Operations: Multiply and subtract

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

He will receive \$6 in change.

Given: Hourly wage and number of hours worked

Find: Amount earned per week

Operations

Multiply to find amount per job.
 $30 \times 4 = 120$ $10 \times 16 = 160$
 $8 \times 30 = 240$

(2) Add to find total.

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

He earned \$520.

Given: Hourly wage and number of hours worked

Find: Total paid to all four workers

Operations

(1) Multiply to find amount per worker

$$\begin{array}{ll} 36 \times 18 = 648 & 26 \times 24 = 624 \\ 28 \times 15 = 420 & 22 \times 48 = 1056 \end{array}$$

(2) Add to find total paid.

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

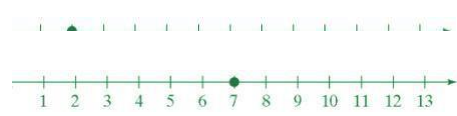
The total amount paid was \$2748.

Chapter 1 Review Exercises

Section 1.1

1. 10,024 Ten-thousands
2. 821,811 Hundred-thousands
3. 92,046
4. 503,160
5. 3 millions + 4 hundred-thousands

7. Two hundred forty-five
8. Thirty-thousand, eight hundred sixty-one
9. 3602
10. 800,039
11. 2;
12. 7;



+ 8 hundreds + 2 tens

6. 3 ten-thousands + 5 hundreds + 5 tens
+ 4 ones

13. $3 < 10$ True

14. $10 > 12$ False

Section 1.2

Addends: 105, 119; sum: 224

Addends: 53, 21; sum: 74

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

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

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

$$\begin{array}{r} 68,421 \\ \underline{2,221} \\ 70,642 \end{array}$$

- (a) The order changed, so it is the commutative property.
 The grouping changed, so it is the associative property.
 The order changed, so it is the commutative property.

403 + 79; 482

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

44 + 92; 136

$$\begin{array}{r} 92 \\ \underline{44} \\ 136 \end{array}$$

36+7=43

23+6=29

- (a) Add the numbers for AA Auto.
 31 25

$$\begin{array}{r} \underline{40} \\ 96 \text{ cars} \end{array}$$

Add the numbers of
 Fords. 21 25

$$\begin{array}{r} \underline{20} \\ 66 \text{ Fords} \end{array}$$

$$\begin{array}{r} 35,377 \\ \underline{10,420} \\ 45,797 \text{ thousand seniors} \end{array}$$

28.
$$\begin{array}{r} 1 \\ 30 \\ 44 \\ 25 \\ 53 \\ \underline{+ 25} \\ 177 \text{ m} \end{array}$$

Section 1.3

minuend: 14
 subtrahend: 8
 difference: 6

minuend: 102
 subtrahend: 78
 difference: 24

31. 37 $\underline{26}+11=37$

$$\begin{array}{r} \underline{11} \\ 26 \end{array}$$

32. 61 $\underline{20}+41=61$

$$\begin{array}{r} \underline{41} \\ 20 \end{array}$$

33.
$$\begin{array}{r} 9 \\ 11010 \\ \underline{2005} \\ -1884 \\ 1\ 21 \end{array}$$

$$\begin{array}{r} 2\ 18 \\ \underline{13\ 89} \\ 2\ 99 \\ 10\ 90 \end{array}$$

$$\begin{array}{r} 99 \\ 101010 \\ 86,000 // // \\ \underline{54981} \\ 31,019 \end{array}$$

$$\begin{array}{r} 9 \\ 71013 \\ 4803 / \\ \underline{2467} \\ 2,336 \end{array} \text{ thousand visitors}$$

$$\begin{array}{r} 99 \\ 101010 \\ 67,000 // // \\ \underline{32812} \\ 34,188 \end{array}$$

Section 1.4

$$\underline{5,234,446}$$

$$5,000,000$$

$$9,332,945$$

$$9,330,000$$

$$894,004 \rightarrow 900,000$$

$$\underline{123,883} \rightarrow \underline{100,000}$$

$$800,000$$

$$38-31;7$$

$$38$$

$$\underline{31}$$

$$7$$

$$330 \rightarrow 300$$

$$489 \rightarrow 500$$

$$123 \rightarrow 100$$

$$\underline{571} \rightarrow 600$$

$$1500$$

$$111 - 15; 96$$

$$10$$

$$\cancel{0}11$$

$$/ \cancel{1}1$$

$$\underline{15}$$

$$96$$

$$140,041,247 \rightarrow \overset{310}{140,000,000}$$

$$\underline{127,078,679} \rightarrow \underline{127,000,000}$$

$$13,000,000$$

$$251 - 42; 209$$

$$411$$

$$/ \cancel{1}$$

$$\underline{42}$$

$$9$$

$$13,000,000 \text{ people}$$

$$90 - 52; 38$$

$$10$$

$$/ \cancel{0}$$

$$\underline{52}$$

$$38$$

$$49. \quad 96,050 \rightarrow \overset{1}{96,000}$$

$$\underline{66,517} \rightarrow \pm \underline{67,000}$$

$$163,000 \text{ m}^3$$

Section 1.5

Factors: 32, 12

Product: 384

Factors: 33, 40

Product: 1320

(a) Yes

Yes

No

c

e

d

$$1018$$

$$4 \cancel{0} / 811511$$

$$95,191,767 //$$

$$\underline{23,299,323}$$

$$71,892,438 \text{ tons}$$

$$115$$

$$25,800,000$$

$$\underline{18,600,000}$$

$$\$7,200,000$$

Chapter 1 Whole Numbers

a

b

$$\begin{array}{r} 1 \\ 1 \\ 142 \\ \underline{43} \\ 11 \\ 426 \\ \underline{5680} \\ 6106 \\ 12 \\ 1024 \\ \underline{51} \end{array}$$

$$\begin{array}{r} \underline{51\ 200} \\ 52,224 \end{array}$$

$$\begin{array}{r} 6\ 000 \\ 5\ 00 \\ \hline 3,000,000 \end{array}$$

61. $26 \qquad 39$

$$\begin{array}{r} +13 \\ 39 \end{array}$$

$$\begin{array}{r} \times 11 \\ 39 \\ \underline{390} \\ \$429 \end{array}$$

62. $551 \qquad 3857$

$$\begin{array}{r} 3 \\ \times 7 \\ 3857 \end{array}$$

$$\begin{array}{r} 111 \\ \times 2 \\ 3857 \text{ lb} \end{array}$$

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

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.

71.
$$\begin{array}{r} 58 \\ 8 \overline{) } \\ \underline{-48} \\ 0 \end{array} \qquad \begin{array}{r} 3 \\ 58 \\ \times 6 \end{array}$$

72.
$$\begin{array}{r} 41R7 \\ 11 \overline{) 458} \\ \underline{-44} \\ 18 \\ \underline{-11} \end{array} \qquad \begin{array}{r} 41 \\ \times 11 \\ \hline 410 \\ 451 \\ 7 \end{array}$$

73.
$$\begin{array}{r} 52R3 \\ 20 \overline{) 1043} \\ \underline{-100} \\ 43 \\ \underline{-40} \\ 3 \end{array} \qquad \begin{array}{r} 458 \checkmark \\ 52 \\ \times 20 \\ \hline 1040 \\ + 3 \\ \hline 1043 \checkmark \end{array}$$

$$\frac{72}{4} = 18$$

$$0 \div 3 = 0 \text{ because } 0 \times 3 = 0.$$

Section 1.6

$$42 \div 6 = 7$$

divisor: 6, dividend: 42, quotient: 7

$$4 \overline{) 52} = 13$$

divisor: 4, dividend: 52, quotient: 13

$$3 \div 1 = 3 \text{ because } 1 \times 3 = 3.$$

$$3 \div 3 = 1 \text{ because } 1 \times 3 = 3.$$

$$3 \div 0 \text{ is undefined.}$$

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



Divide 105 by 4.

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



26 photos with 1 left over

(a) Divide 60 by 15. $60 \div 15 = 4$ T-shirts
 Divide 60 by 12.
 $60 \div 12 = 5$ hats

Section 1.7

$$8 \cdot 8 \cdot 8 \cdot 8 \cdot \frac{5}{8} = 8$$

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5 = 2 \cdot 5$$

$$3^5 = 5 \times 5 \times 5 = 25 \times 5 = 125$$

$$4^4 = 4 \times 4 \times 4 \times 4 = 16 \times 16 = 256$$

$$1^7 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$$

$$10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1,000,000$$

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

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

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

$$10^2 - 5^2 = 100 - 25 = 75$$

$$90 - 4 + 6 \div 3 \cdot 2 = 90 - 4 + 2 \cdot 2$$

$$90 - 4 + 4$$

$$86 + 4$$

$$90$$

$$2 + 3 \cdot 12 \div 2 - 25 = 2 + 3 \cdot 6 - 25$$

$$2 + 36 \div 2 - 25$$

$$2 + 18 - 25$$

$$20 - 25$$

$$-5$$

$$6^2 - 4^2 + (9-7)^3 = 6^2 - 4^2 + 2^3$$

$$36 - 16 + 8$$

$$20 + 8$$

$$28$$

$$26 - 2(10 - 1) + (3 + 4 \cdot 11)$$

$$26 - 2(9) + (3 + 44)$$

$$26 - 18 + 47$$

$$26 - 18 + 47$$

$$\text{mean} = \frac{7 + 6 + 12 + 5 + 7 + 6 + 13}{7} = \frac{56}{7} = 8$$

$$\text{Average} = \frac{80 + 78 + 101 + 92}{5} = \frac{445}{5}$$

\$89

$$\frac{6 + 9 + 11 + 13 + 5}{4} = 8 \text{ houses}$$

per month 6

Section 1.8

Given: Number of animals and species at two zoos

Find: Which zoo has more animals and how many more *Operation:*

Subtraction

$$17,000$$

$$\underline{4,000}$$

$$13,000$$

The Cincinnati Zoo has 13,000 more animals than the San Diego Zoo.

Find: Which zoo has the most species, and how many more

Operation: Subtract

$$710$$

$$\underline{800}$$

$$\frac{750}{50}$$

The San Diego Zoo has 50 more species than the Cincinnati Zoo.

Given: The distance traveled and the number of trips

Find: Number of miles traveled in one week

Operations: Multiplication and addition

$$\begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array}$$

$$\begin{array}{r} 15 \\ + 6 \\ \hline 21 \end{array}$$

21 miles per week

Find: Number of miles traveled in 10 months with 4 weeks a month

Operation: Multiplication

$$21$$

$$84$$

$$\frac{8}{+} \frac{\times 4}{84}$$

5
5

miles/month

×
10 miles/year
84
0

Chapter 1 Whole Numbers

Given: Contract: 252,000,000

Time period: 9 years

taxes: 75,600,000

Find: Amount per year after taxes

Operations

(1) Subtract

$$\begin{array}{r} 11 \\ 141/10 \\ \underline{252,000,000} \\ 75,600,000 \\ \hline 176,400,000 \end{array}$$

Divide

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

He will receive \$19,600,000 per year.

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

Find: Number of plants

Operations

(1) Multiply

$$12 \times 8 = 96$$

(2) Divide

$$96 \div 2 = 48$$

She should purchase 48 plants.

Find: Cost of plants for \$3 each

Operation: Multiply

$$\begin{array}{r} 2 \\ 48 \end{array}$$

$$\underline{3}$$

$$144$$

The plants will cost \$144.

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.

Find: Total cost of garden

Operations: Add

$$144$$

$$\underline{80}$$

$$224$$

Aletha's total cost will be \$224.

Chapter 1 Test

(a) 492 hundreds

23,441 thousands

2,340,711 millions

340,592 ten-thousands

(a) 4,065,000

Twenty-one million, three hundred
twenty-five thousand

Twelve million, two hundred eighty-
seven thousand

729,000

Eleven million, four hundred ten
thousand

(a) $14 > 6$

$72 < 81$

51

78
129

82

4
328

154

41
113

227
4 908
-8
10
-8
28
-28
0

58

49
522
320

2,842
1

149
298

R9
15 324
-30
24
-15
9

9 9
210 1012
30 // // //
2456
5 4 6

0 10
10 984
2 881
8 103

20
42 840
-84
00

5 00000
3 000
1,500,000,000

1
34
89
191
22
336

$403(0) = 0$

$0 \sqrt{16}$ is undefined.

(a) $(11 \cdot 6) \cdot 3 = 11 \cdot (6 \cdot 3)$ The
associative property of multiplication;
the expression shows a change in
grouping.

Chapter 1 Whole Numbers

$(11 \cdot 6) \cdot 3 = 3 \cdot (11 \cdot 6)$
 The commutative property of multiplication; the expression shows a change in the order of the factors.

- (a) $4,850 \rightarrow 4,900$
 $12,493 \rightarrow 12,000$
 $7,963,126 \rightarrow 8,000,000$

1

20. $690,951 \rightarrow 690,000$

$$\begin{array}{r} + 739,117 \\ \hline \end{array} \rightarrow \begin{array}{r} \underline{740,000} \\ 1,430,000 \end{array}$$

There were approximately 1,430,000 people.

$$8^2 \mid 2^4 = 64 \mid 16 = 4$$

22. $26 \cdot \sqrt{4} - 4(8-1) = 26 \cdot \sqrt{4} - 4 \cdot 7$
 $26 \cdot 2 - 4 \cdot 7$
 $52 - 28$
 24

$$36 \div 3(14 - 10) = 36 \div 3(4) = 12(4) = 48$$

$$65 - 2(5 \cdot 3 - 11)^2 = 65 - 2(15 - 11)^2$$

$$65 - 2(4)^2$$

$$65 - 2 \cdot 16$$

$$65 - 32$$

$$33$$

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.

- (a) Subtract to find the change from year 2 to year 3.

$$\begin{array}{r} 2911 \\ 213,015 \\ \hline 212,573 \end{array}$$

4 2 thousand subscribers

The largest increase was from year 3 to year 4. The increase was 15,430 thousand.

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 an average of 5 calls per week.

