Vocabulary and Readiness Check

Use the choices below to fill in each blank.

- standard form
- period
- whole
- expanded form
- place value
- words

1. The numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, ... are called ____ whole ____ numbers.
2. The number 1,286 is written in ____ standard form ____.
3. The number "twenty-one" is written in ____ words ____.
4. The number 900 ÷ 60 ÷ 5 is written in ____ expanded form ____.
5. In a whole number, each group of three digits is called a(n) ____ period ____.
6. The ____ place value ____ of the digit 4 in the whole number 264 is ones.

1.2 Exercise Set

Objective 6 Determine the place value of the digit 5 in each whole number. See Examples 1 through 3.

1. 657 2. 905 3. 5423 4. 6527
tens ones thousands hundreds
5. 43,526,000 6. 79,050,000 7. 5,408,092 8. 51,682,700
hundred-thousands ten-thousands millions ten-millions

Objective 7 Write each whole number in words. See Examples 4 through 7.

9. 354 10. 316 11. 8279 12. 5445
tree hundred fifty-four three hundred sixteen eight thousand, two hundred seventy-nine five thousand, four hundred forty-five
13. 26,990 14. 42,009 15. 2,388,000 16. 3,204,000
twenty-six thousand, nine hundred ninety forty-two thousand, nine two million, three hundred eighty-eight thousand three million, two hundred four thousand
17. 24,350,185 18. 47,033,107 twenty-four million, three hundred fifty thousand, one hundred eighty-five forty-seven million, thirty-three thousand, one hundred seven

Write each number in the sentence in words. See Examples 4 through 7.

19. As of this writing, the population of Iceland is 304,367. (Source: The World Factbook) three hundred four thousand, three hundred sixty-seven

20. Between 2000 and 2005, Brazil lost 13,382 acres of rainforest. thirteen thousand, three hundred eighty-two

21. Due for completion in 2009, the Burj Dubai, in Dubai, United Arab Emirates, a hotel and office building, will be the tallest in the world at a height of more than 2600 feet. (Source: Council on Tall Buildings and Urban Habitat) two thousand, six hundred

22. In a recent year, there were 99,769 patients in the United States waiting for an organ transplant. (Source: United Network for Organ Sharing) ninety-nine thousand, seven hundred sixty-nine

23. Each day, UPS delivers an average of 15,800,000 packages worldwide. (Source: UPS) fifteen million, eight hundred thousand

24. Each year, 350,000,000 Americans visit a local carnival. (Source: Outdoor Amusement Business Association) three hundred fifty million
25. The highest point in Colorado is Mount Elbert, at an
elevation of 14,433 feet. (Source: U.S. Geological
Survey) fourteen thousand, four hundred thirty-three

26. The highest point in Oregon is Mount Hood, at an
elevation of 11,239 feet. (Source: U.S. Geological
Survey) eleven thousand, two hundred thirty-nine

27. In a recent year, the Great Internet Mersenne Prime
Search, a cooperative computing project, helped find
a prime number that has nearly 13,000,000 digits.
(Source: Science News) thirteen million

28. The Goodyear blimp Eagle holds 202,700 cubic feet
of helium. (Source: The Goodyear Tire & Rubber
Company) two hundred two thousand, seven hundred

Write each whole number in standard form. See Examples 8 through 11.

29. Six thousand, five hundred eighty-seven
6587

30. Four thousand, four hundred sixty-eight
4486

31. Fifty-nine thousand, eight hundred
59,800

32. Seventy-three thousand, two
73,002

33. Thirteen million, six hundred one thousand, eleven
13,601,011

34. Sixteen million, four hundred five thousand, sixteen
16,405,016

35. Seven million, seventeen
7,000,017

36. Two million, twelve
2,000,012

37. Two hundred sixty thousand, nine hundred ninety-
seven
260,997

38. Six hundred forty thousand, eight hundred eighty-
one
640,881

Write the whole number in each sentence in standard form. See Examples 8 through 11.

39. The Mir Space Station orbits above Earth at an
average altitude of three hundred ninety-five
kilometers. (Source: Heavens Above) 395

40. The average distance between the surfaces of the
Earth and the Moon is about two hundred thirty-
four thousand miles. 234,000

41. The base price for a 2009 Hummer H3T is thirty
thousand, seven hundred fifty dollars. (Source:
Hummer.com)
30,750

42. The soon-to-be world’s tallest free-standing tower is
the Guangzhou TV Tower in China. Once completed
in (2009), its height will be two thousand one feet
tall. (Source: The World Almanac 2009)
2001

43. The Warner Brothers film The Dark Knight set the
world record for opening day income when it took in
sixty-six million, four hundred thousand dollars on
July 18, 2008. (Source: USA Box Office)
66,400,000

44. The Sony/Columbia Pictures film Spider-man 3 holds
the record for second-highest opening day income; it
took in fifty-nine million, eight hundred forty thousand
dollars on May 4, 2007. (Source: USA Box Office)
59,840,000
45. Morten Anderson, who played in the National Football League in 1982-2007, holds the record for most career field goals at five hundred sixty-five. *(Source: NFL)*

565

46. Morten Anderson also holds the record for the most field goals attempted in a career at seven hundred nine. *(Source: NFL)*

709

Objective 6 Write each whole number in expanded form. See Example 12.

47. 209, 200 + 9

48. 789, 700 + 80 + 9

49. 3470, 3000 + 400 + 70

50. 6040, 6000 + 40

51. 80,774

80,000 + 700 + 70 + 4

52. 20,215

20,000 + 200 + 10 + 5

53. 66,049

60,000 + 6000 + 40 + 9

54. 99,032

90,000 + 9000 + 30 + 2

55. 39,680,000

30,000,000 + 9,000,000 + 600,000 + 80,000

56. 47,703,029

40,000,000 + 7,000,000 + 700,000 + 300 + 20 + 9

47. Mount Shasta erupted in the 1700s. Locate, then write this eruption year in standard form.

1786

58. Mount Baker erupted in the 1700s. Locate, then write this eruption year in standard form.

1792

49. Which volcano in the table has the most eruptions?

Mount Baker

50. Which volcano(es) in the table has two eruptions?

Mount Shasta, Mount St. Helens

51. Which volcano in the table had the earliest eruption?

Glacier Peak

52. Which volcano in the table had the latest eruption?

Mt. St. Helens

Objective 12 Mixed Practice The table shows the beginning year of recent eruptions of major volcanoes in the Cascade Mountains. Use this table to answer Exercises 57 through 62. See the chapter opener and Examples 8 through 11, and 13.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mt. Baker</td>
<td>Washington</td>
<td>1792</td>
<td>1843</td>
<td>1870,1880</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glacier Peak</td>
<td>Washington</td>
<td>1750 (?)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mt. Rainier</td>
<td>Washington</td>
<td>1841,1845</td>
<td>1854</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mt. St. Helens</td>
<td>Washington</td>
<td>1800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mt. Hood</td>
<td>Oregon</td>
<td></td>
<td></td>
<td>1854,1859,1865</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three Sisters</td>
<td>Oregon</td>
<td></td>
<td></td>
<td>1853 (?)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine Lake</td>
<td>California</td>
<td></td>
<td></td>
<td></td>
<td>1910</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mt. Shasta</td>
<td>California</td>
<td>1786</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1855</td>
</tr>
<tr>
<td>Cinder Cone</td>
<td>California</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1850</td>
<td></td>
</tr>
<tr>
<td>Lassen Peak</td>
<td>California</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1914</td>
<td></td>
</tr>
<tr>
<td>Chaos Crags</td>
<td>California</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1854</td>
<td></td>
</tr>
</tbody>
</table>

*Other major volcanoes in the Cascades have had eruptions from 1750 to present; Source: Harris*
The table shows the top ten popular breeds of dogs in 2007 according to the American Kennel Club. Use this table to answer Exercises 63 through 68. See Example 13.

### Top Ten American Kennel Club Registrations in 2007

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of Registered Dogs</th>
<th>Average Dog Maximum Height (in inches)</th>
<th>Average Dog Maximum Weight (in pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beagle</td>
<td>39,384</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Boxer</td>
<td>35,388</td>
<td>25</td>
<td>70</td>
</tr>
<tr>
<td>Bulldog</td>
<td>21,037</td>
<td>25</td>
<td>90</td>
</tr>
<tr>
<td>Dachshund</td>
<td>36,033</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>German shepherd dog</td>
<td>43,575</td>
<td>26</td>
<td>95</td>
</tr>
<tr>
<td>Golden retriever</td>
<td>42,962</td>
<td>24</td>
<td>80</td>
</tr>
<tr>
<td>Labrador retriever</td>
<td>123,760</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Poodle (standard, miniature, and toy)</td>
<td>29,939</td>
<td>standard: 26</td>
<td>standard: 70</td>
</tr>
<tr>
<td>Shih Tzu</td>
<td>27,282</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Yorkshire terrier</td>
<td>48,346</td>
<td>9</td>
<td>7</td>
</tr>
</tbody>
</table>

(Source: American Kennel Club)

63. Which breed has fewer dogs registered, Boxer or Dachshund? Boxer

64. Which breed has more dogs registered, Golden retriever or German shepherd? German Shepherd

65. Which breed has the most American Kennel Club registrations? Write the number of registrations for this breed in words. Labrador retriever; one hundred twenty-three thousand, seven hundred sixty

66. Which of the listed breeds has the fewest registrations? Write the number of registered dogs for this breed in words. Bulldog; twenty-one thousand, thirty-seven

67. What is the maximum weight of an average-size Dachshund? 25 pounds

68. What is the maximum height of an average-size standard poodle? 26 inches

### Concept Extensions

69. Write the largest four-digit number that can be made from the digits 1, 9, 8, and 6 if each digit must be used once. 9861

70. Write the largest five-digit number that can be made using the digits 5, 3, and 7 if each digit must be used at least once. 77,753

Check to see whether each number written in standard form matches the number written in words. If not, correct the number in words. See the Concept Check in this section.