Add the sides.

$$\begin{array}{r} 1 \\ 15 \\ 31 \\ 32 \\ 15 \\ 32 \\ \hline + 31 \\ 156 \text{ mm} \end{array}$$

29. Add to find the perimeter.

$$\begin{array}{r} 13 \\ 47 \\ 128 \\ 47 \\ \hline 128 \end{array}$$

ft

Multiply to find the area.

$$\begin{array}{r} 128 \\ 47 \\ \hline 896 \\ \underline{5120} \\ 6016 \text{ ft}^2 \end{array}$$

3

30. $2379 \rightarrow 2400$

$$\begin{array}{r} \times 1872 \\ \hline \times 1900 \\ \hline 2160000 \\ \underline{2400000} \\ 4,560,000 \text{ m}^2 \end{array}$$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

Chapter Opener Puzzle

3	5	6	^A 1	2	4
^B 1	2	3	^C 4	^D 6	^E 5
6	4	2	5	3	1
2	1	^F 4	6	5	3
^G 5	3	1	^H 2	4	^I 6
4	6	5	3	^J 1	2

Section 2.1 Introduction to Fractions and Mixed Numbers

Section 2.1 Practice Exercises

(a) fractions

numerator; denominator

proper

improper

mixed

2

7

Numerator: 2; denominator: 3

Numerator: 8; denominator: 9

Numerator: 12; denominator: 11

Numerator 1; denominator: 2

6 | 1; 6

9 | 1; 9

2 | 2; 1

8 | 8; 1

0 | 3; 0

0 | 7; 0

2 | 0; undefined

11 | 0; undefined

$\frac{3}{4}$

$\frac{1}{2}$

$9\frac{5}{9}$

$5\frac{3}{5}$

$\frac{1}{6}$

$7\frac{4}{7}$

$8\frac{3}{8}$

$\frac{2}{3}$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

23. $\frac{3}{4}$

$\frac{9}{8}$

24. $\frac{1}{4}$

$\frac{7}{4}$

25. $\frac{1}{8}$

$\frac{7}{4}; 1\frac{3}{4}$

26. $\frac{2}{8}$ or $\frac{1}{4}$

$\frac{13}{4}; 3\frac{1}{4}$

27. $10\overline{)341}$
43

$\frac{13}{8}; 1\frac{5}{8}$

28. $10\overline{)3}$

$\frac{5}{2}; 2\frac{1}{2}$

29. $\frac{10}{21}$

$\frac{13}{44} = \frac{4 \times 1 + 3}{44} = \frac{7}{44}$

30. $\frac{10}{63}$

$\frac{61}{333} = \frac{6 \times 3 + 1}{333} = \frac{19}{333}$

31. Proper

$\frac{42}{999} = \frac{4 \times 9 + 2}{999} = \frac{38}{999}$

32. Proper

33. Improper

$\frac{31}{555} = \frac{3 \times 5 + 1}{555} = \frac{16}{555}$

34. Improper

$\frac{33}{777} = \frac{3 \times 7 + 3}{777} = \frac{24}{777}$

35. Improper

36. Improper

$\frac{82}{333} = \frac{8 \times 3 + 2}{333} = \frac{26}{333}$

37. Proper

38. Proper

$\frac{71}{444} = \frac{7 \times 4 + 1}{444} = \frac{29}{444}$

39. $\frac{5}{2}$

$10\overline{)53} = 10 \times 5 + 3 = 53$
555

40. $\frac{4}{3}$

$11\overline{)137} = 11 \times 12 + 5 = 137$
121212

41. $\frac{12}{4}$

$12\overline{)73} = 12 \times 6 + 1 = 73$
666

42. $\frac{27}{9}$

Section 2.1 Introduction to Fractions and Mixed Numbers

$$\begin{array}{r} 21\bar{3} = \underline{21 \times 8 + 3} = \underline{171} \\ 888 \end{array}$$

$$\begin{array}{r} 15\bar{1} = \underline{15 \times 2 + 1} = \underline{31} \\ 222 \end{array}$$

$$\begin{array}{r} 2\bar{3} = \underline{2 \times 8 + 3} = \underline{19} \\ 888 \\ \text{eighths} \end{array}$$

$$\begin{array}{r} 2\bar{3} = \underline{2 \times 5 + 3} = \underline{13} \\ 555 \\ \text{fifths} \end{array}$$

$$\begin{array}{r} 1\bar{3} = \underline{1 \times 4 + 3} = \underline{7} \\ 444 \\ \text{fourths} \end{array}$$

$$\begin{array}{r} 5\bar{2} = \underline{5 \times 3 + 2} = \underline{17} \\ 333 \\ 17 \text{ thirds} \end{array}$$

$$\begin{array}{r} 65. 8 \overline{) 7} \quad 4\bar{5} \\ \underline{-2} \quad 8 \\ 5 \end{array}$$

$$\begin{array}{r} 66. 7 \overline{) 3} \quad 1\bar{6} \\ \underline{-7} \quad 7 \\ 6 \end{array}$$

$$\begin{array}{r} 67. 5 \overline{) 9} \quad 7\bar{4} \\ \underline{-5} \quad 5 \\ 4 \end{array}$$

$$\begin{array}{r} 68. 4 \overline{) 9} \quad 4\bar{3} \\ \underline{-16} \quad 4 \\ 3 \end{array}$$

$$\begin{array}{r} 69. 10 \overline{) 27} \quad 2\bar{7} \\ \underline{-20} \quad 10 \\ 7 \end{array}$$

$$\begin{array}{r} 70. 18 \overline{) 43} \quad 2\bar{7} \\ \underline{-36} \quad 18 \\ 7 \end{array}$$

$$\begin{array}{r} 71. 9 \overline{) 52} \quad 5\bar{7} \\ \underline{-45} \quad 7 \\ 7 \end{array}$$

$$\begin{array}{r} 72. 12 \overline{) 67} \quad 5\bar{7} \\ \underline{-60} \quad 12 \\ 7 \end{array}$$

$$\begin{array}{r} 73. 11 \overline{) 133} \quad 12\bar{1} \\ \underline{-11} \quad 11 \\ 23 \\ \underline{-22} \\ 1 \end{array}$$

$$\begin{array}{r} 74. 10 \overline{) 1} \quad 5\bar{1} \\ \underline{-5} \quad 10 \\ 1 \end{array}$$

$$\begin{array}{r} 75. 6 \overline{) 3} \quad 3\bar{5} \\ \underline{-18} \quad 6 \\ 5 \end{array}$$

$$\begin{array}{r} 76. 7 \overline{) 5} \quad 16\bar{3} \\ \underline{-7} \quad 7 \\ 45 \\ \underline{-42} \\ 3 \end{array}$$

$$\begin{array}{r} 77. 7 \overline{) 309} \quad 44\bar{1} \\ \underline{-28} \quad 29 \\ 29 \\ \underline{-28} \\ 1 \end{array}$$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

$$78. \begin{array}{r} 230 \\ 4 \overline{) 921} \\ \underline{-8} \\ 12 \\ \underline{-12} \\ 1 \\ \underline{-0} \\ 1 \end{array} \quad 230 \frac{1}{4}$$

$$15 \overline{) 87} \quad \frac{7}{15}$$

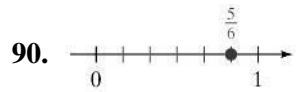
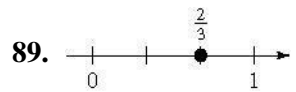
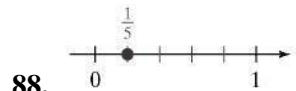
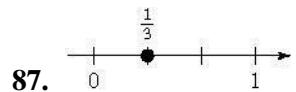
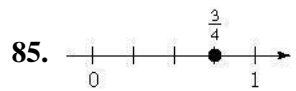
$$\begin{array}{r} 12 \\ \underline{-15} \\ 37 \\ \underline{-30} \\ 7 \end{array}$$

$$79. \begin{array}{r} 1056 \\ 5 \overline{) 5281} \\ \underline{-5} \\ 2 \\ \underline{-0} \\ 28 \\ \underline{-25} \\ 31 \\ \underline{-30} \\ 1 \end{array} \quad 1056 \frac{1}{5}$$

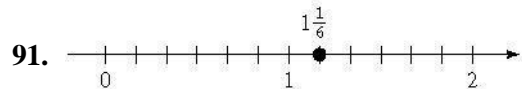
$$34 \overline{) 695} \quad 20 \frac{15}{34}$$

$$\begin{array}{r} 20 \\ \underline{-68} \\ 15 \\ \underline{-0} \\ 15 \end{array}$$

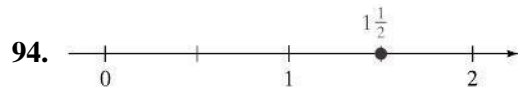
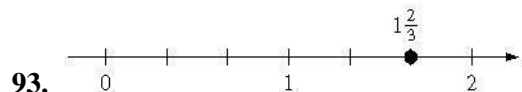
$$80. \begin{array}{r} 901 \frac{5}{8} \\ 8 \overline{) 7213} \\ \underline{-72} \\ 1 \\ \underline{-0} \\ 13 \\ \underline{-8} \\ 5 \end{array}$$



$$81. \begin{array}{r} 810 \\ 11 \overline{) 8913} \\ \underline{-88} \\ 11 \\ \underline{-11} \\ 3 \\ \underline{-0} \\ 3 \end{array} \quad 810 \frac{3}{11}$$



$$82. \begin{array}{r} 185 \\ 23 \overline{) 4257} \\ \underline{-23} \\ 195 \\ \underline{-184} \\ 117 \\ \underline{-115} \\ 2 \end{array} \quad 185 \frac{2}{23}$$



95. False

97. True

96. True

98. True

Section 2.2 Prime Numbers and Factorization

Section 2.2 Practice Exercises

- (a) factor prime
 composite
 prime

c. Between 2 and 3

$$12\overline{)84}$$

$$\frac{5}{2}; \frac{1}{2}$$

$$\frac{5}{4}; \frac{3}{4}$$

$$\frac{6}{5}; \text{improper}$$

$$12\overline{)7}; \text{proper}$$

$$\frac{6}{6}; \text{improper}$$

$$9. \begin{array}{r} 4 \\ 5 \overline{)23} \\ \underline{-20} \\ 3 \end{array}$$

$$62 = 6 \times 7 + 2 = \underline{44}$$

For example: $2 \cdot 4$ and $1 \cdot 8$

For example: $2 \cdot 10$ and $4 \cdot 5$

For example: $4 \cdot 6$ and $2 \cdot 2 \cdot 2 \cdot 3$

For example: $1 \cdot 14$ and $2 \cdot 7$

product	36	42	30	5	81			
Factor	12	7	30	15	27			
Factor	3	6	1	1	3			
Sum	15	13	31	16	30			

product	36	42	45	2	24			
Factor	9	7	15	18	8			
Factor	4	6	3	4	3			
Difference	5	13	12	14	5			

A whole number is divisible by 2 if it is an even number.

A whole number is divisible by 10 if its ones-place digit is 0.

A whole number is divisible by 3 if the sum of its digits is divisible by 3.

A whole number is divisible by 5 if its ones-place digit is 5 or 0.

45

No; 45 is not even.

Yes; $4 + 5 = 9$ is divisible by 3.

Yes; the ones-place digit is 5.

No; the ones-place digit is not 0.

100

Yes; 100 is even.

No; $1 + 0 + 0 = 1$ is not divisible by 3.

Yes; the ones-place digit is 0.

Yes; the ones-place digit is 0.

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

137

No; 137 is not even.
 No; $1 + 3 + 7 = 11$ is not divisible by 3.
 No; the ones-place digit is not 0 or 5.
 No; the ones-place digit is not 0.

$$\begin{array}{r} 5 \\ 22 \overline{) 110} \\ \underline{110} \\ 0 \end{array}$$

241

No; 241 is not even.
 No; $2 + 4 + 1 = 7$ is not divisible by 3.
 No; the ones-place digit is not 0 or 5.
 No; the ones-place digit is not 0.

0
 Yes, 110 is divisible by 22.
 Prime
 Prime

108

Yes; 108 is even.
 Yes; $1 + 0 + 8 = 9$ is divisible by 3.
 No; the ones-place digit is not 0 or 5.
 No; the ones-place digit is not 0.

33. Composite $2 \cdot 5 = 10$
34. Composite $3 \cdot 7 = 21$
35. Composite $3 \cdot 17 = 51$

1040

Yes; 1040 is even.
 No; $1 + 0 + 4 + 0 = 5$ is not divisible by 3.
 Yes; the ones-place digit is 0.
 Yes; the ones-place digit is 0.

36. Composite $3 \cdot 19 = 57$
 Prime
 Prime
 Neither
 Neither

3140

Yes; 3140 is even.
 No; $3 + 1 + 4 + 0 = 8$ is not divisible by 3.
 Yes; the ones-place digit is 0.
 Yes; the ones-place digit is 0.

41. Composite $11 \cdot 11 = 121$
42. Composite $3 \cdot 23 = 69$
 Prime
 Prime

2115

No; 2115 is not even.
 Yes; $2 + 1 + 1 + 5 = 9$ is divisible by 3.
 Yes; the ones-place digit is 5.
 No; the ones-place digit is not 0.

45. Composite $3 \cdot 13 = 39$
46. Composite $7 \cdot 7 = 49$

3

There are two whole numbers that are neither prime nor composite, 0 and 1.
 False; the square of any prime number is

$28 \overline{) 84}$

$$\begin{array}{r} / \\ \underline{84} \\ 0 \end{array}$$

divisible by that prime number.
 False; 9 is not prime.
 False; 2 is not composite.
 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37,

Yes, 84 is divisible by 28.

41, 43, 47

2, 3, 5, 7, 11, 13, 17, 19, 23, 29,
31, 37,
41, 43, 47, 53, 59, 61, 67, 71,
73, 79

Section 2.2 Prime Numbers and Factorization

No, 9 is not a prime number.

No, 8 is not a prime number.

Yes

Yes

7

$$57. 5 \overline{)35}$$

$2 \cdot 5 \cdot 7 = 70$

$$2 \overline{)70}$$

11

$$58. 5 \overline{)55}$$

$$3 \overline{)165}$$

$$3 \overline{)495}$$

13

$$59. 5 \overline{)65}$$

$$2 \overline{)130}$$

$$2 \overline{)260}$$

$$\overline{)7}$$

$$60. 5 \overline{)35}$$

$$5 \overline{)175}$$

$$\overline{)7}$$

$$61. 7 \overline{)49}$$

$$3 \overline{)147}$$

$$3 \overline{)512} \cdot 3 \cdot 17 = 512$$

102—

$$3 \cdot 3 \cdot 5 \cdot 11^2 \cdot 5 \cdot 11 = 495$$

$$2 \cdot 2 \cdot 5 \cdot 13^2 \cdot 5 \cdot 13 = 260$$

$$5 \cdot 5 \cdot 7 = 175$$

$$3 \cdot 7 \cdot 7 = 147$$

$$64. 7 \overline{)77}$$

$$3 \cdot 7 \cdot 11 = 231$$

$$3 \overline{)231}$$

$$65. 7 \overline{)77}$$

$$2 \cdot 2 \cdot 2 \cdot 7 \cdot 11 = 616$$

$$2 \overline{)154}$$

$$2 \overline{)308}$$

$$\overline{)616}$$

$$2 \overline{)616}$$

$$66. 7 \overline{)91}$$

$$2 \cdot 2 \cdot 7 \cdot 13^2 \cdot 7 \cdot 13 = 364$$

$$2 \overline{)182}$$

$$2 \overline{)364}$$

47 is prime.

41 is prime.

1, 2, 3, 4, 6, 12

1, 2, 3, 6, 9, 18

1, 2, 4, 8, 16, 32

1, 5, 11, 55

1, 3, 9, 27, 81

1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

$$3 \overline{)692} \cdot 3 \cdot 23 = 1382$$

1, 2, 3, 4, 6, 8, 12, 16, 24,
48

1, 2, 3, 4, 6, 8, 9, 12, 18,
24, 36, 72

No; 30 is

not

divisible by

4. No; 46 is

not

divisible by

4. Yes; 16

is divisible

by 4. Yes;

64 is

divisible by

4. Yes; 32

is divisible

by 8. Yes;

520 is

divisible by

8.

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

No; 126 is not divisible by 8.

No; 58 is not divisible by 8.

Yes; $3 + 9 + 6 = 18$ is divisible by 9.

Yes; $4 + 1 + 4 = 9$ is divisible by 9.

No; $8 + 4 + 5 + 3 = 20$ is not divisible by 9.

No; $1 + 5 + 8 + 7 = 21$ is not divisible by 9.

Yes; 522 is even and $5 + 2 + 2 = 9$ is divisible by 3.

Yes; 546 is even and $5 + 4 + 6 = 15$ is divisible by 3.

No; 5917 is not even.

No; $6 + 3 + 9 + 4 = 22$ is not divisible by 3.

Section 2.3 Simplifying Fractions to Lowest Terms

Section 2.3 Practice Exercises

lowest

- (a) No
Yes
Yes
No

$$3. \begin{array}{r} 29 \\ 5 \overline{)145} \\ 5 \cdot 29 = 145 \end{array}$$

$$\begin{array}{r} 19 \\ 3 \overline{)572} \\ 572 \cdot 3 \cdot 19 = 114 \end{array}$$

$$\begin{array}{r} 114 \\ 2 \overline{)114} \end{array}$$

$$5. \begin{array}{r} 23 \\ 2 \overline{)46} \\ 2 \cdot 23 = 46 \end{array}$$

$$\begin{array}{r} 23 \\ 2 \cdot 23 = 46 \end{array}$$

$$\begin{array}{r} 92 \\ 2 \overline{)92} \end{array}$$

$$6. \begin{array}{r} 17 \\ 3 \overline{)51} \\ 3 \cdot 17 = 51 \end{array}$$

$$3 \cdot 3 \cdot 17 = 153$$

$$\begin{array}{r} 153 \\ 3 \overline{)153} \end{array}$$

$$7. \begin{array}{r} 17 \\ 5 \overline{)85} \\ 5 \cdot 17 = 85 \end{array}$$

$$\begin{array}{r} 5 \\ 8.3 \overline{)15} \\ 2 \overline{)30} \\ 2 \overline{)60} \\ 2 \overline{)120} \end{array}$$

$$2 \cdot 2 \cdot 2 \cdot 3 \cdot \frac{3}{5} \cdot 3 \cdot 5 = 120$$

$$= 2$$

$$9. \begin{array}{r} 13 \\ 5 \overline{)65} \\ 3 \overline{)195} \end{array}$$

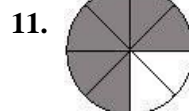
$$3 \cdot 5 \cdot 13 = 195$$

$$10. \begin{array}{r} 5 \\ 3 \overline{)15} \\ 3 \overline{)45} \end{array}$$

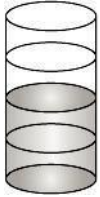
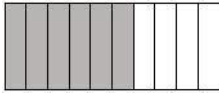
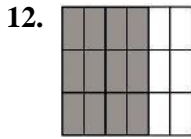
$$2 \cdot 2 \cdot 3 \cdot 3 \cdot \frac{2}{5} \cdot \frac{2}{3} \cdot 5 = 180$$

$$= 2$$

$$\begin{array}{r} 90 \\ 2 \overline{)180} \end{array}$$



Section 2.3 Simplifying Fractions to Lowest Terms



False; $5 \times 5 \neq 4 \times 4$

Two fractions are equivalent if they both

represent the same part of a whole.

17. $2 \times 5 = 3 \times 3$ $\frac{2}{3} \neq \frac{3}{5}$
 $10 \neq 9$

18. $1 \times 9 = 4 \times 2$
 $9 \neq 8$
 $\frac{1}{4} \neq \frac{2}{9}$

$1 \times 6 = 2 \times 3$
 $6 = 6$
 $\frac{1}{2} = \frac{3}{6}$

$6 \times 8 = 16 \times 3$
 $48 = 48$
 $\frac{6}{16} = \frac{3}{8}$

$12 \times 4 = 16 \times 3$
 $48 = 48$
 $\frac{12}{16} = \frac{3}{4}$

$8 \times 27 = 9 \times 20$
 $216 \neq 180$
 $\frac{8}{9} \neq \frac{20}{27}$

$5 \times 18 = 6 \times 12$
 $90 \neq 72$
 $\frac{5}{6} \neq \frac{12}{18}$

25. $\frac{12}{24} = \frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 3}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 3 \cdot 2}$

26. $\frac{15}{18} = \frac{\cancel{3} \cdot 5}{\cancel{2} \cdot 3 \cdot 3} = \frac{5}{6}$

27. $\frac{6}{18} = \frac{\cancel{2} \cdot \cancel{3}}{\cancel{2} \cdot \cancel{3} \cdot 3} = \frac{1}{3}$

28. $\frac{21}{24} = \frac{\cancel{3} \cdot 7}{2 \cdot 2 \cdot \cancel{2} \cdot 3} = \frac{7}{8}$

$\frac{36}{20} = \frac{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot 3}{\cancel{2} \cdot 2 \cdot \cancel{5} \cdot \cancel{2}} = \frac{9}{5}$

30. $\frac{49}{42} = \frac{\cancel{7} \cdot 7}{2 \cdot 3 \cdot \cancel{7}} = \frac{7}{6}$

31. $\frac{15}{12} = \frac{\cancel{3} \cdot 5}{\cancel{2} \cdot 2 \cdot \cancel{2}} = \frac{5}{4}$

$\frac{30}{25} = \frac{\cancel{2} \cdot \cancel{3} \cdot \cancel{5}}{\cancel{5} \cdot 5} = \frac{6}{5}$

$\frac{20}{25} = \frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{5}}{\cancel{5} \cdot 5} = \frac{4}{5}$

$\frac{4 \times 15}{60} = \frac{5 \times 12}{60} = \frac{60}{60}$

$$\frac{8}{16} = \frac{8 \cdot 1}{8 \cdot 2} = \frac{8}{16}$$

$$5^{\frac{4}{5}} = \frac{12}{15}$$

$$\frac{14}{14} = \frac{7}{7} = 1$$

$$\frac{8}{8} = 1$$

$$\frac{50}{25} = \frac{2.25}{25} = 2$$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

$$\frac{24}{66} = \frac{4}{11} = \frac{2}{5.5}$$

$$\frac{9}{9} = 1$$

$$\frac{2}{2} = 1$$

41. $\frac{105}{140} = \frac{3}{4}$

$$\frac{105}{140} = \frac{3 \cdot 5 \cdot 7}{2 \cdot 2 \cdot 5 \cdot 7} = \frac{3}{2 \cdot 2} = \frac{3}{4}$$

$$\frac{33}{11} = \frac{3 \cdot 11}{11} = 3$$

$$\frac{11}{11} = 1$$

$$\frac{65}{5} = \frac{5 \cdot 13}{5} = 13$$

$$\frac{55}{77} = \frac{5 \cdot 11}{7 \cdot 11} = \frac{5}{7}$$

46. $\frac{85}{153} = \frac{5 \cdot 17}{3 \cdot 3 \cdot 17} = \frac{5}{9}$

$$\frac{130}{150} = \frac{2 \cdot 5 \cdot 13}{2 \cdot 3 \cdot 5 \cdot 5} = \frac{13}{15}$$

48. $\frac{70}{120} = \frac{2 \cdot 5 \cdot 7}{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5} = \frac{7}{12}$

$$\frac{385}{195} = \frac{5 \cdot 7 \cdot 11}{3 \cdot 5 \cdot 13} = \frac{7 \cdot 11}{13}$$

$$\frac{6-2}{10+4} = \frac{4}{14} = \frac{2}{7}$$

$$\frac{9-1}{3 \cdot 18} = \frac{8}{54} = \frac{4}{27}$$

$$\frac{5-5}{0} = \frac{0}{0} = \text{undefined}$$

$$\frac{7-2}{11-11} = \frac{5}{0} = \text{undefined}$$

$$\frac{4+7}{7-2} = \frac{11}{5} = \text{undefined}$$

$$\frac{4+7}{11-11} = \frac{11}{0} = \text{undefined}$$

$$11-11 = 0$$

59. $\frac{8-2}{130} = \frac{6}{130} = \frac{3}{65}$

50. $\frac{39}{2 \cdot 5} = \frac{3 \cdot 13}{10} = \frac{39}{10}$

$$\frac{34}{85} = \frac{2 \cdot 17}{5 \cdot 17} = \frac{2}{5}$$

$$\frac{69}{92} = \frac{3 \cdot 23}{2 \cdot 2 \cdot 23} = \frac{3}{4}$$

$$8+2 = 10 \quad 2 \cdot 5 = 10$$

$$\underline{15+3=18} = 6 \cdot 3 = 18$$

$$15-3 = 12 \quad 6 \cdot 2 = 12$$

$$61. \quad \frac{2 \cdot 2 \cdot 3}{4} = \frac{3}{2}$$

$$\frac{160}{4} = 40 = 2 \cdot 2 \cdot 2 \cdot 5$$

$$720 = 72 \cdot 10 = 8 \cdot 9 \cdot 10 = 2^3 \cdot 3^2 \cdot 2 \cdot 5 = 2^4 \cdot 3^2 \cdot 5$$

$$800 = 80 \cdot 10 = 8 \cdot 10 \cdot 10 = 2^3 \cdot 2 \cdot 5 \cdot 2 \cdot 5 = 2^5 \cdot 5^2$$

$$3000 = 30 \cdot 100 = 2 \cdot 3 \cdot 5 \cdot 2 \cdot 2 \cdot 5 \cdot 2 = 2^4 \cdot 3 \cdot 5^2$$

$$\frac{1800}{1500} = \frac{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}{2 \cdot 3 \cdot 5 \cdot 5} = \frac{2 \cdot 3}{5}$$

$$\frac{42000}{22000} = \frac{2 \cdot 2 \cdot 3 \cdot 5 \cdot 7}{2 \cdot 2 \cdot 5 \cdot 11} = \frac{3 \cdot 7}{11}$$

$$\frac{50000}{6500} = \frac{2 \cdot 5 \cdot 5 \cdot 100}{5 \cdot 13 \cdot 10} = \frac{2 \cdot 5 \cdot 10}{13} = \frac{100}{13}$$

$$\frac{5100}{30000} = \frac{51}{3000} = \frac{3 \cdot 17}{2^3 \cdot 3 \cdot 100} = \frac{17}{2000}$$

$$68. \quad \frac{9800}{280} = \frac{98}{28} = \frac{2 \cdot 7 \cdot 7}{2 \cdot 2 \cdot 7} = \frac{7}{2}$$

Section 2.3 Simplifying Fractions to Lowest Terms

69. Heads: $\frac{20}{5} = \frac{\cancel{2} \cdot \cancel{2} \cdot 5}{\cancel{2} \cdot \cancel{2} \cdot 5} =$
 $\frac{48}{12} = \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 3}$

Tails: $48 - 20 = 28$
 $\frac{28}{7} = \frac{\cancel{2} \cdot \cancel{2} \cdot 7}{\cancel{2} \cdot \cancel{2} \cdot 7} =$
 $\frac{48}{12} = \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 3}$

$70 = \frac{2 \cdot 5 \cdot 7}{3 \cdot 5 \cdot 7} = 2$

71. (a) $\frac{6}{3} = \frac{\cancel{2} \cdot 3}{\cancel{3}} =$
 $\frac{26}{6} = \frac{2 \cdot 13}{2 \cdot 3} = \frac{13}{3}$

(b) $26 - 6 = 20$
 $\frac{20}{26} = \frac{\cancel{2} \cdot 2 \cdot 5}{\cancel{2} \cdot 13} = \frac{10}{13}$

72. (a) $\frac{12}{3} = \frac{\cancel{2} \cdot \cancel{2} \cdot 3}{\cancel{3}} =$
 $\frac{88}{22} = \frac{2 \cdot 2 \cdot 2 \cdot 11}{2 \cdot 11}$

(b) $\frac{36}{22} = \frac{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot 3}{\cancel{2} \cdot 2 \cdot 11} =$
 $\frac{88}{22} = \frac{2 \cdot 2 \cdot 2 \cdot 11}{2 \cdot 11}$

(a) Jonathan: $\frac{25}{35} = \frac{5 \cdot \cancel{5}}{\cancel{5} \cdot 7} = \frac{5}{7}$

Jared: $\frac{24}{28} = \frac{\cancel{2} \cdot \cancel{2} \cdot 3}{\cancel{2} \cdot \cancel{2} \cdot 7} = \frac{3}{7}$

Jared sold the greater fractional part

because $\frac{6}{7} > \frac{3}{7}$.

74. (a) Lynette: $\frac{15}{8} = \frac{\cancel{3} \cdot 5}{2 \cdot 2 \cdot 2 \cdot 2}$
 $\frac{24}{8} = \frac{2 \cdot 2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 2}$

Lisa: $\frac{14}{8} = \frac{\cancel{2} \cdot 7}{2 \cdot 2 \cdot 2 \cdot 2} = \frac{7}{4}$

76. (a) $\frac{15}{27} = \frac{3 \cdot \cancel{5}}{\cancel{3} \cdot 3 \cdot 3} = \frac{5}{9}$

(b) $\frac{16}{36} = \frac{\cancel{2} \cdot 2 \cdot 2 \cdot 2}{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot 3} = \frac{4}{9}$

77. (a) 300,000,000
 (b) 36,000,000

(c) $\frac{36,000,000}{300,000,000} = \frac{36}{300} = \frac{\cancel{2} \cdot \cancel{3} \cdot \cancel{2}}{\cancel{2} \cdot \cancel{3} \cdot \cancel{2} \cdot 5 \cdot 5} = \frac{2}{25}$
 $= 2 \cdot \frac{2}{3 \cdot 5 \cdot 5}$

(a) 300,000,000
 75,000,000
 $\frac{300,000,000}{75,000,000} = \frac{300}{75} = \frac{2 \cdot 2 \cdot 3 \cdot 5 \cdot 5}{3 \cdot 5 \cdot 5} = 4$

4 times greater

For example, $\frac{6}{8}, \frac{9}{12}, \frac{12}{16}$

For example, $\frac{2}{6}, \frac{3}{9}, \frac{4}{12}$

For example, $\frac{6}{9}, \frac{4}{6}, \frac{2}{3}$

For example, $\frac{40}{50}, \frac{8}{10}, \frac{4}{5}$

$\frac{16}{8} = \frac{2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2}$

Lisa has completed more of her

course because $\frac{7}{8} > \frac{5}{8}$.