71. No; one hundred five

72. Yes

73. If a number is given in words, describe the process used to write this number in standard form. Answers may vary

74. If a number is written in standard form, describe the process used to write this number in expanded form. Answers may vary

75. Called “Roadrunner” by its users, a computer built by IBM for Los Alamos National Laboratory topped the list of the 500 fastest computers, burning up the bytes at 1,026 petaflops, or more than 1000 trillion arithmetic operations per second. Look up “trillion” in a dictionary and use the definition to write this number in standard form. (Source: TechWorld) 1,000,000,000,000,000

76. A Hurricane Katrina victim is seeking $3 quadrillion from the U.S. government. Look up “quadrillion” (in the American system) and write 3 quadrillion in standard form. (Source: Associated Press) 3,000,000,000,000,000,000
1.3 ADDING AND SUBTRACTING WHOLE NUMBERS, AND PERIMETER

Objective 6 Adding Whole Numbers

The iPod is a hard drive–based portable audio player. As of 2006, it is the most popular digital music player in the United States.

Suppose that an electronics store received a shipment of two boxes of iPods one day and an additional four boxes of iPods the next day. The total shipment in the two days can be found by adding 2 and 4.

\[
2 \text{ boxes of iPods } + 4 \text{ boxes of iPods } = 6 \text{ boxes of iPods}
\]

The sum (or total) is 6 boxes of iPods. Each of the numbers 2 and 4 is called an addend, and the process of finding the sum is called addition.

\[
\begin{array}{c@{}c@{}c}
\text{addend} & + & \text{addend} \\
2 & + & 4 \\
\hline
6 & & \text{sum}
\end{array}
\]

To add whole numbers, we add the digits in the ones place, then the tens place, then the hundreds place, and so on. For example, let’s add 2236 + 160.

\[
\begin{array}{c}
\text{2236} \\
+ \text{160} \\
\hline
\text{2396}
\end{array}
\]

 TEACHING TIP
Vocabulary Check
The new vocabulary words in this section include sum, addend, perimeter, minuend, subtrahend, and difference.

PRACTICE 1
Add: 4135 + 252

 TEACHING TIP
Point out to students that they can and should rewrite problems in a form that makes it easy for them to solve. If an addition problem is given horizontally, they can rewrite it vertically so that it is easy to line up numbers with the same place value.

Example 1 Add: 46 + 713

Solution:

\[
\begin{array}{c@{}c@{}c@{}c@{}c@{}c@{}c}
\text{4} & \text{6} \\
+ & \text{7} & \text{1} & \text{3} \\
\hline
\text{7} & \text{5} & \text{9}
\end{array}
\]

Work Practice 1

Adding by Carrying

When the sum of digits in corresponding place values is more than 9, carrying is necessary. For example, to add 365 + 89, add the ones-place digits first.

Carrying

\[
\begin{array}{c@{}c@{}c@{}c}
\text{3} & \text{6} & \text{5} & + \\
\hline
& & & \text{8} & \text{9}
\end{array}
\]

5 ones + 9 ones = 14 ones or 1 ten + 4 ones

\[
\begin{array}{c}
\text{4} \\
\hline
\text{1} \text{ ten}
\end{array}
\]

Write the 4 ones in the ones place and carry the 1 ten to the tens place.

Next, add the tens-place digits.

\[
\begin{array}{c@{}c@{}c@{}c}
\text{3} & \text{6} & \text{5} & + \\
\hline
& & & \text{8} & \text{9}
\end{array}
\]

1 ten + 6 tens + 8 tens = 15 tens or 1 hundred + 5 tens

\[
\begin{array}{c}
\text{5} & \text{4} \\
\hline
\text{1} \text{ hundred}
\end{array}
\]

Write the 5 tens in the tens place and carry the 1 hundred to the hundreds place.

Next, add the hundreds-place digits.

\[
\begin{array}{c@{}c@{}c@{}c}
\text{4} & \\
\hline
\text{3} & \text{6} & \text{5}
\end{array}
\]

1 hundred + 3 hundreds = 4 hundreds

\[
\begin{array}{c@{}c@{}c@{}c}
\text{4} & \text{5} & \text{4} \\
\hline
\text{1} \text{ hundred}
\end{array}
\]

Write the 4 hundreds in the hundreds place.

Answer

1. 4587
Vocabulary and Readiness Check

Use the choices below to fill in each blank.

0     order     addend     associative
sum   number     grouping     commutative
perimeter     minuend     subtrahend     difference

1. The sum of 0 and any number is the same ___ number ___.
2. In 35 + 20 = 55, the number 35 is called the ___ sum ___ and 35 and 20 are each called a(n) ___ addend ___.
3. The difference of any number and that same number is ___ 0 ___.
4. The difference of any number and 0 is the same ___ number ___.
5. In 37 - 19 = 18, the number 37 is the ___ minuend ___, the 19 is the ___ subtrahend ___, and the 18 is the ___ difference ___.
6. The distance around a polygon is called its ___ perimeter ___.
7. Since 7 + 10 = 10 + 7, we say that changing the ___ order ___ in addition does not change the sum. This property is called the ___ commutative ___ property of addition.
8. Since (3 + 1) + 20 = 3 + (1 + 20), we say that changing the ___ grouping ___ in addition does not change the sum. This property is called the ___ associative ___ property of addition.

1.3 Exercise Set

Objective Add. See Examples 1 through 4.

1. 14 + 22 = 36      2. 27 + 31 = 58      3. 62 + 230 = 292
4. 37 + 542 = 579  5. 13 + 12 = 24  10. 17,427 + 821,059 = 838,486

6. 23 + 30 = 98

7. 5267 + 132 = 5399

8. 236 + 6243 = 6479

9. 22,781 + 186,297 = 209,078

11. 8 + 7 = 15

12. 3 + 2 = 5

13. 81 + 12 = 93

14. 64 + 32 = 96

15. 24 + 9006 + 489 + 2407 = 11,926

16. 16 + 1056 + 748 + 7700 = 9590

17. 6820 + 5626 = 12,446

18. 6789 + 5555 = 12,344
### Chapter 1 | The Whole Numbers

<table>
<thead>
<tr>
<th>19.</th>
<th>20.</th>
<th>21.</th>
<th>22.</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>26</td>
<td>121,742</td>
<td>.504,218</td>
</tr>
<tr>
<td>628</td>
<td>582</td>
<td>57,279</td>
<td>321,920</td>
</tr>
<tr>
<td>5,762</td>
<td>4,763</td>
<td>26,586</td>
<td>38,507</td>
</tr>
<tr>
<td>+29,462</td>
<td>+62,511</td>
<td>+426,782</td>
<td>÷594,687</td>
</tr>
<tr>
<td>35,901</td>
<td>67,882</td>
<td>632,389</td>
<td>1,459,332</td>
</tr>
</tbody>
</table>

**Objective B** Subtract. Check by adding. See Examples 5 through 8.

<table>
<thead>
<tr>
<th>23.</th>
<th>24.</th>
<th>25.</th>
<th>26.</th>
<th>27.</th>
</tr>
</thead>
<tbody>
<tr>
<td>749</td>
<td>957</td>
<td>62</td>
<td>55</td>
<td>922</td>
</tr>
<tr>
<td>−149</td>
<td>−257</td>
<td>−37</td>
<td>−29</td>
<td>−634</td>
</tr>
<tr>
<td>600</td>
<td>700</td>
<td>25</td>
<td>26</td>
<td>288</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>28.</th>
<th>29.</th>
<th>30.</th>
<th>31.</th>
<th>32.</th>
</tr>
</thead>
<tbody>
<tr>
<td>674</td>
<td>600</td>
<td>300</td>
<td>6283</td>
<td>5349</td>
</tr>
<tr>
<td>−299</td>
<td>−432</td>
<td>−149</td>
<td>−560</td>
<td>−720</td>
</tr>
<tr>
<td>375</td>
<td>168</td>
<td>151</td>
<td>5723</td>
<td>4629</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>33.</th>
<th>34.</th>
<th>35.</th>
<th>36.</th>
<th>37.</th>
</tr>
</thead>
<tbody>
<tr>
<td>533</td>
<td>724</td>
<td>1983 − 1904</td>
<td>1983 − 1914</td>
<td>50,000 − 17,289</td>
</tr>
<tr>
<td>−29</td>
<td>−16</td>
<td>79</td>
<td>69</td>
<td>32,711</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>38.</th>
<th>39.</th>
<th>40.</th>
<th>41.</th>
<th>42.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40,000 − 23,582</td>
<td>7020 − 1979</td>
<td>6050 − 1878</td>
<td>51,111 − 19,898</td>
<td>62,222 − 39,898</td>
</tr>
<tr>
<td>16,418</td>
<td>5041</td>
<td>4172</td>
<td>31,213</td>
<td>22,324</td>
</tr>
</tbody>
</table>

**Objectives B E Mixed Practice** Add or subtract as indicated. See Examples 1 through 8.

<table>
<thead>
<tr>
<th>43.</th>
<th>44.</th>
<th>45.</th>
<th>46.</th>
</tr>
</thead>
<tbody>
<tr>
<td>986</td>
<td>986</td>
<td>76 − 67</td>
<td>80 + 93 + 17 + 9 + .2</td>
</tr>
<tr>
<td>+48</td>
<td>−48</td>
<td>9</td>
<td>201</td>
</tr>
<tr>
<td>1034</td>
<td>938</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>47.</th>
<th>48.</th>
<th>49.</th>
<th>50.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9000</td>
<td>10,000</td>
<td>10,962</td>
<td>12,468</td>
</tr>
<tr>
<td>−482</td>
<td>−1786</td>
<td>4851</td>
<td>3211</td>
</tr>
<tr>
<td>8518</td>
<td>8214</td>
<td>+7063</td>
<td>+1988</td>
</tr>
<tr>
<td>22,876</td>
<td>17,667</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Objective C** Find the perimeter of each figure. See Examples 9 and 10.

<table>
<thead>
<tr>
<th>51.</th>
<th>52.</th>
<th>53.</th>
<th>54.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 feet</td>
<td>8 feet</td>
<td>3 centimeters</td>
<td>9 miles</td>
</tr>
<tr>
<td>10 feet</td>
<td>25 ft</td>
<td>12 cm</td>
<td>24 mi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>52.</th>
<th>54.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 centimeters</td>
<td>3 miles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>53.</th>
<th>54.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 inches</td>
<td>8 inches</td>
</tr>
<tr>
<td>24 in.</td>
<td>3 miles</td>
</tr>
</tbody>
</table>
55. 1 inch 8 inches 3 inches 5 inches 7 inches
29 in.

56. 6 inches 5 inches 5 inches 7 inches 3 inches 4 inches
37 in.