(a) Raymond:

$$= \frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 2 \cdot 3 \cdot /}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{3} \cdot \cancel{3} \cdot}$$

$$\frac{3 \cdot 5 = 10}{11 \cdot 11}$$

Travis:
$$\frac{\cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot /}{\cancel{2} \cdot \cancel{2} \cdot \cancel{3} \cdot \cancel{3} \cdot \cancel{3} \cdot \cancel{5} \cdot 11} = \frac{9}{11}$$

Raymond read the greater fractional

part because $\frac{10}{11} > \frac{9}{11}$.

$$\frac{792}{891} = \frac{8}{9}$$

$$\frac{728}{784} = 14 \frac{13}{21}$$

$$\frac{779}{969} = 51 \frac{21}{11}$$

$$220 \frac{462}{11} = 10$$

$$\frac{493}{510} = 30 \frac{29}{10}$$

88. $\frac{871}{469} = \frac{13}{7}$

90. $\frac{713}{437} = \frac{31}{19}$

$\frac{969}{646} = 2 \frac{3}{2}$

Section 2.4 Multiplication of Fractions and Applications

Section 2.4 Practice Exercises

(a) one-tenth

$\frac{1}{2} bh$

(a) $3 \frac{2}{5}$

$\frac{33}{8}$

Numerator: 10; denominator: 14

$\frac{10}{14} = \frac{\cancel{2} \cdot 5}{\cancel{2} \cdot 7} = \frac{5}{7}$

Numerator: 32; denominator: 36

$\frac{32}{36} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2 \cdot 2}{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot 3} = \frac{8}{9}$

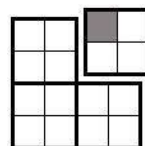
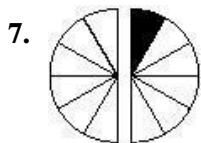
$\frac{2 \cdot 2 \cdot 3 \cdot 3}{9}$

Numerator: 25; denominator: 15

$15 \frac{25}{5} = \frac{5}{3} \cdot \frac{5}{5} = \frac{5}{3}$

Numerator: 2100; denominator: 7000

$\frac{2100}{7000} = \frac{21}{70} = \frac{3 \cdot \cancel{7}}{2 \cdot 5 \cdot \cancel{7}} = \frac{3}{10}$



$\frac{1}{2} \cdot \frac{1}{4} = \frac{1 \cdot 1}{2 \cdot 4} = \frac{1}{8}$

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

$\frac{3}{5} \cdot \frac{5}{15} = \frac{3 \cdot 5}{5 \cdot 15} = \frac{3}{15} = \frac{1}{5}$

13. $\frac{3}{8} \cdot 8 = \frac{3 \cdot 8}{8} = \frac{24}{8} = 6$

$\frac{4}{4} \cdot 1 = 1$

14. $\frac{2}{5} \cdot 20 = \frac{2 \cdot 20}{5} = \frac{40}{5} = 8$

15. $\frac{1}{2} \times \frac{3}{8} = \frac{1 \times 3}{2 \times 8} = \frac{3}{16}$

16. $\frac{2}{3} \times \frac{1}{3} = \frac{2 \times 1}{3 \times 3} = \frac{2}{9}$

17. $\frac{14}{9} \cdot \frac{1}{9} = \frac{14 \cdot 1}{9 \cdot 9} = \frac{14}{81}$

$\frac{1}{9} \cdot \frac{1}{9} = \frac{1 \cdot 1}{9 \cdot 9} = \frac{1}{81}$

$$\frac{\binom{12}{7} \binom{2}{5}}{\binom{2}{7} \binom{2}{5}} = \frac{12 \times 2}{7 \times 5} = \frac{24}{35}$$

Section 2.4 Multiplication of Fractions and Applications

$$(9)(7) = 9 \times 7 = 63$$

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

$$(10)(4) = 10 \times 4 = 40$$

$$\frac{(1)}{8} \times \frac{1}{8} = \frac{1 \times 1}{8 \times 8} = \frac{1}{64}$$

21. $8 \cdot \frac{1}{1} = 8$

$$(11) \frac{1}{11} = 11 \cdot \frac{1}{11} = 1$$

$$3 \cdot \frac{(2)}{2} = 3 \cdot \frac{2}{2} = 3 \cdot 1 = 3$$

$$\frac{17}{7} \cdot \frac{1}{7} = \frac{17 \cdot 1}{7 \cdot 7} = \frac{17}{49}$$

$$\frac{4}{6} \cdot \frac{4}{6} = \frac{4 \cdot 4}{6 \cdot 6} = \frac{16}{36}$$

$$\frac{55}{5} \cdot \frac{1}{5} = \frac{55 \cdot 1}{5 \cdot 5} = \frac{11}{5}$$

$$\frac{5}{25} \cdot \frac{5}{5} = \frac{5 \cdot 5}{25 \cdot 5} = \frac{25}{125} = \frac{1}{5}$$

$$\frac{88}{8} \cdot \frac{1}{8} = \frac{88 \cdot 1}{8 \cdot 8} = \frac{11}{8}$$

$$13 \times 5 = 13 \times 5 = 65$$

$$65$$

$$949 \times 436$$

$$6 \times 7 = 6 \times 7 = 42$$

$$555 \times 525$$

27. $\frac{2}{3} \times \frac{3}{2} = \frac{2 \cdot 3}{3 \cdot 2} = 1$

$$\frac{9}{15} \times \frac{5}{3} = \frac{9 \cdot 5}{15 \cdot 3} = \frac{45}{45} = 1$$

28. $\frac{1}{4} \times \frac{4}{1} = \frac{1 \cdot 4}{4 \cdot 1} = 1$

36. $\frac{(12)(5)}{5} = \frac{12 \cdot 5}{5} = \frac{3 \cdot 4 \cdot 5}{5} = 12$

$$(45)(4) = 45 \cdot 4 = 3 \cdot 3 \cdot 5 \cdot 4 = 180$$

$$(17)(72) = 17 \cdot 72 = 17 \cdot 8 \cdot 9 = 1224$$

$$\frac{1}{1} \times \frac{1}{1} = 1$$

$$(9)(17) = 9 \cdot 17 = 153$$

$$(39)(11) = 39 \cdot 11 = 3 \cdot 13 \cdot 11 = 429$$

$$\frac{11}{13} \cdot \frac{1}{11} = \frac{11 \cdot 1}{13 \cdot 11} = \frac{1}{13}$$

$$11 \cdot \frac{1}{13} = \frac{11 \cdot 1}{13} = \frac{11}{13}$$

21. $\frac{16}{3} \cdot \frac{3}{7} = \frac{16 \cdot 3}{3 \cdot 7} = \frac{16}{7}$

$$\frac{47}{4} \cdot \frac{7}{7} = \frac{47 \cdot 7}{4 \cdot 7} = \frac{47}{4}$$

40. $\frac{85}{2} \cdot \frac{1}{2} = \frac{85 \cdot 1}{2 \cdot 2} = \frac{85}{4}$

$$\frac{6}{3} \cdot \frac{10}{2} = \frac{6 \cdot 10}{3 \cdot 2} = \frac{60}{6} = 10$$

41. $12 \times \frac{15}{42} = \frac{2 \cdot 2 \cdot 3}{2 \cdot 3 \cdot 7} \cdot \frac{3 \cdot 5}{7} = \frac{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}{2 \cdot 3 \cdot 7 \cdot 7} = \frac{30}{49}$

42. $4 \times \frac{8}{92} = \frac{2 \cdot 2}{2 \cdot 2 \cdot 23} \cdot \frac{2 \cdot 2 \cdot 2}{23} = \frac{8}{529}$

$$\frac{8}{7} \times \frac{9}{15} = \frac{8 \cdot 9}{7 \cdot 15} = \frac{72}{105} = \frac{24}{35}$$

16 25

$$29. \frac{5}{6} \times \frac{3}{4} = \frac{5}{2 \cdot 3} \times \frac{3}{4} = \frac{5}{4}$$

$$30. \frac{7}{12} \times \frac{18}{5} = \frac{7}{2 \cdot 2 \cdot 3} \times \frac{2 \cdot 3 \cdot 3}{5} = \frac{21}{10}$$

$$31. \frac{21}{5} \cdot \frac{25}{4} = \frac{3 \cdot 7}{5} \cdot \frac{5 \cdot 5}{2 \cdot 2} = \frac{105}{4}$$

$$16 \cdot \frac{15}{25} = \frac{16}{5} \cdot \frac{3 \cdot 5}{5} = \frac{48}{5}$$

$$24 \cdot 5 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 = 120$$

$$34. \frac{49}{24} \cdot \frac{6}{7} = \frac{7 \cdot 7}{2 \cdot 2 \cdot 2 \cdot 3} \cdot \frac{2 \cdot 3}{7} = \frac{7}{4}$$

$$35. \frac{(6)(22)}{(11)(15)} = \frac{6 \cdot 2 \cdot 11}{5 \cdot 3 \cdot 11} = \frac{4}{5}$$

$$\frac{3 \cdot 3}{7} \times \frac{8 \cdot 2}{7 \cdot 3} \times \frac{5 \cdot 5}{2 \cdot 2} = \frac{10}{1} = 10$$

$$44. \frac{49}{8} \times \frac{4}{5} \times \frac{20}{7} = \frac{7 \cdot 7}{2 \cdot 2 \cdot 2} \times \frac{2}{5} \times \frac{2 \cdot 2 \cdot 5}{7} = \frac{14}{5}$$

$$1 = 14$$

$$5 \times 10 \times 7 = 5 \times 2 \cdot 5 \times 7 = 350$$

$$221523 \cdot 753$$

$$\frac{55}{9} \times \frac{18}{32} \times \frac{24}{11} = \frac{5 \cdot 11}{3 \cdot 3} \times \frac{2 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 2} \times \frac{2 \cdot 2 \cdot 2 \cdot 3}{11} = \frac{15}{2}$$

$$47. \frac{7}{10} \cdot \frac{3}{28} \cdot 5 \cdot \frac{7}{2} \cdot \frac{3}{7} \cdot \frac{5}{1} = \frac{3}{8}$$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

48. $\frac{11}{2} \cdot \frac{2}{15} = \frac{11}{15} \cdot \frac{2}{2} \cdot \frac{1}{3}$

$\frac{18}{12} \cdot \frac{20}{12} \cdot \frac{3}{3} \cdot \frac{2}{2} \cdot \frac{5}{5} \cdot \frac{1}{1}$

$\frac{100 \times 21 \times 14}{49257 \cdot 71 \cdot 5 \cdot 5} = \frac{2 \cdot 2 \cdot 5 \cdot 5 \cdot 3 \cdot 7 \cdot 2 \cdot 7}{24}$

$1 = 24$

38 $\frac{5}{2} \cdot \frac{19}{11} \cdot \frac{5}{5}$

$\frac{11 \times 11 \times 5}{2219 \cdot 2 \cdot 11} = \frac{7 \times 19}{1 \cdot 19} = 5$

51. $(\frac{1}{1})^3 = \frac{1}{1} \cdot \frac{1}{1} \cdot \frac{1}{1} = \frac{1}{1}$

$(10)^4 = 10 \cdot 10 \cdot 10 \cdot 10 = 1000$

$(1)^4 = 1 \cdot 1 \cdot 1 \cdot 1 = 1$

52. $10^6 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10,000$

$(10)^6 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10,000$

53. $(\frac{1}{1})^6 = \frac{1}{1} \cdot \frac{1}{1} \cdot \frac{1}{1} \cdot \frac{1}{1} \cdot \frac{1}{1} \cdot \frac{1}{1} = \frac{1}{1}$

$(10)^6 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 1,000,000$

$= 1,000,000$

54. $(1)^9 = 1$

$(10)^9 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10^9$

$(\frac{2}{5})^3 = \frac{2}{5} \cdot \frac{2}{5} \cdot \frac{2}{5} = \frac{8}{125}$

$(\frac{1}{5})^3 = \frac{1}{5} \cdot \frac{1}{5} \cdot \frac{1}{5} = \frac{1}{125}$

61. $(\frac{3}{2})^2 = \frac{3}{2} \cdot \frac{3}{2} = \frac{9}{4}$

$(5)^2 = 5 \cdot 5 = 25$

$(9)^2 = 81$

3

62. $(\frac{10}{3})^2 = \frac{10}{3} \cdot \frac{10}{3} = \frac{100}{9}$

$(30)^2 = 30 \cdot 30 = 900$

$\frac{1}{0}$

$(\frac{21}{8})^2 = \frac{21}{8} \cdot \frac{21}{8} = \frac{441}{64}$

63. $3 \cdot 4 = 12$

$(\frac{30}{24})^3 = \frac{30}{24} \cdot \frac{30}{24} \cdot \frac{30}{24} = \frac{27}{8}$

64. $(\frac{6}{8})^3 = \frac{6}{8} \cdot \frac{6}{8} \cdot \frac{6}{8} = \frac{27}{64}$

$\frac{1}{1} \cdot \frac{1}{1} \cdot \frac{1}{1} = 1$

65. $(\frac{16}{9})^2 = \frac{16}{9} \cdot \frac{16}{9} = \frac{256}{81}$

1

1

$$= \frac{\quad}{\quad}$$

1,000,000,000

$$(1)^2 \quad 1 \quad 1 \quad 1$$

$$55. \left(\frac{1}{9} \right) = \frac{1}{9} \cdot \frac{1}{9} = \frac{1}{81}$$

$$(1)^2 = 1 \cdot 1 = 1$$

$$\left(\frac{1}{4} \right) 4 \quad 4 \quad 16$$

$$57. (3)^3 = 3 \cdot 3 \cdot 3 = 27$$

$$(2) \quad 2 \quad 2 \quad 2 \quad 8$$

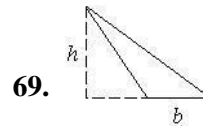
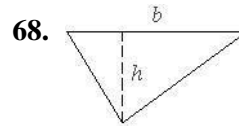
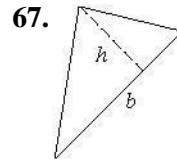
$$58. \left(\frac{4}{1} \right)^3 = \frac{4}{1} \cdot \frac{4}{1} \cdot \frac{4}{1} = \frac{64}{1}$$

$$(3) \quad 3 \quad 3 \quad 3 \quad 27$$

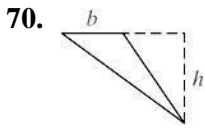
$$\left(\frac{3}{4} \right)^3 = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{27}{64}$$

$$\cup \quad /$$

$$\frac{28}{42} \cdot \left(\frac{3}{6} \right)^2 = 28 \cdot \frac{9}{36} = 7$$



Section 2.4 Multiplication of Fractions and Applications



$$A = \frac{1}{2}bh = \frac{1}{2}(11)(8) = \frac{1}{2} \cdot \frac{11}{1} \cdot \frac{8}{1} = 44 \text{ cm}^2$$

72. $A = \frac{1}{2}bh = \frac{1}{2}(15)(12) = \frac{1}{2} \cdot \frac{15}{1} \cdot \frac{12}{1} = 90 \text{ in.}^2$

73. $A = \frac{1}{2}bh = \frac{1}{2}(8)(8) = \frac{1}{2} \cdot \frac{8}{1} \cdot \frac{8}{1} = 32 \text{ m}^2$

$$A = bh = (1) \cdot \frac{1}{2} \cdot \frac{7}{1} \cdot \frac{7}{1} = \frac{7}{2} \text{ ft}^2$$

$$22 \frac{1}{4} = 24 \frac{1}{8}$$

75. $A = \frac{1}{2}bh = \frac{1}{2}(8) = \frac{1}{2} \cdot \frac{8}{1} = 4 \text{ yd}^2$

76. $A = \frac{1}{2}bh = \frac{1}{2} \cdot \frac{16}{3} = \frac{8}{3}$

$$= \frac{1}{2} \cdot \frac{3}{1} \cdot \frac{8}{3} = 4 \text{ or } 2 \frac{2}{1} \text{ mm}^2$$

$$\frac{2}{1} \cdot \frac{1}{3} \cdot \frac{9}{3} = 2$$

$$\frac{23}{8} \cdot \frac{23}{2}$$

80. $A = l \times w = 24 \cdot 4 = 32 \frac{\text{ft}}{8}$

$$A = (8)(4) + \frac{1}{2}(8)(4) = 32 + 4 \cdot 4 = 32 + 16 = 48 \text{ yd}^2$$

$$A = (8)(3) + \frac{1}{2}(8)(3) = 24 + 4 \cdot 3 = 24 + 12 = 36 \text{ m}^2$$

$$A = (6) \cdot \frac{1}{2} + (6) \cdot \frac{1}{2} = \frac{6}{2} + \frac{6}{2} = 3 + 3 = 6$$

$$\frac{4}{3} + \frac{5}{7} = \frac{4 \cdot 7}{3 \cdot 7} + \frac{5 \cdot 3}{7 \cdot 3} = \frac{28}{21} + \frac{15}{21} = \frac{43}{21} \cdot 3 = 7 + 2 = 9 \text{ cm}^2$$

84. $A = \frac{1}{2}(8) \cdot \frac{1}{2} + \frac{1}{2}(8) \cdot \frac{1}{2} = 4 \cdot \frac{1}{2} + 4 \cdot \frac{1}{2} = 2 + 2 = 4$

$$\frac{2}{9} + \frac{2}{4} = \frac{2}{9} + \frac{2}{4} = \frac{2}{9} + \frac{1}{2} = \frac{2 \cdot 2}{9 \cdot 2} + \frac{1 \cdot 9}{2 \cdot 9} = \frac{4}{18} + \frac{9}{18} = \frac{13}{18} \cdot 4 = 9 + 15 = 24 \text{ m}^2$$

85. $\frac{5}{8} \cdot 16 = \frac{5}{1} \cdot \frac{16}{8} = 10$

The amount left is 10 gal.

86. $\frac{3}{4} \cdot 11,000 = \frac{3}{4} \cdot \frac{11,000}{1} = 8,250$

The cost is \$8250.

$$\frac{1}{1} \cdot \frac{1}{1} \cdot \frac{1}{1}$$

$$77. A = l \times w = \frac{13}{7} \cdot \frac{1}{3} \cdot \frac{1}{4} \text{ cm}$$

$$78. A = l \times w = \frac{8}{3} \cdot \frac{1}{7} \cdot 1 = 8 \text{ m}$$

$$79. A = l \times w = \frac{13}{16} \cdot \frac{15}{16} = \frac{195}{256} \text{ in.}$$

$$4 \cdot 2 = 8$$

Trey ate $\frac{1}{8}$ of the pizza for breakfast.

$$88. \frac{1}{4} \cdot \frac{2}{5} = \frac{1}{10}$$

$\frac{1}{10}$ of the sample has O-negative blood.

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

89. $3 \cdot 5 \frac{1}{2} = 3 \cdot 1 \frac{1}{2} = 3 \frac{3}{2} = 4 \frac{1}{2}$ Corrine will

$$\begin{array}{r} 4 \quad 2 \quad 4 \quad 2 \quad 8 \quad 8 \\ \text{prepare } 4 \frac{1}{8} \text{ lb.} \end{array}$$

$$8 \frac{3}{140} \cdot \frac{2}{3} = 8 \frac{3}{8} \cdot \frac{422}{3} = \frac{1}{4} \cdot \frac{211}{1} = \frac{211}{8} =$$

$52 \frac{3}{4}$; $52 \frac{3}{4}$ lb must be destroyed.

$$\begin{array}{r} 2 \cdot 9,825,000 = 2 \cdot \frac{3,275,000}{9,825,000} \\ = 331 \end{array}$$

$$\begin{array}{r} 7 \text{ —————} \\ 1 \end{array}$$

6,550,000

There are 6,550,000 viewers.

$$3 \cdot \frac{3}{4} = 3 \cdot \frac{3}{4} = \frac{9}{4} \text{ or } 2 \frac{1}{4}$$

Nancy spends $\frac{1}{4}$ or $2 \frac{1}{4}$ hr a day.

93. First place: $\frac{2}{3} \cdot 1200 = \frac{2}{3} \cdot \frac{400}{1200} =$

$$\begin{array}{r} \$800 \\ 3 \quad 1 \end{array}$$

Second place: $\frac{1}{4} \cdot 1200 = \frac{1}{4} \cdot \frac{300}{1200} =$

$$\begin{array}{r} \$300 \\ 4 \quad 1 \end{array}$$

100

(b) $\frac{1}{\sqrt{36}} = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

96. (a) $\left(\frac{2}{7}\right)^2 = \frac{2}{7} \cdot \frac{2}{7} = \frac{4}{49}$

(b) $\sqrt{\frac{4}{49}} = \sqrt{\frac{2}{7} \cdot \frac{2}{7}} = \frac{2}{7}$

97. $\sqrt{\frac{1}{25}} = \sqrt{\frac{1}{5} \cdot \frac{1}{5}} = \frac{1}{5}$

98. $\sqrt{\frac{1}{100}} = \sqrt{\frac{1}{10} \cdot \frac{1}{10}} = \frac{1}{10}$

99. $\sqrt{\frac{64}{81}} = \sqrt{\frac{8}{9} \cdot \frac{8}{9}} = \frac{8}{9}$

100. $\sqrt{4} = \sqrt{2 \cdot 2} = 2$

101. $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \frac{1}{64}$

The next number is $\frac{1}{16} \cdot \frac{1}{2} = \frac{1}{32}$

102. $\frac{2}{3}, \frac{2}{3}, \frac{2}{3}, \frac{2}{3}, \frac{2}{3}$

$\frac{3}{3}, \frac{9}{3}, \frac{3 \cdot 3}{3}, \frac{27}{3}, \frac{9}{3}$
The next number is $\frac{2}{3}$

Third place: $\frac{1}{12} \cdot 1200 = \frac{1}{1} \cdot \frac{1200}{1} =$
 \$100

$$27 \cdot 31 = 847$$

$$1(1) = 1$$

$$2(8) = 16$$

$$1(1) = 1$$

$$8(2) = 16$$

They are the same.

$$2(1) = 2$$

$$3(4) = 12$$

$$\frac{1(2)}{1} = \frac{2}{1} = 2$$

$$4(3) = 12$$

They are the same.

94. $\frac{2}{3} \cdot (40)(36) = \frac{2}{1} \cdot \frac{40}{1} \cdot \frac{36}{1} =$
 $\frac{960}{1}$

$$40 \times 36 = 1440$$

$$1440 - 960 = 480$$

Frankie mowed 960 yd . He has 480 yd left to mow.

95. (a) $\left(\frac{1}{1}\right)^2 = \frac{1}{1} \cdot \frac{1}{1} =$
 $\frac{1}{1}$

$$(6) \quad 6 \cdot 6 = 36$$

Section 2.5 Division of Fractions and Applications

Section 2.5 Practice Exercises

1. reciprocals

2. $2^2 \cdot 3^3$

3. $\frac{9}{2} \times 5 = 5$

1

4. $\frac{24}{7} \cdot \frac{7}{8} = 3$

1

5. $\frac{34}{5} \cdot \frac{5}{17} = 2$

1

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

2

7. $8 \cdot \frac{5}{24} = \frac{5}{3}$

8. $\frac{2}{7} \cdot \frac{7}{2} = 1$

1

9. $\frac{9}{5} \cdot \frac{5}{9} = 1$

10. $1 \times 10 = 1 \cdot 10 = 10 = 1$

11. $\frac{1}{5} \times 3 = \frac{1}{5} \cdot 3 = \frac{3}{5} = 1$

3 3 1 3

(c) Yes, $\frac{1}{6}$

(d) No, $\frac{1}{0}$ is undefined.

13. $\frac{8}{7}$

14. $\frac{6}{-5}$

15. $\frac{9}{10}$

16. $\frac{5}{14}$

17. $\frac{1}{4}$

18. $\frac{1}{9}$

19. No reciprocal exists.

20. No reciprocal exists.

21. $\frac{1}{3}$

22. $\frac{1}{5}$

23. multiplying

24. multiplying

25. $\frac{2}{15} \div \frac{5}{12} = \frac{2}{15} \cdot \frac{12}{5} = \frac{2 \cdot 2 \cdot 2 \cdot 3}{3 \cdot 5 \cdot 5} = \frac{8}{25}$

12. (a) Yes, $\frac{1}{1} = 2$

$\frac{3}{-}$

(b) Yes, $\frac{3}{5}$

26. $11 \div 6 = 11 \cdot 5 = 55$
 $3 \quad 5 \quad 3 \quad 6 \quad 18$

27. $\frac{7}{13} \div \frac{2}{5} = \frac{7}{13} \cdot \frac{5}{2} = \frac{35}{26}$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

$$\frac{8}{7} \div \frac{3}{10} = \frac{8}{7} \cdot \frac{10}{3} = \frac{80}{21}$$

$$29. \frac{14}{3} \div \frac{6}{5} = \frac{14}{3} \cdot \frac{5}{6} = \frac{35}{9}$$

$$\frac{11}{3} \div \frac{11}{4} = \frac{11}{3} \cdot \frac{4}{11} = \frac{4}{3}$$

$$30. 2 \div 4 = \frac{2}{1} \cdot \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$$

$$\frac{15}{2} \div \frac{3}{2} = \frac{15}{2} \cdot \frac{2}{3} = \frac{15}{1} \cdot \frac{1}{3} = 5$$

$$10 \frac{9}{2} \div 2 = \frac{10 \cdot 2 + 9}{2} \cdot \frac{1}{2} = \frac{29}{2} \cdot \frac{1}{2} = \frac{29}{4}$$

$$\frac{3}{4} \div \frac{3}{4} = \frac{3}{4} \cdot \frac{4}{3} = \frac{12}{12} = 1$$

$$\frac{6}{6} \div \frac{6}{5} = \frac{6}{6} \cdot \frac{5}{6} = \frac{30}{6} = 5$$

$$5 \div 5 = \frac{5}{1} \cdot \frac{1}{5} = \frac{5}{5} = 1$$

$$\frac{2}{3} \div \frac{7}{3} = \frac{2}{3} \cdot \frac{3}{7} = \frac{21}{21} = 1$$

$$7 \div 3 = \frac{7}{1} \cdot \frac{1}{3} = \frac{7}{3}$$

$$\frac{3}{4} \div \frac{4}{5} = \frac{3}{4} \cdot \frac{5}{4} = \frac{20}{16} = \frac{5}{4}$$

$$4 \div 5 = \frac{4}{1} \cdot \frac{1}{5} = \frac{4}{5}$$

$$37. \frac{12}{5} \div 4 = \frac{12}{5} \cdot \frac{1}{4} = \frac{3}{5}$$

$$\frac{30}{40} \div \frac{15}{8} = \frac{30}{40} \cdot \frac{8}{15} = \frac{240}{600} = \frac{2}{5}$$

$$41. \frac{10}{9} \div \frac{1}{18} = \frac{10}{9} \cdot \frac{18}{1} = 20$$

$$42. \frac{4}{3} \div \frac{1}{3} = \frac{4}{3} \cdot \frac{3}{1} = 4$$

$$43. 12 \div \frac{4}{3} = 12 \cdot \frac{3}{4} = 9$$

$$44. 24 \div \frac{5}{8} = 24 \cdot \frac{8}{5} = \frac{192}{5} = 38 \frac{2}{5}$$

$$45. \frac{9}{100} \div \frac{13}{1000} = \frac{9}{100} \cdot \frac{1000}{13} = \frac{9000}{1300} = \frac{90}{13}$$

$$46. \frac{1000}{17} \div \frac{10}{3} = \frac{1000}{17} \cdot \frac{3}{10} = \frac{3000}{170} = \frac{300}{17}$$

$$47. \frac{36}{5} \div \frac{25}{9} = \frac{36}{5} \cdot \frac{9}{25} = \frac{324}{125} = 2 \frac{124}{125}$$

$$38. \frac{20}{6} \div 5 = \frac{20}{6} \cdot \frac{1}{5} = \frac{4}{3}$$

$$39. \frac{2}{50} \cdot \frac{18}{25} = \frac{9}{25} \cdot \frac{2}{25} = \frac{18}{625}$$

$$48. \frac{13}{17} \cdot \frac{10}{17} = \frac{130}{289}$$

$$49. \frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \cdot \frac{4}{1} = \frac{7}{2}$$

$$50. 12\frac{7}{3} \div 3 = 12\frac{7}{3} \cdot \frac{1}{3} = 12\frac{7}{9}$$

Section 2.5 Division of Fractions and Applications

$$51. \frac{5}{8} \cdot \frac{1}{9^2} = \frac{5}{36} \cdot \frac{1}{81} = \frac{5}{2916}$$

$$52. \frac{16}{4} \div \frac{1}{3} = 12$$

$$53. 6 \cdot 3 = 18$$

$$54. 12 \cdot 6 = 72$$

$$55. \frac{16}{5} \div 8 = \frac{16}{5} \cdot \frac{1}{8} = \frac{2}{5}$$

$$56. 11^{42} \div 7 = 11^{42} \cdot \frac{1}{7} = 11^{42} \cdot \frac{1}{7}$$

$$57. 3 \mid 5 = \frac{3}{1} \cdot \frac{2}{3} = 2$$

$$8 \mid 4 = \frac{8}{2} \cdot \frac{1}{4} = 1$$

$$\frac{2}{1} \cdot \frac{1}{2} = 1$$

$$\frac{40 \cdot 18}{25 \cdot 3} = \frac{5 \cdot 8 \cdot 3 \cdot 6}{5 \cdot 5 \cdot 3 \cdot 5} = \frac{48}{25}$$

$$63. 8 \mid 3 = \frac{8}{1} \cdot \frac{3}{8} = 3$$

$$64. 5 \mid 4 = \frac{5}{1} \cdot \frac{4}{5} = 4$$

65. $\frac{6}{3}$ multiplies $\frac{2}{3}$ by $\frac{1}{1}$, and $\frac{6}{3} \mid 6$ multiplies $\frac{2}{3}$ by $\frac{1}{1}$. So $\frac{2}{3} \cdot 6 = 2 \cdot \frac{6}{3} = 4$

and $\frac{2}{3} \mid 6 = \frac{2}{3} \cdot \frac{1}{1} = \frac{2}{3}$

$\frac{8}{3}$ multiplies $\frac{2}{3}$ by $\frac{1}{1}$, and $8 \mid 3$

multiplies $\frac{2}{3}$ by $\frac{3}{2}$. So $\frac{2}{3} \cdot \frac{3}{2} = 1 \cdot \frac{2}{3} = \frac{2}{3}$

and $8 \mid \frac{2}{3} = \frac{8}{1} \cdot \frac{3}{8} = 3$

$$67. \frac{54}{21} \cdot \frac{2}{3} = \frac{54}{9} \cdot \frac{2}{7} = \frac{27}{7}$$

$$\frac{27}{7} \cdot \frac{1}{8} = \frac{27}{56}$$

$$\frac{1}{1} = 2 \quad = 7$$

$$9 = 7$$

$$60. \frac{2}{6} \cdot 9 = \frac{2 \cdot 3}{\cancel{3}} \cdot \frac{9}{\cancel{3}} =$$

$$3 \cdot \frac{\cancel{3}}{1} \cdot 1$$

$$61. \frac{22}{7} \cdot \frac{5}{16} = \frac{\cancel{2} \cdot 11}{7} \cdot \frac{\cancel{5}}{\cancel{2} \cdot 8} = \frac{55}{2 \cdot 8 \cdot 56}$$

$$68. \frac{48}{56} \cdot \frac{3}{8} = \frac{\frac{16}{\cancel{4}} \cdot \frac{1}{\cancel{4}}}{\cancel{4} \cdot 7} \cdot \frac{\cancel{8}}{\cancel{4}} = \frac{16}{7 \cdot 8} \cdot \frac{1}{7}$$

$$56 \cdot 8 \cdot \frac{3}{7} \cdot \frac{1}{7}$$

$$= \frac{16}{7} \cdot \frac{1}{8} \cdot \frac{1}{7}$$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

$$69. \frac{3}{5} \cdot \frac{5}{6} = \frac{3}{6} = \frac{1}{2} \quad \frac{7}{5} \cdot \frac{5}{7} = \frac{7}{7} = 1$$

$$\frac{5}{7} \cdot \frac{3}{5} = \frac{3}{7} \quad \frac{5}{63} \cdot \frac{10}{3} = \frac{10}{9}$$