57. 10 meters 44 m
5 meters 5 meters 12 meters

58. 8 feet 40 ft
3 feet 4 feet 5 feet

59. Find the sum of 297 and 1796. 2093

60. Find the sum of 802 and 6487. 7289

61. Find the total of 76, 39, 8, 17, and 126. 266

62. Find the total of 89, 45, 2, 19, and 341. 496

63. Find the difference of 41 and 21. 20

64. Find the difference of 16 and 5. 11

65. What is 452 increased by 92? 544

66. What is 712 increased by 38? 750

67. Find 108 less 36. 72

68. Find 25 less 12. 13

69. Find 12 subtracted from 100. 88

70. Find 86 subtracted from 90. 4

71. The population of Florida is projected to grow from 19,308 thousand in 2010 to 22,478 thousand in 2020. What is Florida’s projected population increase over this time period? 3170 thousand

72. The population of California is projected to grow from 39,136 thousand in 2010 to 44,126 thousand in 2020. What is California’s projected population increase over this time period? 4990 thousand

73. A new DVD player with remote control costs $295. A college student has $914 in her savings account. How much will she have left in her savings account after she buys the DVD player? $619

74. A stereo that regularly sells for $547 is discounted by $99 in a sale. What is the sale price? $448
A river basin is the geographic area drained by a river and its tributaries. The Mississippi River Basin is the third largest in the world and is divided into six sub-basins, whose areas are shown in the following bar graph. Use this graph for Exercises 75 through 78.

75. Find the total U.S. land area drained by the Upper Mississippi and Lower Mississippi sub-basins. 264,000 sq mi

76. Find the total U.S. land area drained by the Ohio and Tennessee sub-basins. 204,000 sq mi

77. How much more square feet of land is drained by the Missouri sub-basin than the Arkansas Red-White sub-basin? 283,000 sq mi

78. How much more square feet of land is drained by the Upper Mississippi sub-basin than the Lower Mississippi sub-basin? 114,000 sq mi

79. A homeowner is installing a fence in his backyard. How many feet of fencing are needed to enclose the yard below? 340 ft

80. A homeowner is considering installing gutters around her home. Find the perimeter of her rectangular home. 210 ft

81. Professor Graham is reading a 503-page book. If she has just finished reading page 239, how many more pages must she read to finish the book? 264 pages

82. When a couple began a trip, the odometer read 55,492. When the trip was over, the odometer read 59,330. How many miles did they drive on their trip? 3828 mi

83. In 2008, the country of New Zealand had 29,719,969 more sheep than people. If the human population of New Zealand in 2008 was 4,280,031, what was the sheep population? (Source: Statistics New Zealand) 34,000,000

84. During one month in 2008, the two top-selling automobiles in the United States were the Honda Accord and the Toyota Camry. There were 41,382 Accords and 44,064 Camrys sold that month. What was the total number of Accords and Camrys sold in that month? (Source: Toyota Corp. and Honda Corp.) 85,446 automobiles

The decibel (dB) is a unit of measurement for sound. Every increase of 10 dB is a tenfold increase in sound intensity. The bar graph below shows the decibel levels for some common sounds. Use this graph for Exercises 85 through 88.

85. What is the dB rating for live rock music? 100 dB

86. Which is the quietest of all the sounds shown in the graph? leaves rustling

87. How much louder is the sound of snoring than normal conversation? 58 dB

88. What is the difference in sound intensity between live rock music and loud television? 30 dB
89. In 2008, there were 2677 Gap Inc. (Gap, Banana Republic, Old Navy) stores located in the United States and 493 located outside the United States. How many Gap Inc. stores were located worldwide? (Source: Gap, Inc.) 3170

90. Automobile classes are defined by the amount of interior room. A subcompact car is defined as a car with a maximum interior space of 99 cubic feet. A midsize car is defined as a car with a maximum interior space of 119 cubic feet. What is the difference in volume between a midsize and a subcompact car? 20 cu ft

91. The largest permanent Monopoly board is made of granite and is located in San Jose, California. It is in the shape of a square with side lengths of 31 ft. Find the perimeter of the square playing board. 124 ft

92. The smallest commercially available jigsaw puzzle is a 1000-piece puzzle manufactured in Spain. It is in the shape of a rectangle with length of 18 inches and width of 12 inches. Find the perimeter of this rectangular-shaped puzzle. 60 in.

The table shows the number of Target stores in ten states. Use this table to answer Exercises 93 through 98.

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Stores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pennsylvania</td>
<td>47</td>
</tr>
<tr>
<td>California</td>
<td>225</td>
</tr>
<tr>
<td>Florida</td>
<td>115</td>
</tr>
<tr>
<td>Georgia</td>
<td>51</td>
</tr>
<tr>
<td>Illinois</td>
<td>82</td>
</tr>
<tr>
<td>New York</td>
<td>58</td>
</tr>
<tr>
<td>Michigan</td>
<td>57</td>
</tr>
<tr>
<td>Minnesota</td>
<td>71</td>
</tr>
<tr>
<td>Ohio</td>
<td>63</td>
</tr>
<tr>
<td>Texas</td>
<td>136</td>
</tr>
</tbody>
</table>

(Source: Target Corporation)

93. Which state has the most Target stores? California

94. Which of the states listed in the table has the fewest number of Target stores? Pennsylvania

95. What is the total number of Target stores located in the three states with the most Target stores? 476 stores

96. How many Target stores are located in the ten states listed in the table? 905 stores

97. Which pair of neighboring states have more Target stores combined, Florida and Georgia or Michigan and Ohio? Florida and Georgia

98. Target operates stores in 47 states. There are 686 Target stores located in the states not listed in the table. How many Target stores are in the United States? 1591 stores

99. The State of Delaware has 2029 miles of urban highways and 3865 miles of rural highways. Find the total highway mileage in Delaware. (Source: U.S. Federal Highway Administration) 5894 mi

100. The state of Rhode Island has 5193 miles of urban highways and 1222 miles of rural highways. Find the total highway mileage in Rhode Island. (Source: U.S. Federal Highway Administration) 6415 mi

Concept Extensions

For Exercises 101–104, identify which number is the minuend and which number is the subtrahend. See the Concept Check in this section.

101. \[ 48 - 1 \]

minuend: 48; subtrahend: 1

102. \[ \frac{2863}{1904} \]

minuend: 2863; subtrahend: 1904

103. Subtract 7 from 70.

minuend: 70; subtrahend: 7

104. Find 86 decreased by 25.

minuend: 86; subtrahend: 25

105. In your own words, explain the commutative property of addition. answers may vary

106. In your own words, explain the associative property of addition. answers may vary
CHAPTER 1: THE WHOLE NUMBERS

Check each addition below. If it is incorrect, find the correct answer. See the first Concept Check in this section.

107. \[\begin{array}{c}
566 \\
+ 871 \\
\hline
1439
\end{array}\] correct

108. \[\begin{array}{c}
773 \\
+ 481 \\
\hline
1254
\end{array}\] correct

109. \[\begin{array}{c}
14 \\
+ 257 \\
\hline
371
\end{array}\] incorrect; 350

110. \[\begin{array}{c}
19 \\
+ 651 \\
\hline
870
\end{array}\] incorrect; 933

Identify each answer as correct or incorrect. Use addition to check. If the answer is incorrect, write the correct answer.

111. \[\begin{array}{c}
741 \\
- 56 \\
\hline
685
\end{array}\] incorrect; 685

112. \[\begin{array}{c}
478 \\
- 89 \\
\hline
389
\end{array}\] correct

113. \[\begin{array}{c}
1029 \\
- 888 \\
\hline
141
\end{array}\] correct

114. \[\begin{array}{c}
7615 \\
- 547 \\
\hline
7068
\end{array}\] incorrect; 7068

Fill in the missing digits in each problem.

115. \[\begin{array}{c}
526 \\
- 284 \\
\hline
242
\end{array}\]

116. \[\begin{array}{c}
10,244 \\
- 8,534 \\
\hline
1710
\end{array}\]

117. Is there a commutative property of subtraction? In other words, does order matter when subtracting? Why or why not? answers may vary

118. Explain why the phrase “Subtract 7 from 10” translates to “10 - 7.” answers may vary

119. The local college library is having a Million Pages of Reading promotion. The freshmen have read a total of 289,462 pages; the sophomores have read a total of 369,477 pages; the juniors have read a total of 218,287 pages; and the seniors have read a total of 121,685 pages. Have they reached a goal of one million pages? If not, how many more pages need to be read? no; 1,089 more pages
Vocabulary and Readiness Check

Use the choices below to fill in each blank.

60    rounding    exact
70    estimate    graph

1. To __________ a number on a number line, darken the point representing the location of the number.
2. Another word for approximating a whole number is __________.
3. The number 65 rounded to the nearest ten is __________, but the number 61 rounded to the nearest ten is __________.
4. An exact number of products is 1265, but an estimate is 1000.

1.4 Exercise Set

Objective 3 Round each whole number to the given place. See Examples 1 through 3.

1. 423 to the nearest ten
   420
2. 273 to the nearest ten
   270
3. 635 to the nearest ten
   640
4. 846 to the nearest ten
   850
5. 2791 to the nearest hundred
   2800
6. 8494 to the nearest hundred
   8500
7. 495 to the nearest ten
   500
8. 898 to the nearest ten
   900
9. 21,094 to the nearest thousand
   21,000
10. 82,198 to the nearest thousand
    82,000
11. 33,762 to the nearest thousand
    34,000
12. 42,682 to the nearest ten-thousand
    40,000
13. 328,495 to the nearest hundred
    328,500
14. 179,406 to the nearest hundred
    179,400
15. 36,499 to the nearest thousand
    36,000
16. 96,501 to the nearest thousand
    97,000
17. 39,994 to the nearest ten
    39,990
18. 99,995 to the nearest ten
    100,000
19. 29,834,235 to the nearest ten-million
    30,000,000
20. 39,523,698 to the nearest million
    40,000,000

Complete the table by estimating the given number to the given place value.

<table>
<thead>
<tr>
<th>Tens</th>
<th>Hundreds</th>
<th>Thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>5281</td>
<td>5280</td>
</tr>
<tr>
<td>22.</td>
<td>7619</td>
<td>7620</td>
</tr>
<tr>
<td>23.</td>
<td>9444</td>
<td>9440</td>
</tr>
<tr>
<td>24.</td>
<td>7777</td>
<td>7780</td>
</tr>
<tr>
<td>25.</td>
<td>14,876</td>
<td>14,880</td>
</tr>
</tbody>
</table>
Round each number to the indicated place.