$$\frac{5}{35} \cdot \frac{1}{5} = \frac{1}{35} \quad \frac{16}{1} \cdot \frac{1}{2} = \frac{16}{2} = 8$$

$$70. \frac{8}{8} \cdot \frac{16}{4} = 4 \quad \frac{35}{4} \cdot 4 = 35$$

$$\frac{7}{2}$$

$$71. \left(\frac{3}{8}\right)^2 = \frac{9}{64} \quad \frac{9}{14} \cdot \frac{3}{8} = \frac{27}{112} \quad \frac{9}{14} \cdot \frac{9}{14} = \frac{81}{196}$$

$$\frac{6}{4} \cdot \frac{9}{32} = \frac{27}{64}$$

$$72. \left(\frac{1}{2}\right)^2 = \frac{1}{4} \quad \left(\frac{1}{2}\right)^2 = \frac{1}{4} \quad \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

$$\frac{8}{2} \cdot \frac{2}{2} = 4$$

$$\frac{1}{8} \cdot \frac{1}{2} = \frac{1}{16}$$

$$73. \left(\frac{2}{5}\right)^2 = \frac{4}{25} \quad \left(\frac{1}{2}\right)^2 = \frac{1}{4} \quad \left(\frac{3}{20}\right)^2 = \frac{9}{400}$$

$$\frac{9}{400}$$

$$\left(\frac{5}{5}\right)^2 = 1 \quad \left(\frac{5}{5}\right)^2 = 1 \quad \left(\frac{5}{5}\right)^2 = 1$$

$$74. \frac{1}{1} \cdot \frac{1}{1} = 1 \quad \frac{1}{1} \cdot \frac{1}{1} = 1 \quad \frac{1}{1} \cdot \frac{1}{1} = 1$$

$$76. \left(\frac{1}{3}\right)^2 = \frac{1}{9} \quad \frac{9}{3} \cdot \frac{8}{2} = 12 \quad \frac{1}{2} \cdot 8 = 4$$

$$= \frac{3}{3} \cdot \frac{8}{2} = 4$$

$$77. \frac{15}{16} \cdot \left(\frac{2}{3}\right)^2 = \frac{15}{16} \cdot \frac{4}{9} = \frac{5}{12}$$

$$\frac{5}{12} \cdot \frac{20}{21} = \frac{100}{252} = \frac{25}{63}$$

$$78. \frac{8}{27} \cdot \left(\frac{3}{4}\right)^2 = \frac{8}{27} \cdot \frac{9}{16} = \frac{1}{3}$$

$$= \frac{8}{27} \cdot \frac{9}{16} = \frac{1}{3}$$

$$79. \frac{9}{4} \cdot \frac{1}{8} = \frac{9}{32}$$

$$\begin{aligned}
 & (12 \ 3) \quad (12 \ 2) \quad (8) \quad 8 \ 8 \\
 & 4 \\
 & = \frac{25}{64}
 \end{aligned}$$

$$\begin{aligned}
 & \begin{matrix} 2 & & 2 & & 2 \\ (63 \ 9) & & (63 \ 4) & & (7) \end{matrix} \\
 75. & \text{---} \mid \mid \cdot 4 = \mid \cdot \cdot \cdot 4 = \mid \mid \\
 & \cdot 4
 \end{aligned}$$

$$\begin{aligned}
 & \begin{matrix} (8 \ 4) & & (8 \ 9) & & (2) \\ 2 & & 1 & & \end{matrix} \\
 & = 2 \cdot \underline{7} \cdot \underline{4} = \underline{49} \cdot \underline{1} = 49 \\
 & \quad \quad \quad 2 \ 2 \ 14 \ / \ 1
 \end{aligned}$$

1

$$\begin{aligned}
 80. & \frac{4}{3} \cdot \frac{1}{6} = \frac{4}{18} = \frac{2}{9} \\
 & \quad \quad \quad \frac{4}{18} \cdot \frac{6}{1} = 8
 \end{aligned}$$

$$81. 36 \mid \frac{2}{3} = \frac{36}{1} \cdot \frac{2}{3} = 54$$

Li wrapped 54 packages.

$$82. 60 \mid \frac{3}{4} = \frac{60}{1} \cdot \frac{3}{4} = 80$$

She can sell 80 parcels of land.

Section 2.5 Division of Fractions and Applications

$$83. \frac{3}{2} \div \frac{1}{16} = \frac{3}{2} \cdot \frac{16}{1} = 24 \text{ cups of juice}$$

$$84. \frac{4}{1} \div 100 = \frac{4}{1} \cdot \frac{1}{100} = \frac{4}{100} = \frac{1}{25} = 125 \text{ cm}$$

$$85. 16 \cdot \frac{3}{4} = 12$$

The stack will be 12 in. high.

$$86. \frac{5}{4} \div \frac{24}{1} = \frac{5}{4} \cdot \frac{1}{24} = \frac{5}{96} = 30$$

Yes, the books will take up only 30 in.

$$87. (a) 18 \div \frac{2}{3} = \frac{18}{1} \cdot \frac{3}{2} = 27$$

27 commercials in 1 hr

$$27 \times 24 = 648$$

648 commercials in 1 day

$$(a) 20 \div \frac{1}{2} = \frac{20}{1} \cdot \frac{2}{1} = 40$$

40 commercials in 1 hr

$$40 \times 24 = 960$$

960 commercials in 1 day

$$89. (a) \frac{1}{10} \cdot 240,000 = \frac{1}{10} \cdot \frac{240,000}{1} = \frac{240,000}{10} = 24,000$$

The down payment is \$24,000.

$$\$240,000 - \$24,000 = \$216,000$$

He will have to finance \$216,000.

$$90. (a) \frac{1}{12} \cdot 19,560 = \frac{1}{12} \cdot \frac{19,560}{1}$$

$$\frac{19,560}{12}$$

$$1630$$

The down payment is \$1630.

$$815$$

$$(b) \frac{1}{2} \cdot 1630 = \frac{1}{2} \cdot \frac{1630}{1} = 815$$

$$\$815 = \$815$$

Althea will have to pay \$815.

$$\$19,560 - \$1630 = \$17,930$$

She will have to finance \$17,930.

$$3$$

$$91. (a) \frac{1}{3} \cdot \frac{9}{4} = \frac{3}{4}$$

$$\frac{3}{4}$$

She plans to sell $\frac{3}{4}$ acre.

$$\frac{2}{3}$$

She keeps $\frac{2}{3}$ of the land.

$$\frac{1}{3} \cdot \frac{3}{4} = \frac{1}{4}$$

$$\frac{2}{3} \cdot \frac{9}{4} = \frac{3}{2} \text{ or } 1 \frac{1}{2} \text{ acres}$$

$$\frac{1}{3} \cdot \frac{9}{4} = \frac{3}{4}$$

$$1 \frac{1}{2}$$

$$92. (a) \frac{1}{6} \cdot (24 + 18) = \frac{1}{6} \cdot (42) = \frac{42}{6} = 7$$

Josh has read 7 pages.

$$(24 + 18) - 7 = 42 - 7 = 35 \text{ He still must read 35 pages.}$$

$$2$$

$$- \frac{1}{2} \cdot \frac{7}{8} = -\frac{7}{16}$$

$$\frac{2}{3} \cdot 24,000 = \frac{2}{3} \cdot \frac{24,000}{1} = \frac{48,000}{3} = 16,000$$

Ricardo's mother will pay \$16,000.

$$\$24,000 - \$16,000 = \$8,000$$

Ricardo will have to pay \$8,000.

$$93. \quad 4 \div 8 = \frac{4}{8} = \frac{1}{2} = 0.5$$

She can prepare 14 samples.

$$94. \begin{array}{r} 7 \\ 14 \overline{) 1} = 7 \cdot \frac{1}{14} = \frac{7}{14} = \frac{1}{2} \end{array}$$

Tony must make 14 strikes.

The length is 12 ft, because

$$\begin{array}{r} 5 \ 30 \ 2 \\ 30 \overline{) 302} = \frac{5}{6} \cdot 2 = \frac{10}{3} = 3 \frac{1}{3} \end{array}$$

$$\begin{array}{r} 2 \ 1 \ 5 \\ 4 \overline{) 11} = 2 \frac{3}{4} \end{array}$$

The width is 7 m, because

$$\begin{array}{r} 8 \ 14 = \frac{8}{7} \cdot \frac{1}{2} = \frac{4}{7} \end{array}$$

The product will be less than 47 because $\frac{3}{5}$ is less than one.

The product will be less than 81 because $\frac{4}{7}$ is less than one.

The quotient will be more than 25 because $\frac{2}{3}$ is between zero and one.

The quotient will be more than 41 because $\frac{2}{11}$ is between zero and one.

Problem Recognition Exercises: Multiplication and Division of Fractions

1. (a) $\frac{8}{16} \cdot \frac{3}{5} = \frac{2}{5}$

(c) $\frac{8}{9} \cdot \frac{6}{3} = \frac{8}{3} = 2 \frac{2}{3}$

(d) $\frac{6}{20} \cdot \frac{8}{5} = \frac{3}{5} = \frac{3}{5}$

(c) $12 \overline{) 2} = \frac{1}{6}$

(d) $12 \overline{) 8} = \frac{2}{3}$

(a) $\frac{3}{15} \cdot \frac{3}{5} = \frac{1}{5}$

$3 \overline{) 15} = 5$

$3 \overline{) 155} = 51 \frac{5}{3}$

$$2. (a) \frac{10}{40} \cdot \frac{12}{1} = \frac{10}{\cancel{4} \cdot 10} \cdot \frac{\cancel{3} \cdot 4}{1} =$$

$$\frac{3 \cdot 7}{12} \cdot \frac{10}{\cancel{3} \cdot 4} \cdot \frac{4 \cdot 10}{\cancel{4}} = 40$$

73737

$$(c) \frac{10}{7} \cdot \frac{12}{5} = \frac{10}{\cancel{2} \cdot 5} \cdot \frac{\cancel{2} \cdot 6}{\cancel{2} \cdot 7} = \frac{35}{5}$$

$$(d) \frac{12}{18} \cdot \frac{10}{3} = \frac{\cancel{2} \cdot 6}{\cancel{2} \cdot 3} \cdot \frac{\cancel{2} \cdot 5}{\cancel{2} \cdot 3} = \frac{35}{3}$$

$$\frac{7}{35} \cdot \frac{3}{7} \cdot \frac{10}{7} \cdot \frac{2 \cdot 5}{35}$$

$$3. (a) 12 \cdot \frac{2}{7} = \frac{12}{\cancel{3} \cdot 4} \cdot \frac{\cancel{3} \cdot 4}{7} \cdot \frac{9}{1} = \frac{27}{7}$$

$$\frac{8}{2} \cdot \frac{1}{8} \cdot \frac{8}{1} \cdot \frac{2 \cdot 4}{2}$$

$$(b) \frac{9}{8} \cdot \frac{12}{8} = \frac{9}{\cancel{3} \cdot 4} \cdot \frac{\cancel{3} \cdot 4}{1} \cdot \frac{4}{2} = \frac{27}{2}$$

$$15 \mid = \frac{7}{\cancel{7}} \cdot \frac{1}{1} = \frac{7}{7} \cdot \frac{1}{1} = 1$$

$$(d) \frac{3}{5} \mid 15 = \frac{3}{\cancel{3} \cdot 5} \cdot \frac{1}{1} = \frac{3}{5} \cdot \frac{1}{1} = \frac{1}{5}$$

$$\frac{5}{5} \cdot \frac{15}{5} \cdot \frac{5}{5} \cdot \frac{3}{5} \cdot \frac{5}{5} \cdot \frac{25}{25}$$

$$5. (a) \frac{5}{6} \cdot \frac{5}{6} = \frac{25}{36}$$

$$\frac{5}{6} \cdot \frac{6}{5} = \frac{\cancel{5} \cdot 1}{\cancel{5} \cdot 1} = 1$$

$$\frac{5}{5} \cdot \frac{5}{5} \cdot \frac{6}{6} \cdot \frac{1}{1}$$

$$\frac{6}{5} \mid 6 = \frac{6}{\cancel{6}} \cdot \frac{5}{\cancel{5}} \cdot \frac{1}{1} = \frac{25}{5}$$

$$6 \mid 5 = \frac{6}{6} \cdot \frac{5}{5} = \frac{36}{36}$$

$$(b) \frac{1}{3} = \frac{7}{12} \quad | \quad \frac{2}{9} = \frac{1}{3} \cdot \frac{7}{9} \cdot \frac{3}{2} = \frac{1}{2} \cdot \frac{7}{3} \cdot \frac{3}{2} = \frac{7}{4} \cdot \frac{1}{2} = \frac{7}{8}$$

$$(c) \frac{1}{2} = \frac{7}{12} \cdot \frac{2}{9} = \frac{1}{3} \cdot \frac{9}{2} \cdot \frac{2}{9} = \frac{1}{2} \cdot \frac{3}{1} \cdot \frac{3}{3} = \frac{3}{2}$$

$$2 \cdot 9 \cdot 3 \cdot 2 \cdot 7 \cdot 3 \cdot 2 \cdot 7 \cdot 3 \cdot 7$$

$$\frac{1}{2} \cdot \frac{7}{9} \cdot \frac{2}{3} = \frac{1}{9} \cdot \frac{9}{3} = \frac{27}{27}$$

$$2 \cdot 9 \cdot 3 = 7 \cdot 2 = 2 \cdot 28$$

$$9. (a) \frac{9}{10} \cdot 6 \cdot \frac{1}{4} = \frac{9}{10} \cdot \frac{6}{1} \cdot \frac{1}{4} = \frac{9}{2} \cdot \frac{3}{2} = \frac{27}{2}$$

$$10 \cdot 1 \cdot 2 \cdot 2 \cdot 20$$

$$9 \cdot \frac{1}{2} \cdot 9 \cdot \frac{6}{4}$$

$$\frac{10}{6} \cdot \frac{4}{1} = 10 \cdot 1$$

$$\frac{9}{2} \cdot \frac{3}{5} \cdot \frac{4}{1} = \frac{108}{5}$$

$$\frac{9}{10} \cdot \frac{1}{4} = 10 \cdot \frac{9}{1} \cdot \frac{1}{6} = \frac{3}{2} \cdot \frac{4}{2} \cdot \frac{1}{4} = \frac{3}{80}$$

$$12. (a) 6 \cdot 10 = \frac{6}{1} \cdot \frac{1}{10} = \frac{2}{1} \cdot \frac{3}{5} = \frac{1}{5} = \frac{3}{5}$$

$$(b) 10 \cdot 6 = \frac{10}{1} \cdot \frac{1}{6} = \frac{2}{1} \cdot \frac{5}{3} = \frac{1}{3} = \frac{5}{3}$$

$$1 \cdot 6 \cdot 1 \cdot 2 \cdot 3 \cdot 3$$

$$6 \cdot 10 = 60$$

$$10 \cdot 6 = 60$$

$$(a) 8 \cdot \frac{1}{4} = 8 \cdot \frac{1}{4} = 32$$

$$\frac{1}{8}$$

$$8 \cdot 4 = 2$$

$$8 \cdot 4 = 2$$

$$8 \cdot 4 = 32$$

$$14. (a) \frac{1}{7} \cdot 2 = \frac{1}{7} \cdot \frac{1}{2} = \frac{1}{14}$$

$$(b) \frac{1}{7} \cdot 2 = \frac{1}{7} \cdot \frac{2}{1} = \frac{2}{7}$$

(c) $\frac{1}{7} \cdot \frac{1}{2} = \frac{1}{14}$

$\frac{1}{7} \cdot \frac{1}{2} = \frac{1}{14}$

(d) $7 \div 2 = 7 \cdot \frac{1}{2} = \frac{7}{2}$

15. (a) $4 \cdot \frac{1}{6} = 4 \cdot \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$

(b) $\frac{4}{2} \div 6 = 4 \cdot \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$

(c) $4 \cdot \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$

$6 \overline{) 16636} \quad 4 \cdot 9 \quad 9$

(d) $\frac{4}{6} \div \frac{1}{6} = 4 \cdot \frac{6}{6} = 4$

$6 \overline{) 16636} \quad 1 \overline{) 36} = 4 \cdot \frac{36}{6} = 144$

16. (a) $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

$2 \overline{) 3236}$

$(1)2 \quad 2 \quad 1 \quad 3 \quad 3$

(b) $\frac{1}{2} \div \frac{1}{3} = \frac{1}{2} \cdot \frac{3}{1} = \frac{3}{2}$

$\frac{1}{2} \cdot \frac{3}{2} = \frac{3}{4}$

(c) $\frac{1}{2} \cdot \frac{3}{2} = \frac{3}{4}$

$2 \overline{) 339}$

(d) $\frac{1}{3} \div \frac{1}{2} = \frac{1}{3} \cdot \frac{2}{1} = \frac{2}{3}$

$(3) \quad 2 \quad (3 \quad 3) \quad 2 \quad 9$

$= \frac{1}{2} \cdot \frac{2}{4} = \frac{2}{8}$

Section 2.6 Multiplication and Division of Mixed Numbers

Section 2.6 Practice Exercises

improper

1
2. $\frac{5}{6} \cdot \frac{2}{9} = \frac{5}{27}$

3

2

7. $18 \frac{52}{13} \div 18 \frac{52}{13} = 18 \frac{52}{13} \cdot \frac{1}{13} = 18 \frac{4}{9} = 9 \frac{2}{9}$

$\frac{13}{5} \cdot \frac{26}{9} = 9$

1

2 1

$$4. \frac{20}{9} \div \frac{10}{3} = \frac{20}{9} \cdot \frac{3}{3} = \frac{20}{3}$$

$$5. \frac{42}{11} \div \frac{7}{2} = \frac{42}{11} \cdot \frac{2}{7} = \frac{12}{11}$$

$$6. \frac{32}{15} \div 4 = \frac{32}{15} \cdot \frac{1}{4} = \frac{8}{15}$$

1

8. 1. Multiply the whole number by the denominator.
2. Add the result to the numerator.
3. Write the result from step 2 over the denominator.

$$9. 3\frac{2}{5} = \frac{3 \times 5 + 2}{5} = \frac{17}{5}$$

$$2\frac{7}{10} = \frac{2 \times 10 + 7}{10} = \frac{27}{10}$$

$$1\frac{4}{7} = \frac{1 \times 7 + 4}{7} = \frac{11}{7}$$

$$4\frac{1}{8} = \frac{4 \times 8 + 1}{8} = \frac{33}{8}$$

Section 2.6 Multiplication and Division of Mixed Numbers

$$13. 6 \overline{) \frac{12}{77}} = 12 \frac{5}{6}$$

$$\begin{array}{r} 12 \frac{5}{6} \\ \underline{-6} \\ 17 \\ \underline{-12} \\ 5 \end{array}$$

$$14. 11 \overline{) 57} = 5 \frac{2}{11}$$

$$\begin{array}{r} 5 \frac{2}{11} \\ \underline{-55} \\ 2 \\ \underline{-2} \\ 0 \end{array}$$

$$15. 4 \overline{) \frac{9}{39}} = 9 \frac{3}{4}$$

$$\begin{array}{r} 9 \frac{3}{4} \\ \underline{-36} \\ 3 \end{array}$$

$$16. 2 \overline{) \frac{15}{31}} = 15 \frac{1}{2}$$

$$\begin{array}{r} 15 \frac{1}{2} \\ \underline{-2} \\ 11 \\ \underline{-10} \\ 1 \end{array}$$

$$17. (2 \frac{1}{3}) \div (3 \frac{1}{5}) = 37 \frac{1}{5}$$

$$\begin{array}{r} 37 \frac{1}{5} \\ \underline{-36} \\ 1 \end{array}$$

$$5 \overline{) \frac{1}{37}} = 7 \frac{2}{5}$$

$$\begin{array}{r} 7 \frac{2}{5} \\ \underline{-35} \\ 2 \end{array}$$

$$18. (5 \frac{1}{4}) \div (3 \frac{3}{4}) = 26 \frac{3}{4} = 39$$

$$\begin{array}{r} 26 \frac{3}{4} \\ \underline{-26} \\ 3 \end{array}$$

$$(5)(4) = 20$$

$$2 \overline{) \frac{19}{39}} = 19 \frac{1}{2}$$

$$\begin{array}{r} 19 \frac{1}{2} \\ \underline{-2} \\ 19 \end{array}$$

$$19. 2 \frac{1}{3} \cdot \frac{5}{7} = \frac{7}{3} \cdot \frac{5}{7} = \frac{5}{3}$$

$$3 \overline{) \frac{1}{5}} = 1 \frac{2}{3}$$

$$20. 6 \frac{1}{8} \cdot \frac{4}{7} = \frac{4}{8} = \frac{1}{2}$$

$$2 \overline{) \frac{3}{7}} = 3 \frac{1}{2}$$

$$\begin{array}{r} 3 \frac{1}{2} \\ \underline{-6} \\ 1 \end{array}$$

$$21. 4 \frac{2}{9} \cdot 9 = \frac{38}{9} \cdot 9 = 38$$

$$22. 3 \frac{1}{3} \cdot 6 = \frac{10}{3} \cdot 6 = 20$$

$$23. (5 \frac{3}{16}) \div (5 \frac{1}{16}) = \frac{83}{16} \div \frac{81}{16} = \frac{83}{81}$$

$$3 \overline{) \frac{27}{83}} = 27 \frac{2}{3}$$

$$\begin{array}{r} 27 \frac{2}{3} \\ \underline{-81} \\ 2 \end{array}$$

$$-21$$

$$2 \overline{) \frac{19}{39}} = 19 \frac{1}{2}$$

$$\begin{array}{r} 19 \frac{1}{2} \\ \underline{-2} \\ 19 \end{array}$$

$$24. \binom{8}{1} = \binom{8}{13}$$

$$3 \cdot \binom{1}{1} = 18$$

5

$$25. \binom{7}{2} \cdot 10 = \frac{29}{2} \cdot 10 = \underline{145}$$

$$\binom{4}{2} \cdot 4 \cdot 1 \cdot 2$$

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

$$2 \overline{) 145} = 72 \frac{1}{2}$$

$$\begin{array}{r} 72 \\ \underline{-14} \\ 5 \\ \underline{-4} \\ 1 \end{array}$$

26. $(2 \cancel{2}) \cdot 3 = \cancel{8} \cdot \cancel{3} = 8$

$$(3) \quad \cancel{3} \quad 1$$

$$\frac{5}{48} \cdot 0 = 0$$

$$\underline{1}$$

$$0 \cdot 610 = 0$$

29. $(3 \cancel{1}) \parallel (2 \cancel{1}) = \cancel{2} \cdot 15 = 15 = 7 \underline{1}$

$$(2) \parallel (7) \quad 2 \quad \cancel{7} \quad 2 \quad 2$$

30. $(1 \cancel{3}) \parallel (1) = 13 \quad \underline{10} \quad 4 \quad 8 \quad 8$

$$(10) \parallel (4) \quad \underline{10} \quad 4 \quad 8 \quad 8$$

31. $(5 \cancel{5}) \parallel (9 \parallel 1 \cancel{5}) = 5 \cdot \cancel{9} = 2 \underline{25}$

$$(8 \parallel 8) \quad 5 \quad 25$$

32. $(6 \cancel{1}) \parallel (2 \cancel{3}) \parallel (8) = \underline{49} \cdot \frac{11}{4} \cdot \frac{8}{4} = \frac{77}{4} = 19 \underline{1}$

$$(7) \quad 11 \quad 8 \quad 77 \quad 4$$

$$7 \quad 3 \quad 17 \quad 11 \quad 17 \quad 2 \quad 4 \quad 34$$

35. $5 \cancel{8} \div 1 \underline{1} = \underline{53} \quad \div 1 = \underline{53} \cdot \underline{3} = \underline{53} = 4 \underline{5}$

$$9 \quad 39 \quad 3 \quad 94 \quad 12 \quad 12$$

36. $12 \underline{4} \mid 2 \underline{3} = \underline{64} \mid \underline{13} \cdot \underline{64} \cdot \underline{5} = \underline{64} = 4 \underline{12}$

$$5 \quad 5 \quad 55 \quad 5 \quad \cancel{13} \quad 13$$

37. $2 \underline{1} \div 1 \underline{1} = \underline{5} \quad \div 17 = \underline{5} \cdot \underline{17} = \underline{40} = 2 \underline{6}$

$$2 \quad 16 \quad 2 \quad 16 \quad 2 \quad 17 \quad 17 \quad 17$$

38. $7 \underline{3} \div 1 \underline{7} = \underline{38} \div 19 = \underline{38} \cdot \underline{12} = \underline{24} = 4 \underline{4}$

$$5 \quad 12 \quad 5 \quad 12 \quad 5 \quad 195 \quad 5$$

39. $4 \underline{2} \cdot \underline{2} \cdot \underline{4} = \underline{2} \cdot \underline{9} = \underline{2} \cdot \underline{9} = 2$

$$1 \quad 1 \quad 9 \quad 9 \quad 4$$

40. $5 \underline{5} \div 2 \underline{1} = \underline{35} \div 7 = \underline{35} = 2$

$$6 \quad 36 \quad 36 \quad \cancel{7} \quad 22$$

41. $0 \mid 6 \underline{7} = 0$

$$12$$

42. $0 \mid 1 \underline{9} = 0$

43. $2 \underline{5} \mid \underline{1} = \underline{17} \mid \underline{1} = \underline{17} \cdot \underline{6} = 17$

$$6 \quad 6 \quad 6 \quad 66 \quad 1$$

$$10 \div 2 = 5 \quad 10 \div 4 = 2 \text{ R } 2$$

55

5

17 2

$$34. \quad 5 \overline{)103} = 20 \text{ R } 3 \quad 5 \overline{)103} = 20 \text{ R } 3 \quad 5 \overline{)103} = 20 \text{ R } 3$$

5 1

1

1

$$44. \quad 6 \frac{1}{2} \div \frac{1}{2} = 13 \quad 6 \frac{1}{2} \div \frac{1}{2} = 13$$

2 2 2 22 / 1

1

2

$$45. \quad 1 \frac{1}{3} \div \frac{2}{7} = \frac{4}{3} \div \frac{2}{7} = \frac{4}{3} \cdot \frac{7}{2} = \frac{14}{3} = 4 \frac{2}{3}$$

1

Section 2.6 Multiplication and Division of Mixed Numbers

$$46. 2\frac{1}{7} \div 1\frac{5}{3} = \frac{15}{7} \div 1\frac{5}{3} = \frac{15}{7} \cdot \frac{3}{8} = \frac{45}{56} = 0\frac{45}{56}$$

$$\begin{array}{r} 1 \quad 7 \quad 2 \quad 7 \quad 1 \quad 7 \quad 3 \\ 3 \quad 2 \div 2 = 2 \div 1 = 2 \cdot 2 \quad 4 = 1 \quad 4 \\ = \\ \underline{2} \quad \underline{14} \quad \underline{3} \quad \underline{14} \quad \underline{1} \quad \underline{14} \quad \underline{5} \end{array}$$

$$4 \quad 3 \div 3 = 3 \div 1 = 3 \cdot 3 \quad 9 = 19$$

$$49. 4\frac{3}{4} \cdot 8 = \frac{19}{4} \cdot 8 = 38$$

Tabitha earned \$38.

$$2\frac{2}{3} \cdot 10,500 = \frac{8}{3} \cdot \frac{10,500}{1} = \frac{84,000}{3} = 28,000$$

The land will cost Kurt \$28,000.

$$\begin{array}{r} 7 \quad 257 \quad 25 \quad 1285 \quad 1 \\ 25 \quad 10 \cdot 25 \quad \underline{10} \cdot \quad \rightarrow \quad 2 = 642 \quad 2 \\ = \end{array}$$

Average Americans consume $642\frac{1}{2}$ lb.

$$12 \div \frac{3}{4} = \frac{12}{1} \cdot \frac{4}{3} = 16$$

Kayla will have 16 doses.

$$(a) 1 \quad 4 \div \frac{1}{7} = 28$$

$$1\frac{3}{4} \div 3 = \frac{7}{4} \div 1\frac{3}{4} = \frac{7}{4} \cdot \frac{4}{7} = 1$$

Each child will inherit \$12 million.

$$(a) \text{ Lucy: } 35\frac{1}{2} \times 14 = \frac{71}{2} \cdot 14 = 497$$

$$\text{Ricky: } 42\frac{1}{2} \times 10 = \frac{85}{2} \cdot 10 = 425$$

$$497 - 425 = 72$$

Lucy earned \$72 more than Ricky.

$$(b) 497 + 425 = 922$$

Together they earned \$922.

$$56. 28 \div 1\frac{17}{24} = \frac{28}{1} \div \frac{41}{24} = \frac{28}{1} \cdot \frac{24}{41}$$

$$\frac{24}{41} = \frac{672}{41} = 16\frac{16}{41}$$

The roll is $16\frac{16}{41}$ ft long.

$$57. 2\frac{1}{5} \div 1\frac{1}{10} = \frac{11}{5} \div 1\frac{1}{10} = \frac{11}{5} \cdot \frac{10}{11} = 2$$

$$\frac{3}{3} \cdot \frac{5}{5} = \frac{15}{6} \cdot \frac{11}{8} = \frac{55}{8} = 6\frac{7}{8}$$

$$4 \cdot 1\frac{6}{2} = 4 \cdot \frac{6}{2} = 12$$

$$4 = 4 \div 4 = 1$$

$$\begin{array}{r} 7 \\ 4 \\ 4 \cdot 1 = 7 \\ \text{weeks old} \end{array}$$

1

$$\begin{array}{r} 1 \\ 6 \\ 59. 6 \div 1 \frac{1}{8} = \\ 1 \div 8 = 1 \cdot \\ 9 = 3 = 5_3 \end{array}$$