**27.** In Spring 2009, the University of Illinois at Urbana-Champaign enrolled a student body of 39,786. Round this number to the nearest thousand. *(Source: University of Illinois at Urbana-Champaign) 40,000*

**28.** The number of students enrolled at UCLA in Fall 2008 was 38,893. Round this number to the nearest thousand. *(Source: University of California at Los Angeles) 39,000*

**29.** Kareem Abdul-Jabbar holds the NBA record for points scored, a total of 38,387 over his NBA career. Round this number to the nearest thousand. *(Source: National Basketball Association) 38,000 points*

**30.** It takes 60,149 days for Neptune to make a complete orbit around the Sun. Round this number to the nearest hundred. *(Source: National Space Science Data Center) 60,100 days*

**31.** In 2008, the most valuable brand in the world was Wal-Mart, having just overtaken the long-time leader, Coca-Cola. The estimated brand value of Wal-Mart was $42,570,000,000. Round this to the nearest billion. *(Source: Wall Street Journal) $43,000,000,000*

**32.** According to the 2009 Population Clock, the population of the United States was 305,747,409 in February 2009. Round this population figure to the nearest million. *(Source: U.S. Census population clock) 306,000,000*

**33.** The average salary for a Boston Red Sox baseball player during the 2008 season was $4,934,078. Round this average salary to the nearest hundred-thousand. *(Source: ESPN) $4,900,000*

**34.** In FY 2008, the Procter & Gamble Company had $83,503,000,000 in sales. Round this sales figure to the nearest billion. *(Source: Procter & Gamble) $84,000,000,000*

**35.** The United States currently has 262,700,000 cellular mobile phone users, while India has 296,886,000 users. Round each of the user numbers to the nearest million. *(Source: Cellular Telecommunications Industry Association) US: 263,000,000; India: 297,000,000*

**Objective Estimate the sum or difference by rounding each number to the nearest ten. See Examples 4 and 5.**

<table>
<thead>
<tr>
<th>37.</th>
<th>39</th>
<th>38.</th>
<th>52</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td></td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>+17</td>
<td></td>
<td>+29</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td>130</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>39.</th>
<th>449</th>
<th>40.</th>
<th>555</th>
</tr>
</thead>
<tbody>
<tr>
<td>-373</td>
<td>80</td>
<td></td>
<td>320</td>
</tr>
</tbody>
</table>

**Estimate the sum or difference by rounding each number to the nearest hundred. See Examples 4 and 5.**

<table>
<thead>
<tr>
<th>41.</th>
<th>1913</th>
<th>42.</th>
<th>4050</th>
</tr>
</thead>
<tbody>
<tr>
<td>1886</td>
<td>3133</td>
<td>-1492</td>
<td>-1870</td>
</tr>
<tr>
<td>+1925</td>
<td>+1220</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>5700</td>
<td>8400</td>
<td></td>
<td>11,400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>43.</th>
<th>1774</th>
<th>44.</th>
<th>1989</th>
<th>45.</th>
<th>3995</th>
<th>46.</th>
<th>799</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1425</td>
<td>800</td>
<td></td>
<td>100</td>
<td>+4944</td>
<td></td>
<td></td>
<td>1655</td>
</tr>
<tr>
<td>-1200</td>
<td>300</td>
<td></td>
<td>11,400</td>
<td></td>
<td></td>
<td></td>
<td>2800</td>
</tr>
</tbody>
</table>
Three of the given calculator answers below are incorrect. Find them by estimating each sum.

47. \(463 + 219\) 600
   incorrect

48. \(522 + 785\) 1307
   correct

49. \(229 + 443 + 606\) 1278
   correct

50. \(542 + 789 + 198\) 2139
   incorrect

51. \(7806 + 5150\) 12,956
   correct

52. \(5233 + 4988\) 9011
   incorrect

Objective Solve each problem by estimating. See Examples 6 and 7.

53. An appliance store advertises three refrigerators on sale at \$899, \$1499,\) and \$999. Round each cost to the nearest hundred to estimate the total cost. \$3400

54. Suppose you scored 89, 97, 100, 79, 75, and 82 on your biology tests. Round each score to the nearest ten to estimate your total score. 530

55. The distance from Kansas City to Boston is 1429 miles and from Kansas City to Chicago is 530 miles. Round each distance to the nearest hundred to estimate how much farther Boston is from Kansas City than Chicago is. 900 mi

56. The Gonzales family took a trip and traveled 588, 689, 277, 143, 59, and 802 miles on six consecutive days. Round each distance to the nearest hundred to estimate the distance they traveled. 2600 mi

57. The peak of Mt. McKinley, in Alaska, is 20,320 feet above sea level. The top of Mt. Rainier, in Washington, is 14,410 feet above sea level. Round each height to the nearest thousand to estimate the difference in elevation of these two peaks. (Source: U.S. Geological Survey) 6900 ft

58. A student is pricing new car stereo systems. One system sells for \$1895 and another system sells for \$1524. Round each price to the nearest hundred dollars to estimate the difference in price of these systems. \$400

59. In 2008, the population of Joliet, Illinois, was 142,702, and the population of Evanston, Illinois, was 75,543. Round each population to the nearest ten-thousand to estimate how much larger Joliet was than Evanston. (Source: U.S. Census Bureau) Joliet is larger by approximately 60,000.

60. Round each distance given on the map to the nearest ten to estimate the total distance from North Platte, Nebraska, to Lincoln, Nebraska. 230 mi
**Mixed Practice (Sections 1.2 and 1.4)** The following table shows a few of the airports in the United States with the largest volumes of passengers. Complete this table. The first line is completed for you. (Source: Airports Council International)

<table>
<thead>
<tr>
<th>City Location of Airport</th>
<th>Total Passengers in 2007 (in hundred-thousands of passengers)</th>
<th>Amount Written in Standard Form</th>
<th>Standard Form Rounded to the Nearest Million</th>
<th>Standard Form Rounded to the Nearest Ten-Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, GA</td>
<td>894</td>
<td>89,400,000</td>
<td>89,000,000</td>
<td>90,000,000</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>761</td>
<td>76,100,000</td>
<td>76,000,000</td>
<td>80,000,000</td>
</tr>
<tr>
<td>Los Angeles, CA</td>
<td>619</td>
<td>61,900,000</td>
<td>62,000,000</td>
<td>60,000,000</td>
</tr>
<tr>
<td>Dallas/Fort Worth, TX</td>
<td>598</td>
<td>59,800,000</td>
<td>60,000,000</td>
<td>60,000,000</td>
</tr>
<tr>
<td>Denver, CO</td>
<td>499</td>
<td>49,900,000</td>
<td>50,000,000</td>
<td>50,000,000</td>
</tr>
</tbody>
</table>

**Concept Extensions**

67. Find one number that when rounded to the nearest hundred is 5700. 5723, for example

68. Find one number that when rounded to the nearest ten is 5700. 5698, for example

69. A number rounded to the nearest hundred is 8600.
   a. Determine the smallest possible number. 8550
   b. Determine the largest possible number. 8649

70. On August 23, 1989, it was estimated that 1,500,000 people joined hands in a human chain stretching 370 miles to protest the fiftieth anniversary of the pact that allowed what was then the Soviet Union to annex the Baltic nations in 1939. If the estimate of the number of people is to the nearest hundred-thousand, determine the largest possible number of people in the chain. 1,549,999

71. In your own words, explain how to round a number to the nearest thousand. Answers may vary

72. In your own words, explain how to round 9660 to the nearest thousand. Answers may vary

73. Estimate the perimeter of the rectangle by first rounding the length of each side to the nearest ten. 140 m

74. Estimate the perimeter of the triangle by first rounding the length of each side to the nearest hundred. 21,900 mi

86 meters

Rectangles

17 meters

5950 miles

7693 miles

8203 miles
Example 8: Budgeting Money

Suzanne Scarpulla and a friend plan to take their children to the Georgia Aquarium in Atlanta, the world's largest aquarium. The ticket price for each child is $22 and for each adult, $26. If five children and two adults plan to go, how much money is needed for admission? *(Source: GeorgiaAquarium.org)*

**Solution:** If the price of one child's ticket is $22, the price for 5 children is $22 \times 5 = 110$. The price of one adult ticket is $26$, so the price for two adults is $26 \times 2 = 52$. The total cost is:

<table>
<thead>
<tr>
<th>In Words</th>
<th>Translate to Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>price of 5 children (5 \times 22)</td>
<td>$110$</td>
</tr>
<tr>
<td>+ cost of 2 adults (2 \times 26)</td>
<td>$+ 52$</td>
</tr>
<tr>
<td>total cost</td>
<td>$162$</td>
</tr>
</tbody>
</table>

The total cost is $162.

Work Practice 8

Example 9: Estimating Word Count

The average page of a book contains 259 words. Estimate, rounding each number to the nearest hundred, the total number of words contained on 212 pages.

**Solution:** The exact number of words is $259 \times 212$. Estimate this product by rounding each factor to the nearest hundred.

\[
\begin{align*}
259 & \text{ rounds to } 300 \\
\times 212 & \text{ rounds to } \times 200,
\end{align*}
\]

\[
\frac{300 \times 200 = 60,000}{3 \times 2 = 6}
\]

There are approximately 60,000 words contained on 212 pages.

Work Practice 9

Calculator Explorations: Multiplying Numbers

To multiply numbers on a calculator, find the keys marked \(\times\) and \(=\) or \(\text{ENTER}\). For example, to find $31 \times 66$ on a calculator, press the keys $31 \times 66 = \text{or} \text{ENTER}$. The display will read $2046$. Thus, $31 \times 66 = 2046$.

Use a calculator to multiply.

1. \(72 \times 48\) \(3456\)
2. \(81 \times 92\) \(7452\)
3. \(163 \times 94\) \(15,322\)
4. \(285 \times 144\) \(41,040\)
5. \(983(277)\) \(272,291\)
6. \(1562(843)\) \(1,316,766\)

Answers

8. $133 9. 80,008$ words
Vocabulary and Readiness Check

Use the choices below to fill in each blank.

area  grouping  commutative  1  product  length
factor  order  associative  0  distributive  number

1. The product of 0 and any number is ______ 0 ______.
2. The product of 1 and any number is the _____ number _____.
3. In $8 \cdot 12 = 96$, the 96 is called the ______ product ______ and 8 and 12 are each called a(n) ______ factor ______.
4. Since $9 \cdot 10 = 10 \cdot 9$, we say that changing the _____ order _____ in multiplication does not change the product. This property is called the ______ commutative ______ property of multiplication.
5. Since $(3 \cdot 4) \cdot 6 = 3 \cdot (4 \cdot 6)$, we say that changing the _____ grouping _____ in multiplication does not change the product. This property is called the ______ associative ______ property of multiplication.
6. _____ Area _____ measures the amount of surface of a region.
7. Area of a rectangle = _____ length _____ \cdot _____ width _____.
8. We know $9(10 + 8) = 9 \cdot 10 + 9 \cdot 8$ by the _____ distributive _____ property.

1.5 Exercise Set

Objective 1 Multiply. See Example 1.

1. $1 \cdot 24$  
   24
2. $55 \cdot 1$  
   55
3. $0 \cdot 19$  
   0
4. $27 \cdot 0$  
   0
5. $8 \cdot 0 \cdot 9$  
   0
6. $7 \cdot 6 \cdot 0$  
   0
7. $87 \cdot 1$  
   87
8. $1 \cdot 41$  
   41

Use the distributive property to rewrite each expression. See Example 2.

9. $6(3 + 8)$  
   $6 \cdot 3 + 6 \cdot 8$
10. $5(8 + 2)$  
    $5 \cdot 8 + 5 \cdot 2$
11. $4(3 + 9)$  
    $4 \cdot 3 + 4 \cdot 9$

12. $6(1 + 4)$  
    $6 \cdot 1 + 6 \cdot 4$
13. $20(14 + 6)$  
    $20 \cdot 14 + 20 \cdot 6$
14. $12(12 + 3)$  
    $12 \cdot 12 + 12 \cdot 3$

Objective 2 Multiply. See Example 3.

15. $64 \times 8$  
    $512$
16. $79 \times 3$  
    $237$
17. $613 \times 6$  
    $3678$
18. $638 \times 5$  
    $3190$

19. $277 \times 6$  
    $1662$
20. $882 \times 2$  
    $1764$
21. $1074 \times 6$  
    $6444$
22. $9021 \times 3$  
    $27063$
Objectives Mixed Practice Multiply. See Examples 1 through 5.

23. \(89 \times 13\) 24. \(91 \times 72\) 25. \(421 \times 58\) 26. \(526 \times 23\) 27. \(306 \times 81\) 28. \(708 \times 21\)

29. \((780)(20)\) 30. \((720)(80)\) 31. \((495)(13)(0)\) 32. \((593)(47)(0)\) 33. \((640)(1)(10)\)

34. \((240)(1)(20)\) 35. \(1234 \times 39\) 36. \(1357 \times 79\) 37. \(609 \times 234\) 38. \(807 \times 127\)

39. \(8649 \times 274\) 40. \(1234 \times 567\) 41. \(589 \times 110\) 42. \(426 \times 110\) 43. \(1941 \times 2035\) 44. \(1876 \times 1407\)

45. 9 meters \(\times\) 7 meters \(\Rightarrow\) area: 63 sq m; perimeter: 32 m

46. 3 inches \(\times\) 13 inches \(\Rightarrow\) area: 39 sq in.; perimeter: 32 in.

47. 17 feet \(\times\) 40 feet \(\Rightarrow\) area: 680 sq ft; perimeter: 114 ft

48. 25 centimeters \(\times\) 20 centimeters \(\Rightarrow\) area: 500 sq cm; perimeter: 90 cm

Objective Mixed Practice (Section 1.3) Find the area and the perimeter of each rectangle. See Example 6.

Objective Estimate the products by rounding each factor to the nearest hundred. See Example 9.

49. \(576 \times 354\)

50. \(982 \times 650\)

51. \(604 \times 451\)

52. \(111 \times 999\)

Without actually calculating, mentally round, multiply, and choose the best estimate.

53. \(38 \times 42 =\)

a. 16  b. 160  c. 1600  d. 16,000

c  d

54. \(2872 \times 12 =\)

a. 2872  b. 28,720  c. 287,200  d. 2,872,000

b  c

55. \(612 \times 29 =\)

a. 180  b. 1800  c. 18,000  d. 180,000

c  d

56. \(706 \times 409 =\)

a. 280  b. 2800  c. 28,000  d. 280,000

c  d
Objectives (b) Mixed Practice—Translating Solve. See Examples 6 through 9.

57. Multiply 80 by 11.
880

58. Multiply 70 by 12.
840

59. Find the product of 6 and 700.
4200

60. Find the product of 9 and 900.
8100

61. Find 2 times 2240.
4480

62. Find 3 times 3310.
9930

63. One tablespoon of olive oil contains 125 calories. How many calories are in 3 tablespoons of olive oil? (Source: Home and Garden Bulletin No. 72, U.S. Department of Agriculture). 375 cal

65. The textbook for a course in biology costs $94. There are 35 students in the class. Find the total cost of the biology books for the class. $3290

66. The seats in a large lecture hall are arranged in 14 rows with 34 seats in each row. Find how many seats are in this room. 476 seats

67. Cabot Creamery is packing a pallet of 20-lb boxes of cheddar cheese to send to a local restaurant. There are five layers of boxes on the pallet, and each layer is four boxes wide by five boxes deep.
- a. How many boxes are in one layer? 20
- b. How many boxes are on the pallet? 100
- c. What is the weight of the cheese on the pallet? 2000 lb

69. A plot of land measures 80 feet by 110 feet. Find its area. 8800 sq ft

71. The largest hotel lobby can be found at the Hyatt Regency in San Francisco, CA. It is in the shape of a rectangle that measures 350 feet by 160 feet. Find its area. 56,000 sq ft

70. A house measures 45 feet by 60 feet. Find the floor area of the house. 2700 sq ft

72. Recall from an earlier section that the largest commercial building in the world under one roof is the flower auction building of the cooperative VBA in Aalsmeer, Netherlands. The floor plan is a rectangle that measures 776 meters by 639 meters. Find the area of this building. (A meter is a unit of length in the metric system.) (Source: The Handy Science Answer Book, Visible Ink Press) 495,864 sq m

73. A pixel is a rectangular dot on a graphing calculator screen. If a graphing calculator screen contains 62 pixels in a row and 94 pixels in a column, find the total number of pixels on a screen. 5828 pixels

74. A certain compact disc (CD) can hold 700 megabytes (MB) of information. How many MBs can 17 discs hold? 11,900 MB
75. A line of print on a computer contains 60 characters (letters, spaces, punctuation marks). Find how many characters there are in 35 lines. 2100 characters

76. An average cow eats 3 pounds of grain per day. Find how much grain a cow eats in a year. (Assume 365 days in a year.) 1095 lb

77. One ounce of Planters® Dry Roasted Peanuts has 160 calories. How many calories are in 8 ounces? (Source: RJR Nabisco, Inc.) 1280 cal

78. One ounce of Planters® Dry Roasted Peanuts has 13 grams of fat. How many grams of fat are in 16 ounces? (Source: RJR Nabisco, Inc.) 208 g

79. The Thespian club at a local community college is ordering T-shirts. T-shirts size S, M, or L cost $10 each and T-shirts size XL or XXL cost $12 each. Use the table below to find the total cost. (The first row is filled in for you.)

<table>
<thead>
<tr>
<th>T-Shirt Size</th>
<th>Number of Shirts Ordered</th>
<th>Cost per Shirt</th>
<th>Cost per Size Ordered</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>4</td>
<td>$10</td>
<td>$40</td>
</tr>
<tr>
<td>M</td>
<td>6</td>
<td>$10</td>
<td>$60</td>
</tr>
<tr>
<td>L</td>
<td>20</td>
<td>$10</td>
<td>$200</td>
</tr>
<tr>
<td>XL</td>
<td>3</td>
<td>$12</td>
<td>$36</td>
</tr>
<tr>
<td>XXL</td>
<td>3</td>
<td>$12</td>
<td>$36</td>
</tr>
</tbody>
</table>

80. The student activities group at North Shore Community College is planning a trip to see the local minor league baseball team. Tickets cost $5 for students, $7 for nonstudents, and $2 for children under 12. Use the following table to find the total cost.

<table>
<thead>
<tr>
<th>Person</th>
<th>Number of Persons</th>
<th>Cost per Person</th>
<th>Cost per Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>24</td>
<td>$5</td>
<td>$120</td>
</tr>
<tr>
<td>Nonstudent</td>
<td>4</td>
<td>$7</td>
<td>$28</td>
</tr>
<tr>
<td>Children under 12</td>
<td>5</td>
<td>$2</td>
<td>$10</td>
</tr>
</tbody>
</table>

81. Celestial Seasonings of Boulder, Colorado, is a tea company that specializes in herbal teas, accounting for over $100,000,000 in herbal tea blend sales in the United States annually. Their plant in Boulder has bagging machines capable of bagging over 1000 bags of tea per minute. If the plant runs 24 hours day, how many tea bags are produced in one day? (Source: Celestial Seasonings) 1,440,000 tea bags

82. The number of “older” Americans (ages 65 and older) has increased twofold since 1900. If there were 3.1 million “older” Americans in 1900, how many were there in 2008? (Source: Administration on Aging, U.S. Census Bureau) 37.2 million

**Mixed Practice (Sections 1.3, 1.5) Perform each indicated operation.**

83. \[
\begin{array}{c}
\text{128} \\
+ 7 \\
\hline
135
\end{array}
\]

84. \[
\begin{array}{c}
126 \\
- 8 \\
\hline
118
\end{array}
\]

85. \[
\begin{array}{c}
134 \\
\times 16 \\
\hline
2144
\end{array}
\]

86. \[
\begin{array}{c}
47 + 26 + 10 + 231 + 50 \\
364
\end{array}
\]

87. Find the sum of 19 and 4. 23

88. Find the product of 19 and 4. 76

89. Find the difference of 19 and 4. 15

90. Find the total of 19 and 4. 23

**Concept Extensions**

Solve. See the first Concept Check in this section.