3

$$\begin{array}{r} 1 \\ 1 \\ 17 \\ 1 \end{array}$$

(b) $2 \cdot 8 \div 4 = 8 \div 4$

$$\begin{array}{r} 1 \\ 17 \cdot \frac{1}{4} = \frac{17}{4} = 8 \text{ weeks old} \end{array}$$

$$\begin{array}{r} 8 \\ 2 \\ 1 \\ 2 \\ 1 \end{array}$$

/

$$\begin{array}{r} 1 \\ 8 \\ 7 \\ 8 \\ 3 \\ 24 \\ 3 \end{array}$$

60. $8 \div 2 \frac{3}{7} = 1 \div 3 = 1 \cdot 7 \cdot 7 = 37$

$$\begin{array}{r} 3 \\ 2 \\ 7 \\ 10 \\ 2 \\ 27 \\ 9 \\ 4 \end{array}$$

61. -

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

$$62. \begin{array}{r} 4 \ 1 \ \overset{1}{4} \\ 8 \end{array} \cdot \begin{array}{r} 41 \ 41 \\ 5 \end{array} = 3 \frac{1}{8} = 3 \frac{5}{8} = 3 \frac{5}{8}$$

$$412 \frac{1}{0} \cdot 0 =$$

$$64. \begin{array}{r} 1 \\ 5 \end{array} \cdot \begin{array}{r} 16 \\ 3 \end{array} \div \begin{array}{r} 6 \\ 1 \end{array} = \begin{array}{r} 16 \\ 3 \end{array} \cdot \begin{array}{r} 1 \\ 1 \end{array} = 32$$

$$65. 10 \frac{1}{2} \div 9 = \frac{21}{2} \div \frac{9}{1} = \frac{21}{2} \cdot \frac{1}{9} = \frac{7}{6} = 1 \frac{1}{6}$$

$$7 \cdot \begin{array}{r} 8 \\ 1 \end{array} 9 = 7 \cdot \begin{array}{r} 17 \\ 9 \end{array} = \begin{array}{r} 34 \\ 63 \end{array}$$

$$0 \overline{)9} \ 3 = 0$$

$$68. \begin{array}{r} 3 \\ 8 \end{array} \div \begin{array}{r} 1 \\ 2 \end{array} = \begin{array}{r} 3 \\ 8 \end{array} \cdot \begin{array}{r} 2 \\ 2 \end{array} = \begin{array}{r} 3 \\ 8 \end{array} \cdot \begin{array}{r} 2 \\ 5 \end{array} = \begin{array}{r} 3 \\ 20 \end{array}$$

$$69. 12 \cdot \begin{array}{r} 1 \\ 8 \end{array} = \begin{array}{r} 12 \\ 8 \end{array} \cdot \begin{array}{r} 1 \\ 2 \end{array} = \begin{array}{r} 12 \\ 2 \end{array} = 1 \frac{1}{2}$$

$$74. \begin{array}{r} (\ 1) (\ 4) (\ 14) \\ 5 \ || \ 1 \ || \ \end{array} \begin{array}{r} 31 \\ 11 \\ 14 \end{array} = \begin{array}{r} 62 \\ 31 \\ 9 \end{array} = 39 \frac{4}{9}$$

$$78 \div 1 \ 3 \div 2 \ 4 = \begin{array}{r} 57 \\ 8 \end{array} \div \begin{array}{r} 4 \\ 3 \end{array} \div \begin{array}{r} 9 \\ 4 \end{array}$$

$$\begin{array}{r} 1911 \\ 57 \end{array} \div \begin{array}{r} 3 \\ 4 \end{array} = \begin{array}{r} 19 \\ 3 \end{array}$$

$$8 \overline{)4} \cdot \begin{array}{r} 9 \\ 9 \end{array} = 8 = 28$$

$$38 \frac{1}{5} \div 5 \ 7 \div 16 = \begin{array}{r} 5 \\ 8 \end{array} \div \begin{array}{r} 40 \\ 7 \end{array} \div \begin{array}{r} 21 \\ 16 \end{array}$$

$$\begin{array}{r} 25 \\ 8 \end{array} \cdot \begin{array}{r} 7 \\ 40 \end{array} \cdot \begin{array}{r} 16 \\ 21 \end{array} = \begin{array}{r} 10 \\ 24 \end{array} = 12 \frac{5}{24}$$

The perimeter of the garden is
 $2(20) + 2(15) = 40 + 30 = 70$ ft.

$$70 \overline{)1} \ 4 = \begin{array}{r} 1 \\ 1 \end{array} \overline{)4} = \begin{array}{r} 5 \\ 1 \end{array} \cdot \begin{array}{r} 14 \\ 4 \end{array} = 56$$

56 bricks will be needed.

$56 \times \$3 = \168
 The total cost is \$168.

$$\begin{array}{r} 1 \\ 1 \end{array} \cdot \begin{array}{r} 129 \\ 43 \end{array} = \begin{array}{r} 129 \\ 2 \end{array}$$

$$70. \frac{20}{2} \cdot \frac{2}{15} = \frac{20}{15} = \frac{4}{3} = 1 \frac{1}{3}$$

$6 \frac{8}{9} \div 0$ is undefined.

$$\frac{1}{2} \cdot 8 = 4$$

$$73. \left(\frac{32}{5} \right) \left(\frac{7}{34} \right) \left(\frac{33}{4} \right) = \frac{17}{4} \cdot \frac{7}{4} = \frac{119}{16} = 7 \frac{7}{16}$$

$$78. 64 \div 21 \div 2 = 64 \div 42 = \frac{32}{21} = 1 \frac{11}{21}$$

It takes 3 gallons of gas for Sara to get to and from work.

$$3 \times \$5 = \$15$$

It costs Sara \$15 each day.

$$\frac{2}{12} \cdot \frac{1}{3} = \frac{1}{18}$$

$$38 \frac{1}{3} \div 12 \frac{1}{2} = 315 \frac{1}{2}$$

$$81. 56\frac{5}{6} \div 3\frac{1}{6} = 17\frac{18}{19}$$

$$82. 25\frac{1}{5} \cdot 18\frac{1}{2} = 466\frac{1}{5}$$

$$83. 32\frac{7}{12} \div 12\frac{1}{6} = 2\frac{99}{146}$$

$$84. 106\frac{1}{9} \div 41\frac{5}{6} = 2\frac{404}{753}$$

$$85. 11\frac{1}{2} \cdot 41\frac{3}{4} = 480\frac{1}{8}$$

$$86. 9\frac{8}{9} \cdot 28\frac{1}{3} = 280\frac{5}{27}$$

Chapter 2 Review Exercises

Section 2.1

$$\frac{1}{2}$$

$$\frac{4}{7}$$

(a) $\frac{5}{3}$

Improper

(a) $\frac{1}{6}$

Proper

$$7$$

$$15$$

$$\frac{23}{8} \text{ or } 2\frac{7}{8}$$

$$\frac{7}{6} \text{ or } 1\frac{1}{6}$$

$$6\frac{1}{7} = \frac{6 \times 7 + 1}{7} = \frac{43}{7}$$

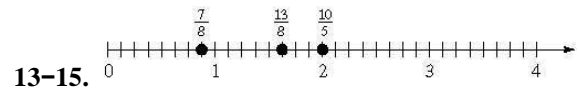
$$11\frac{2}{5} = \frac{11 \times 5 + 2}{5} = \frac{57}{5}$$

$$\frac{1}{4} \div \frac{1}{4} = \frac{17}{4} \cdot \frac{1}{1}$$

$$4 \div 4 = \frac{17}{4} \cdot \frac{1}{1} = 17$$

$$11. \begin{array}{r} 5 \\ 9 \overline{) 47} \\ \underline{-45} \\ 2 \end{array} \quad 5\frac{2}{9}$$

$$\frac{23}{21} = 1\frac{2}{21}$$



$$16. \begin{array}{r} 3 \\ 7 \overline{) 941} \\ \underline{-7} \\ 24 \\ \underline{-21} \\ 31 \end{array} \quad 134\frac{3}{7}$$

$$\frac{-28}{3}$$

$$17. \begin{array}{r} 60 \\ 26 \overline{) 1582} \\ \underline{-156} \\ 22 \\ \underline{-0} \\ 22 \end{array} \quad 26 \quad 13$$

Section 2.2

21, 51, 1200

55, 140, 260, 1200

58, 124, 140, 260, 1200

1

Prime

Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

Composite $44 = 4 \times 11$

Neither

Neither

$$2 \overline{) 4}$$

$$2 \overline{) 8}$$

$$2 \overline{) 16}$$

$$2 \overline{) 32}$$

$$2 \overline{) 64}$$

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$$

$$5 \overline{) 55}$$

$$3 \overline{) 165}$$

$$2 \overline{) 330}$$

$$2 \cdot 3 \cdot 5 \cdot 11 = 330$$

$$3 \overline{) 9}$$

$$5 \overline{) 45}$$

$$5 \overline{) 225}$$

$$2 \overline{) 450}$$

$$2 \overline{) 900}$$

$$\frac{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 \cdot 2 \cdot 2}{2 \cdot 3} = \frac{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}{3} = 900$$

1, 2, 3, 4, 6, 8, 12, 16, 24, 48

1, 2, 4, 5, 8, 10, 16, 20, 40, 80

Section 2.3

$$3 \times 9 \quad 6 \times 5$$

$$18 \neq 30$$

$$\frac{3}{6} \neq \frac{5}{9}$$

$$15 \times 14 \quad 21 \times 10$$

$$210 = 210$$

$$\frac{15}{21} = \frac{10}{14}$$

$$\frac{5}{20} = \frac{5}{40} = \frac{1}{8}$$

$$\frac{14}{49} = \frac{2}{7} = \frac{2}{7}$$

$$\frac{24}{16} = \frac{3}{2} = \frac{3}{2}$$

$$\frac{63}{27} = \frac{9}{9} = 1$$

$$\frac{42}{21} = 2$$

$$\frac{17}{17} = 1$$

$$\frac{42}{21} = 2$$

$$\frac{120}{150} = \frac{4}{5} = \frac{4}{5}$$

$$\frac{1400}{2000} = \frac{14}{20} = \frac{7}{10} = \frac{7}{10}$$

$$\frac{42}{45} = \frac{14}{15} = \frac{14}{15}$$

$$\frac{45}{45} = 1$$

$$\frac{3}{7} = \frac{3}{7} = \frac{3}{7}$$

$$\frac{45}{15} = 3$$

41. (a) $\frac{6}{10} = \frac{3}{5} = \frac{3}{5}$

$$\frac{6}{15} = \frac{2}{5} = \frac{2}{5}$$

Section 2.4

42. $\frac{3}{5} \times \frac{2}{7} = \frac{6}{35}$

$$\frac{4}{3} \times \frac{8}{3} = \frac{32}{9}$$

$$\frac{9}{14} \cdot \frac{14}{9} = 1$$

$$45. 33 \cdot \frac{5}{11} = 15$$

$$46. \frac{2}{3} \cdot \frac{3}{2} = 1$$

$$47. \frac{45}{7} \cdot \frac{6}{10} = \frac{27}{7}$$

$$48. \frac{1}{10} \cdot \frac{10}{10} \cdot \frac{10}{10} \cdot \frac{10}{10} \cdot \frac{10}{10} = \frac{1}{10}$$

$$49. \frac{1}{5} \cdot \frac{1}{10} = \frac{1}{50}$$

2
5

$$54. A = \frac{1}{2}(12) \left(\frac{17}{2} \right) = 6 \cdot \frac{17}{2} = 51 \text{ f}^2$$

$$55. A = lw = \frac{5}{4} \cdot 8 \cdot \frac{10}{3} = 100 \text{ m}^2$$

$$A = \frac{20}{3} \cdot \frac{1}{2} \cdot \frac{20}{3} = \frac{200}{9}$$

$$2. \frac{20}{3} \cdot \frac{1}{2} \cdot \frac{20}{3} = \frac{200}{9}$$

$$57. 4 \cdot 8 = 32 \text{ or } 3 \cdot 2 = 6$$

Maximus requires $\frac{7}{2}$ or $3 \frac{1}{2}$ yd

of lumber.

$$58. \frac{1}{4} \cdot 3600 = 900$$

There are 900 African American students.

$$= \frac{1}{100}$$

$$59. \frac{1}{12} \cdot 3600 = 300$$

$$\frac{1}{12} \cdot 3600 = \frac{1}{12} \cdot \frac{3600}{1} = \frac{3600}{12} = 300$$

$$50. \left| \frac{1}{20} \cdot \frac{1}{3} \right| = \frac{1}{60} = \frac{1}{10} \cdot \frac{1}{10} \cdot \frac{1}{10} = 1000$$

$$0 \quad 1$$

$$51. \left(\frac{1}{10} \right)^3 \left(\frac{1000}{17} \right) = \frac{1}{1000} \cdot \frac{1000}{17} = \frac{1}{17}$$

$$1$$

$$\frac{1}{2}$$

$$A = 2bh$$

$$A = lw$$

$$\frac{1}{1} \cdot \frac{3600}{1} = 3600$$

There are 300 Asian American students.

$$\frac{1}{2} \cdot \frac{1}{6} \cdot 3600 = \frac{1}{12} \cdot 3600 = 300$$

300 There are 300 Hispanic female students.

$$61. \frac{1}{2} \cdot \frac{5}{12} \cdot 3600 = \frac{5}{24} \cdot 3600 = \frac{5 \cdot 3600}{24} = \frac{18000}{24} = 750$$

There are 750 Caucasian male students.

Section 2.5

$$3 \frac{4}{4} \div \frac{1}{1} = 3 \cdot \frac{4}{1} = 12$$

63. $\frac{1}{12} \cdot 12 = \frac{1 \cdot 12}{12} = 1$

$$7^2 = 49$$

$$\frac{1}{7}$$

Reciprocal does not exist.

$$6$$

$$\frac{1}{5}$$

multiplying

$$\frac{28}{20} \cdot \frac{21}{15} = \frac{28 \cdot 21}{20 \cdot 15} = \frac{4 \cdot 7 \cdot 3 \cdot 7}{4 \cdot 5 \cdot 3 \cdot 5} = \frac{7 \cdot 7}{5 \cdot 5} = \frac{49}{25}$$

$$\frac{7}{9} \cdot \frac{35}{63} = \frac{7 \cdot 35}{9 \cdot 63} = \frac{7 \cdot 5 \cdot 7}{3 \cdot 3 \cdot 7 \cdot 3} = \frac{5}{9}$$

72. $\frac{6}{21} \cdot \frac{1}{3} = \frac{6 \cdot 1}{21 \cdot 3} = \frac{2}{7}$

73. $\frac{3}{12} \div \frac{1}{5} = \frac{3}{12} \cdot \frac{5}{1} = \frac{15}{12} = \frac{5}{4}$

76. $\left(\frac{1}{19}\right)^3 \div \left(\frac{1}{19}\right)^3 = \frac{1^3}{19^3} \cdot \frac{19^3}{1^3} = 1$

77. $\left(\frac{12}{5}\right)^2 \div 36 = \frac{144}{25} \div 36 = \frac{144}{25} \cdot \frac{1}{36} = \frac{4}{25}$

$$\frac{36}{5} \cdot \frac{4}{5} = \frac{144}{25} = \frac{4}{25}$$

78. $\frac{81}{55} \div \frac{3}{11} \div \frac{3}{2} = \frac{81}{55} \cdot \frac{11}{3} \cdot \frac{2}{3} = \frac{18}{5}$

79. $\frac{4}{13} \cdot \left(\frac{1}{2}\right)^3 \div 2 = \frac{4}{13} \cdot \frac{1}{8} \div 2 = \frac{1}{26} \div 2 = \frac{1}{52}$

$$\frac{4}{5} \cdot 20 = \frac{4 \cdot 20}{5} = \frac{80}{5} = 16$$

81. $18 \div \frac{2}{3} = 18 \cdot \frac{3}{2} = 27$

$5 \times 2 = 10$. There will be 10 pieces.

$$\frac{45}{22} = \frac{45}{22} =$$

$$2 \frac{1}{22}$$

$$(8) \quad 1 \frac{8}{2} \quad 2 \quad 2$$

Chapter 2 Test

(a) $8 \frac{5}{8}$

Proper

(a) $\frac{7}{3}$

Improper