91. Rewrite \(6 + 6 + 6 + 6 + 6\) using multiplication. \(5 \cdot 6\) or \(6 \cdot 5\)

92. Rewrite \(11 + 11 + 11 + 11 + 11\) using multiplication. \(6 \cdot 11\) or \(11 \cdot 6\)
93. a. Rewrite $3 \cdot 5$ as repeated addition.
   b. Explain why there is more than one way to do this.
      a. $5 + 5 + 5$ or $3 + 3 + 3 + 3 + 3$
      b. answers may vary

94. a. Rewrite $4 \cdot 5$ as repeated addition.
   b. Explain why there is more than one way to do this.
      a. $5 + 5 + 5 + 5$ or $4 + 4 + 4 + 4 + 4$
      b. answers may vary

Find and explain the error in each multiplication problem. See the second Concept Check in this section.

95. \[
\begin{array}{c}
203 \times 14 \\
\hline
2842 \\
\end{array}
\]

96. \[
\begin{array}{c}
31 \times 50 \\
\hline
1550 \\
\end{array}
\]

Fill in the missing digits in each problem.

97. \[
\begin{array}{c}
42 \times 3 \\
\hline
126 \\
3780 \\
3906 \\
\end{array}
\]

98. \[
\begin{array}{c}
_7 \times 6 \\
\hline
171 \\
3420 \\
3591 \\
\end{array}
\]

99. Explain how to multiply two 2-digit numbers using partial products. answers may vary

100. In your own words, explain the meaning of the area of a rectangle and how this area is measured. answers may vary

101. A window washer in New York City is bidding for a contract to wash the windows of a 23-story building. To write a bid, the number of windows in the building is needed. If there are 7 windows in each row of windows on 2 sides of the building and 4 windows per row on the other 2 sides of the building, find the total number of windows.
   506 windows

102. During the NBA's 2007-2008 regular season, Kobe Bryant of the Los Angeles Lakers scored 150 three-point field goals, 775 two-point field goals, and 623 free throws (worth one point each). How many points did Kobe Bryant score during the 2007-2008 regular season? (Source: NBA)
   2623 points
**Objective** Finding Averages

A special application of division (and addition) is finding the average of a list of numbers. The average of a list of numbers is the sum of the numbers divided by the number of numbers.

\[
\text{average} = \frac{\text{sum of numbers}}{\text{number of numbers}}
\]

**Example 12** Averaging Scores

A mathematics instructor is checking a simple program she wrote for averaging the scores of her students. To do so, she averages a student’s scores of 75, 96, 81, and 88 by hand. Find this average score.

**Solution:** To find the average score, we find the sum of the student’s scores and divide by 4, the number of scores.

\[
\begin{align*}
75 + 96 + 81 + 88 &= 340 \\
\text{average} &= \frac{340}{4} = 85 \\
\end{align*}
\]

The average score is 85.

**Work Practice 12**

---

**Calculator Explorations** Dividing Numbers

To divide numbers on a calculator, find the keys marked \( \div \) and = or ENTER. For example, to find 435 \( \div \) 5 on a calculator, press the keys 435 \( \div \) 5 = or ENTER. The display will read 87. Thus, 435 \( \div \) 5 = 87.

**Use a calculator to divide.**

1. 848 \( \div \) 16 = 53
2. 564 \( \div \) 12 = 47
3. 95 \( \div \) 890 = 62
4. 27 \( \div \) 1053 = 39
5. 32 \( \div \) 886 = 261
6. 143 \( \div \) 088 = 542
7. 0 \( \div \) 315 = 0
8. 315 \( \div \) 0 = error

**Answer**

12. 18 min
Vocabulary and Readiness Check

Use the choices below to fill in each blank.

1. number divisor dividend
2. undefined average quotient

1. In $90 \div 2 = 45$, the answer 45 is called the __quotient__, 90 is called the __dividend__, and 2 is called the __divisor__.

2. The quotient of any number and 1 is the same __number__.

3. The quotient of any number (except 0) and the same number is __1__.

4. The quotient of 0 and any number (except 0) is __0__.

5. The quotient of any number and 0 is __undefined__.

6. The __average__ of a list of numbers is the sum of the numbers divided by the __number__ of numbers.

1.6 Exercise Set

Objective A Find each quotient. See Examples 1 through 3.

1. $54 \div 9 = 6$
2. $72 \div 9 = 8$
3. $36 \div 3 = 12$
4. $24 \div 3 = 8$
5. $0 \div 8 = 0$

6. $0 \div 4 = 0$
7. $31 \div 1 = 31$
8. $38 \div 1 = 38$
9. $18 \div 18 = 1$
10. $49 \div 49 = 1$

11. $24 \div 3 = 8$
12. $45 \div 9 = 5$
13. $26 \div 0 = \text{undefined}$
14. $12 \div 0 = \text{undefined}$
15. $26 \div 26 = 1$

16. $6 \div 6 = 1$
17. $0 \div 14 = 0$
18. $7 \div 0 = \text{undefined}$
19. $18 \div 2 = 9$
20. $18 \div 3 = 6$

Objectives A B Mixed Practice Divide and then check by multiplying. See Examples 1 through 5.

21. $3 \sqrt{87} = 29$
22. $5 \sqrt{85} = 17$
23. $3 \sqrt{222} = 74$
24. $8 \sqrt{640} = 80$
25. $3 \sqrt{1014} = 338$
26. $4 \sqrt{2104} = 526$

27. $\frac{30}{0} = \text{undefined}$
28. $\frac{0}{30} = 0$
29. $63 \div 7 = 9$
30. $56 \div 8 = 7$
31. $150 \div 6 = 25$
32. $121 \div 11 = 11$

33. $7 \sqrt{479} = 68 \text{ R } 3$
34. $7 \sqrt{426} = 60 \text{ R } 6$
35. $6 \sqrt{1421} = 256 \text{ R } 5$
36. $3 \sqrt{1240} = 413 \text{ R } 1$
37. $305 \div 8 = 38 \text{ R } 1$
38. $167 \div 3 = 55 \text{ R } 2$
39. $2286 \div 7 = 326 \text{ R } 4$
40. $3333 \div 4 = 833 \text{ R } 1$
Divide and then check by multiplying. See Examples 8 and 9.

41. $55 \div 13 = 4 \text{ R } 7$

42. $23 \div 32 = 0 \text{ R } 23$

43. $23 \div 1127 = 0 \text{ R } 99$

44. $42 \div 2016 = 0 \text{ R } 7$

45. $97 \div 9417 = 0 \text{ R } 7$

46. $44 \div 1938 = 0 \text{ R } 2$

47. $3146 \div 15 = 209 \text{ R } 11$

48. $7354 \div 12 = 612 \text{ R } 10$

49. $6578 \div 13 = 506 \text{ R } 10$

50. $5670 \div 14 = 405 \text{ R } 10$

51. $9299 \div 46 = 202 \text{ R } 7$

52. $2505 \div 64 = 39 \text{ R } 9$

53. $12444 \div 236 = 54 \text{ R } 220$

54. $5781 \div 123 = 47 \text{ R } 23$

55. $10297 \div 103 = 99 \text{ R } 100$

56. $23092 \div 96 = 240 \text{ R } 52$

57. $20619 \div 102 = 202 \text{ R } 57$

58. $40853 \div 203 = 201 \text{ R } 30$

59. $244989 \div 423 = 579 \text{ R } 72$

60. $164592 \div 543 = 303 \text{ R } 63$

Divide. See Examples 1 through 9.

61. $7 \div 119 = 0 \text{ R } 7$

62. $8 \div 104 = 0 \text{ R } 8$

63. $7 \div 580 = 0 \text{ R } 7$

64. $5 \div 3017 = 0 \text{ R } 5$

65. $40 \div 85312 = 0 \text{ R } 40$

66. $50 \div 85747 = 0 \text{ R } 50$

67. $142 \div 863360 = 0 \text{ R } 142$

68. $214 \div 650560 = 0 \text{ R } 214$

Objective: Translating

Solve. See Examples 10 and 11.

69. Find the quotient of 117 and 5. 23 R 2

70. Find the quotient of 94 and 7. 13 R 3

71. Find 200 divided by 35. 5 R 25

72. Find 116 divided by 32. 3 R 20

73. Find the quotient of 62 and 3. 20 R 2

74. Find the quotient of 78 and 5. 15 R 3

75. Martin Thieme teaches American Sign Language classes for $65 per student for a 7-week session. He collects $2145 from the group of students. Find how many students are in the group. 33 students

76. Kathy Gomez teaches Spanish lessons for $85 per student for a 5-week session. From one group of students, she collects $4930. Find how many students are in the group. 58 students

77. The gravity of Jupiter is 318 times as strong as the gravity of Earth, so objects on Jupiter weigh 318 times as much as they weigh on Earth. If a person would weigh 52,470 pounds on Jupiter, find how much the person weighs on Earth. 165 lb

78. Twenty-one people pooled their money and bought lottery tickets. One ticket won a prize of $5,292,000. Find how many dollars each person received. $252,000

79. An 18-hole golf course is 5580 yards long. If the distance to each hole is the same, find the distance between holes. 310 yd

80. A truck hauls wheat to a storage granary. It carries a total of 5768 bushels of wheat in 14 trips. How much does the truck haul each trip if each trip it hauls the same amount? 412 bushels

81. There is a bridge over highway I-35 every three miles. The first bridge is at the beginning of a 265-mile stretch of highway. Find how many bridges there are over 265 miles of I-35. 89 bridges

82. The white stripes dividing the lanes on a highway are 25 feet long, and the spaces between them are 25 feet long. Let's call a "lane divider" a stripe followed by a space. Find how many whole "lane dividers" there are in 1 mile of highway. (A mile is 5280 feet.) 105 lane dividers
83. Ari Trainor is in the requisitions department of Central Electric Lighting Company. Light poles along a highway are placed 492 feet apart. The first light pole is at the beginning of a 1-mile strip. Find how many poles she should order for the 1-mile strip of highway. (A mile is 5280 feet.) 11 light poles

84. Professor Lopez has a piece of rope 185 feet long that she wants to cut into pieces for an experiment in her physics class. Each piece of rope is to be 8 feet long. Determine whether she has enough rope for her 22-student class. Determine the amount extra or the amount short.

yes; she has 9 ft left over

85. Broad Peak in Pakistan is the twelfth-tallest mountain in the world. Its elevation is 26,400 feet. A mile is 5280 feet. How many miles tall is Broad Peak? (Source: National Geographic Society) 5 mi

86. Randy Moss of the New England Patriots led the NFL in touchdowns during the 2007 regular football season, scoring a total of 138 points from touchdowns. If a touchdown is worth 6 points, how many touchdowns did Moss make during the 2007 season?
(Source: NFL) 23 touchdowns

87. Find how many yards are in 1 mile. (A mile is 5280 feet; a yard is 3 feet.) 1760 yd

88. Find how many whole feet are in 1 rod. (A mile is 5280 feet; 1 mile is 320 rods.) 16 ft

Objective 8 Find the average of each list of numbers. See Example 12.

89. 10, 24, 35, 22, 17, 12 20
90. 37, 26, 15, 29, 51, 22 30
91. 205, 972, 210, 161 387
92. 121, 200, 185, 176, 163 169
93. 86, 79, 81, 69, 80 79
94. 92, 96, 90, 85, 92, 79 89

The normal monthly temperature in degrees Fahrenheit for Salt Lake City, Utah, is given in the graph. Use this graph to answer Exercises 95 and 96. (Source: National Climatic Data Center)

95. Find the average temperature for June, July, and August.
74°

96. Find the average temperature for October, November, and December.
41°
Mixed Practice (Sections 1.3, 1.5, 1.6) Perform each indicated operation. Watch the operation symbol.

97. 82 + 463 + 29 + 8704 = 9278
98. 23 + 407 + 92 + 7011 = 7533

99. \( \frac{546}{\times 28} \)
\[ \frac{15,288}{38,448} \]
100. \( \frac{712}{\times 54} \)
101. \( -\frac{722}{-\frac{43}{679}} \)
102. \( -\frac{712}{-\frac{54}{658}} \)

103. \( \frac{45}{0} \) undefined
104. \( \frac{0}{23} \)
105. \( 228 \div 24 = 9 \text{ R } 12 \)
106. \( 304 \div 31 = 9 \text{ R } 25 \)

Concept Extensions

Match each word phrase to the correct translation. (Not all letter choices will be used.) See the Concept Check in this section.

107. The quotient of 40 and 8   c
108. The quotient of 200 and 20   b
109. 200 divided by 20   b
110. 40 divided by 8   c

The following table shows the top five leading U.S. television advertisers in 2007 and the amount of money spent that year on advertising. Use this table to answer Exercises 111 and 112. (Source: Television Bureau of Advertising).

<table>
<thead>
<tr>
<th>Advertiser</th>
<th>Amount Spent on Television Advertising in 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Motors, Dealers and corporate</td>
<td>$443,135,000</td>
</tr>
<tr>
<td>Chrysler-Carberus</td>
<td>$391,390,600</td>
</tr>
<tr>
<td>Ford Motor Company, Dealers and corporate</td>
<td>$365,557,400</td>
</tr>
<tr>
<td>AT&amp;T Inc.</td>
<td>$348,802,200</td>
</tr>
<tr>
<td>Toyota, Dealers and corporate</td>
<td>$310,829,500</td>
</tr>
</tbody>
</table>

In Example 12 in this section, we found that the average of 75, 96, 81, and 88 is 85. Use this information to answer Exercises 113 and 114.

113. If the number 75 is removed from the list of numbers, does the average increase or decrease? Explain why. increase; answers may vary

114. If the number 96 is removed from the list of numbers, does the average increase or decrease? Explain why. decrease; answers may vary

115. Without computing it, tell whether the average of 126, 135, 198, 113 is 86. Explain why it is possible or why it is not. no; answers may vary

116. Without computing it, tell whether the average of 38, 27, 58, and 43 is 17. Explain why it is possible or why it is not. no; answers may vary

117. If the area of a rectangle is 60 square feet and its width is 5 feet, what is its length? 12 ft

118. If the area of a rectangle is 84 square inches and its length is 21 inches, what is its width? 4 inches

119. Write down any two numbers whose quotient is 25. answers may vary

120. Write down any two numbers whose quotient is 1. answers may vary

121. Find 26 ÷ 5 using the process of repeated subtraction. 5 R 1

122. Find 86 ÷ 10 using the process of repeated subtraction. 8 R 6
Vocabulary and Readiness Check

Use the choices below to fill in each blank.

addition multiplication exponent
subtraction division base

1. In $2^5 = 32$, the 2 is called the ___ base ___ and the 5 is called the ___ exponent ___.
2. To simplify $8 \div 2 \cdot 6$, which operation should be performed first? ___ multiplication ___.
3. To simplify $(8 + 2) \cdot 6$, which operation should be performed first? ___ addition ___.
4. To simplify $9(3 - 2) \div 3 + 6$, which operation should be performed first? ___ subtraction ___.
5. To simplify $8 \div 2 \cdot 6$, which operation should be performed first? ___ division ___.

1.7 Exercise Set

Objective A Write using exponential notation. See Examples 1 through 4.

1. $4 \cdot 4 \cdot 4$
   $4^3$
2. $5 \cdot 5 \cdot 5 \cdot 5$
   $5^4$
3. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$
   $7^5$
4. $6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 \cdot 6$
   $6^6$
5. $12 \cdot 12 \cdot 12$
   $12^3$
6. $10 \cdot 10 \cdot 10$
   $10^3$
7. $6 \cdot 6 \cdot 5 \cdot 5 \cdot 5$
   $6^2 \cdot 5^3$
8. $4 \cdot 4 \cdot 3 \cdot 3 \cdot 3$
   $4^2 \cdot 3^3$
9. $9 \cdot 8 \cdot 8$
   $9 \cdot 8^2$
10. $7 \cdot 4 \cdot 4 \cdot 4$
    $7 \cdot 4^3$
11. $3 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
   $3 \cdot 2^4$
12. $4 \cdot 6 \cdot 6 \cdot 6 \cdot 6$
    $4 \cdot 6^4$
13. $3 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5 \cdot 5$
    $3 \cdot 2^4 \cdot 5^5$
14. $6 \cdot 6 \cdot 2 \cdot 9 \cdot 9 \cdot 9 \cdot 9$
    $6^2 \cdot 2^4 \cdot 9^4$

Objective B Evaluate. See Examples 5 through 8.

15. $8^2$
    64
16. $2^2$
    36
17. $5^3$
    125
18. $6^3$
    216
19. $2^5$
    32
20. $3^5$
    243
21. $1^{10}$
    1
22. $1^{12}$
    1
23. $7^1$
    7
24. $8^1$
    8
25. $2^7$
    128
26. $5^4$
    625
27. $2^8$
    256
28. $3^3$
    27
29. $4^4$
    256
30. $4^3$
    64
31. $9^3$
    729
32. $8^3$
    512
33. $12^2$
    144
34. $11^2$
    121
35. $10^2$
    100
36. $10^3$
    1000
37. $20^1$
    20
38. $14^1$
    14
39. $3^6$
    729
40. $4^5$
    1024
41. $3 \cdot 2^6$
    192
42. $5 \cdot 3^2$
    45
43. $2 \cdot 3^4$
    162
44. $2 \cdot 7^2$
    98

Objective C Simplify. See Examples 9 through 14.

45. $15 + 3 \cdot 2$
    $21$
46. $24 + 6 \cdot 3$
    $42$
47. $14 \div 7 \cdot 2 + 3$
    $7$
48. $100 \div 10 \cdot 5 + 4$
    $54$
49. \(32 \div 4 - 3\)  
   \(5\)  

50. \(42 \div 7 - 6\)  
   \(0\)  

51. \(13 + \frac{24}{8}\)  
   \(16\)  

52. \(32 + \frac{8}{2}\)  
   \(36\)  

53. \(6 \cdot 5 + 8 \cdot 2\)  
   \(46\)  

54. \(3 \cdot 4 + 9 \cdot 1\)  
   \(21\)  

55. \(\frac{5 + 12 \div 4}{1^2}\)  
   \(8\)  

56. \(\frac{6 + 9 + 3}{3^2}\)  

57. \((7 + 5^3) \div 4 \cdot 2^3\)  
   \(64\)  

58. \(6^2 \cdot (10 - 8)\)  
   \(72\)  

59. \(5^2 \cdot (10 - 8) + 2^3 + 5^2\)  
   \(83\)  

60. \(5^3 + (10 + 15) + 9^2 + 3^3\)  
   \(113\)  

61. \(\frac{18 + 6}{2^4 - 2^2}\)  
   \(2\)  

62. \(\frac{40 + 8}{5^2 - 3^2}\)  
   \(3\)  

63. \((3 + 5) \cdot (9 - 3)\)  
   \(48\)  

64. \((9 - 7) \cdot (12 + 18)\)  
   \(60\)  

65. \(\frac{7(9 - 6) + 3}{3^3 - 3}\)  
   \(4\)  

66. \(\frac{5(12 - 7) - 4}{3^2 - 18}\)  
   \(3\)  

67. \(8 + 0 + 37\)  
   undefined  

68. \(18 - 7 + 0\)  
   undefined  

69. \(2^4 \cdot 4 - (25 \div 5)\)  
   \(59\)  

70. \(2^3 \cdot 3 - (100 \div 10)\)  
   \(14\)  

71. \(3^4 - [35 - (12 - 6)]\)  
   \(52\)  

72. \([40 - (8 - 2)] - 2^2\)  
   \(2\)  

73. \((7 \cdot 5) + [9 + (3 + 3)]\)  
   \(44\)  

74. \((18 \div 6) + [(3 + 5) \cdot 2]\)  
   \(19\)  

75. \(8 \cdot [2^2 + (6 - 1) \cdot 2] - 50 \cdot 2\)  
   \(12\)  

76. \(35 + [3^3 + (9 - 7) - 2^2] + 10 \cdot 3\)  
   \(35\)  

77. \(\frac{9^2 + 2^2 - 1^2}{8 \div 2 \cdot 3 \cdot 1 + 3}\)  
   \(21\)  

78. \(\frac{5^2 - 2^3 + 1^4}{10 \div 5 \cdot 4 \cdot 1 + 4}\)  
   \(9\)  

79. \(\frac{2 + 4^2}{5(20 - 16) - 3^2 - 5}\)  
   \(3\)  

80. \(\frac{3 + 9^2}{3(10 - 6) - 2^2 - 1}\)  
   \(12\)  

81. \(9 \div 3 + 5 \cdot 2 - 10\)  
   \(43\)  

82. \(10 \div 2 + 3^3 \cdot 2 - 20\)  
   \(39\)  

83. \([13 \div (20 - 7) + 2^2] - (2 + 3)^2\)  
   \(8\)  

84. \([15 \div (11 - 6) + 2^2] + (5 - 1)^2\)  
   \(23\)  

85. \(7^2 - [18 - (40 \div (5 \cdot 1) + 2] + 5^2]\)  
   \(16\)  

86. \(29 - [5 + 3 \cdot (8 \cdot (10 - 8)) - 50]\)  
   \(26\)
Objective 1 Mixed Practice (Section 1.3)  Find the area and perimeter of each square. See Example 15.

87.  area: 49 sq m; perimeter: 28 m
88.  area: 81 sq cm; perimeter: 36 cm
89.  area: 529 sq mi; perimeter: 92 mi
90.  area: 1681 sq ft; perimeter: 164 ft

Concept Extensions

Answer the following true or false. See the Concept Check in this section.

91. “Six to the fifth power” is the same as $6^5$. true
92. “Seven squared” is the same as $7^2$. true
93. $2^5$ is the same as $5 \cdot 5$. false
94. $4^9$ is the same as $4 \cdot 9$. false

Insert grouping symbols (parentheses) so that each given expression evaluates to the given number.

95. $2 + 3 \cdot 6 - 2$; evaluates to 28
   $(2 + 3) \cdot 6 - 2$

96. $2 + 3 \cdot 6 - 2$; evaluates to 20
   $(2 + 3) \cdot (6 - 2)$

97. $24 \div 3 \cdot 2 + 2 \cdot 5$; evaluates to 14
   $24 \div (3 \cdot 2) + 2 \cdot 5$

98. $24 \div 3 \cdot 2 + 2 \cdot 5$; evaluates to 15
   $24 \div (3 \cdot 2) \cdot 5$

99. A building contractor is bidding on a contract to install gutters on seven homes in a retirement community, all in the shape shown. To estimate the cost of materials, she needs to know the total perimeter of all seven homes. Find the total perimeter. 1260 ft

100. The building contractor from Exercise 99 plans to charge $4 per foot for installing vinyl gutters. Find the total charge for the seven homes given the total perimeter answer to Exercise 99. $3040

Simplify.

101. $(7 + 2^4)^2 - (3^5 - 2^6)^2$
   $6,384,814$

102. $25^3 \cdot (45 - 7 \cdot 5) \cdot 5$
   $781,250$

103. Write an expression that simplifies to 5. Use multiplication, division, addition, subtraction, and at least one set of parentheses. Explain the process you would use to simplify the expression. answers may vary; $(20 - 10) \cdot 5 + 25 + 3$

104. Explain why $2 \cdot 3^2$ is not the same as $(2 \cdot 3)^2$. answers may vary
Vocabulary and Readiness Check

Use the choices below to fill in each blank. You may use each choice more than once.

<table>
<thead>
<tr>
<th>Evaluating the expression</th>
<th>Variable(s)</th>
<th>Expression</th>
<th>Equation</th>
<th>Solution</th>
</tr>
</thead>
</table>
1. A combination of operations on letters (variables) and numbers is a(n) ________ expression ________
2. A letter that represents a number is a(n) ________ variable ________
3. $3x - 2y$ is called a(n) ________ expression ________ and the letters $x$ and $y$ are ________ variables ________
4. Replacing a variable in an expression by a number and then finding the value of the expression is called ________ evaluating the expression ________
5. A statement of the form "expression = expression" is called a(n) ________ equation ________
6. A value for the variable that makes the equation a true statement is called a(n) ________ solution ________

1.8 Exercise Set

Objective A Complete the table. The first row has been done for you. See Examples 1 through 5.

<table>
<thead>
<tr>
<th>$a$</th>
<th>$b$</th>
<th>$a + b$</th>
<th>$a - b$</th>
<th>$a \cdot b$</th>
<th>$a + b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>9</td>
<td>54</td>
<td>36</td>
<td>405</td>
<td>5</td>
</tr>
<tr>
<td>21</td>
<td>7</td>
<td>28</td>
<td>14</td>
<td>147</td>
<td>3</td>
</tr>
<tr>
<td>24</td>
<td>6</td>
<td>30</td>
<td>18</td>
<td>144</td>
<td>4</td>
</tr>
<tr>
<td>152</td>
<td>0</td>
<td>152</td>
<td>152</td>
<td>0</td>
<td>undefined</td>
</tr>
<tr>
<td>298</td>
<td>0</td>
<td>298</td>
<td>298</td>
<td>0</td>
<td>undefined</td>
</tr>
<tr>
<td>56</td>
<td>1</td>
<td>57</td>
<td>55</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>82</td>
<td>1</td>
<td>83</td>
<td>81</td>
<td>82</td>
<td>82</td>
</tr>
</tbody>
</table>

Evaluate each following expression for $x = 2$, $y = 5$, and $z = 3$. See Examples 1 through 5.

7. $3 + 2z$
   $9$
8. $7 + 3z$
   $16$
9. $3x - 5x$
   $8$
10. $4yz + 2x$
    $64$
11. $z - x + y$
    $6$
12. $x + 5y - z$
    $24$
13. $4x - z$
    $5$
14. $2y + 5z$
    $25$
15. $y^3 - 4x$
    $117$
16. $y^3 - z$
    $122$
17. $2xy^2 - 6$
    $94$
18. $3yz^2 + 1$
    $136$
19. $8 - (y - x)$
    $5$
20. $3 + (2y - 4)$
    $9$
21. $x^2 + (y - z)$
    $34$
22. $x^2 - (y - z)$
    $14$
23. $6xy$
    $3$
24. $8yz$
    $15$
25. $2y - 2$
    $8$
26. $6 + 3x$
    $20$
27. $x + 2y$
    $4$
28. $2z + 6$
    $3$
29. $5x - 10$
    $y$
30. $70 - 15$
    $2y - z$
31. $2y^2 - 4y + 3$
    $33$
32. $3x^2 + 2x = 5$
    $11$
33. $(4y - 5z)^3$
    $125$
34. $(4y + 2z)^2$
    $841$
35. $(xy + 1)^2$
    $121$
36. $(xz - 5)^2$
    $1$
37. $2y(4z - x)$
    $100$
38. $3z(y + z)$
    $48$
39. \( xy(5 + z - x) \)

40. \( xx(2y + x - z) \)

41. \( \frac{7x + 2y}{3x} \)

42. \( \frac{6z + 2y}{4} \)

43. The expression \( 16t^2 \) gives the distance in feet that an object falls after \( t \) seconds. Complete the table by evaluating \( 16t^2 \) for each given value of \( t \).

<table>
<thead>
<tr>
<th>( t )</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 16t^2 )</td>
<td>16</td>
<td>64</td>
<td>144</td>
<td>256</td>
</tr>
</tbody>
</table>

44. The expression \( \frac{5(F - 32)}{9} \) gives the equivalent degrees Celsius for \( F \) degrees Fahrenheit. Complete the table by evaluating this expression for each given value of \( F \).

<table>
<thead>
<tr>
<th>( F )</th>
<th>50</th>
<th>59</th>
<th>68</th>
<th>77</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{5(F - 32)}{9} )</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

Objective 3. Decide whether the given number is a solution of the given equation. See Example 6.

45. Is 10 a solution of \( n - 8 = 27 \)?
   yes

47. Is 3 a solution of \( 24 = 80n \)?
   no

49. Is 7 a solution of \( 3n - 5 = 10 \)?
   no

51. Is 20 a solution of \( 2(n - 17) = 6 \)?
   yes

53. Is 0 a solution of \( 5x + 3 = 4x + 13 \)?
   no

55. Is 8 a solution of \( 7f = 64 - f \)?
   yes

Determine which numbers in each set are solutions to the corresponding equations. See Example 7.

57. \( n - 2 = 10; \{10, 12, 14\} \)
   12

59. \( 5n = 30; \{6, 25, 30\} \)
   6

61. \( 6x + 2 = 26; \{0, 2, 4\} \)
   4

63. \( 3(n - 4) = 10; \{5, 7, 10\} \)
   none

65. \( 7x - 9 = 5x + 13; \{3, 7, 11\} \)
   11

Objective 9. Translating. Write each phrase as a variable expression. Use \( x \) to represent "a number." See Example 8.

67. Eight more than a number
   \( x + 8 \)

69. The total of a number and eight
   \( x + 8 \)

68. The sum of three and a number
   \( 3 + x \)

70. The difference of a number and five hundred
   \( x - 500 \)
71. Twenty decreased by a number
    \[ 20 - x \]

73. The product of 512 and a number
    \[ 512x \]

75. The quotient of eight and a number
    \[ \frac{8}{x} \]

77. The sum of seventeen and a number added to the
    product of five and the number
    \[ 5x + (17 + x) \]

79. The product of five and a number
    \[ 5x \]

81. A number subtracted from 11
    \[ 11 - x \]

83. A number less 5
    \[ x - 5 \]

85. 6 divided by a number
    \[ \frac{6}{x} \]

87. Fifty decreased by eight times a number
    \[ 50 - 8x \]

72. A number less thirty
    \[ x - 30 \]

74. A number times twenty
    \[ 20x \]

76. A number divided by 11
    \[ \frac{x}{11} \]

78. The quotient of twenty and a number, decreased by
    three
    \[ \frac{20}{x - 3} \]

80. The difference of twice a number, and four
    \[ 2x - 4 \]

82. Twelve subtracted from a number
    \[ x - 12 \]

84. The sum of a number and 7
    \[ x + 7 \]

86. The product of a number and 7
    \[ 7x \]

88. Twenty decreased by twice a number
    \[ 20 - 2x \]

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**Concept Extensions**

*For Exercises 89 through 92, use a calculator to evaluate each expression for \( x = 23 \) and \( y = 72. *\)

89. \( x^4 - y^2 \)
    \[ 274,657 \]

91. \( x^2 + 5y - 112 \)
    \[ 777 \]

93. If \( x \) is a whole number, which expression is the
    largest: \( 2x, 5x, \) or \( \frac{x}{3} \)?
    Explain your answer. \( 5x \); answers may vary

95. In Exercise 43, what do you notice about the value
    of \( 16t^2 \) as \( t \) gets larger?
    As \( t \) gets larger, \( 16t^2 \) gets larger.

96. In Exercise 44, what do you notice about the value of
    \( \frac{5(F - 32)}{9} \) as \( F \) gets larger?
    As \( F \) gets larger, \( \frac{5(F - 32)}{9} \) gets larger.