Prealgebra and Introductory Algebra 6th edition Martin-Gay Solutions Manual

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INSTRUCTOR'S SOLUTIONS MANUAL

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PREALGEBRA AND INTRODUCTORY ALGEBRA

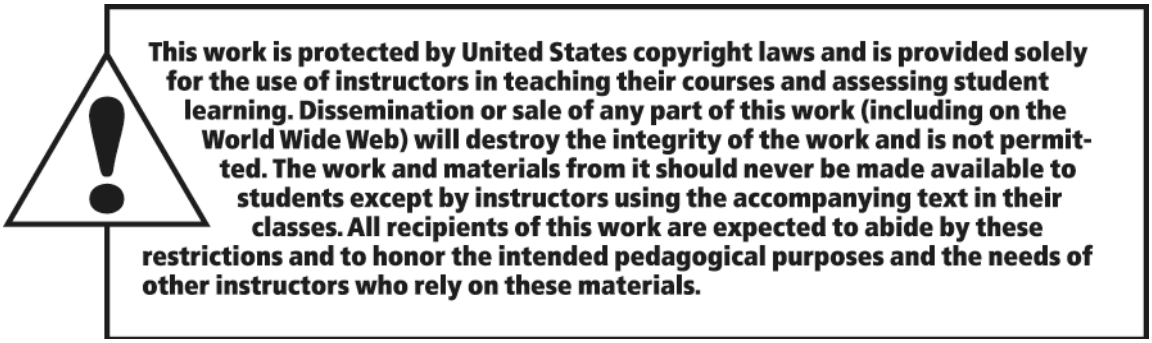
SIXTH EDITION

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Prealgebra and Introductory Algebra 6th edition Martin-Gay Solutions Manual



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Chapter 1

Section 1.2 Practice Exercises

1. The place value of the 8 in 38,760,005 is millions.
2. The place value of the 8 in 67,890 is hundreds.
3. The place value of the 8 in 481,922 is ten-thousands.
4. 54 is written as fifty-four.
5. 678 is written as six hundred seventy-eight.
6. 93,205 is written as ninety-three thousand, two hundred five.
7. 679,430,105 is written as six hundred seventy-nine million, four hundred thirty thousand, one hundred five.
8. Thirty-seven in standard form is 37.
9. Two hundred twelve in standard form is 212.
10. Eight thousand, two hundred seventy-four in standard form is 8,274 or 8274.
11. Five million, fifty-seven thousand, twenty-six in standard form is 5,057,026.
12. 4,026,301
    $= 4{,}000{,}000 + 20{,}000 + 6000 + 300 + 1$
13. **a.** Find Australia in the "Country" column. Read from left to right until the "bronze" column is reached. Australia won 22 bronze medals.

    b. Find the countries for which the entry in the "Total" column is greater than 60. The United States, China, ROC, and Great Britain won more than 60 medals.

Vocabulary, Readiness & Video Check 1.2

1. The numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, ... are called whole numbers.
2. The number 1286 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 3 digits is called a period.
6. The place value of the digit 4 in the whole number 264 is ones.
7. hundreds
8. To read (or write) a number, read from left to right.
9. 80,000
10. Dachsund

Exercise Set 1.2

2. The place value of the 5 in 905 is ones.
4. The place value of the 5 in 6527 is hundreds.
6. The place value of the 5 in 79,050,000 is ten-thousands.
8. The place value of the 5 in 51,682,700 is ten-millions.
10. 316 is written as three hundred sixteen.
12. 5445 is written as five thousand, four hundred forty-five.
14. 42,009 is written as forty-two thousand, nine.
16. 3,204,000 is written as three million, two hundred four thousand.
18. 47,033,107 is written as forty-seven million, thirty-three thousand, one hundred seven.
20. 254 is written as two hundred fifty-four.
22. 105,447 is written as one hundred five thousand, four hundred forty-seven.
24. 1,110,000,000 is written as one billion, one hundred ten million.
26. 11,239 is written as eleven thousand, two hundred thirty-nine.
28. 202,700 is written as two hundred two thousand, seven hundred.
30. Four thousand, four hundred sixty-eight in standard form is 4468.

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32. Seventy-three thousand, two in standard form is 73,002.

34. Sixteen million, four hundred five thousand, sixteen in standard form is 16,405,016.

36. Two million, twelve in standard form is 2,000,012.

38. Six hundred forty thousand, eight hundred eighty-one in standard form is 640,881.

40. Two hundred thirty-four thousand in standard form is 234,000.

42. One thousand, eight hundred fifteen in standard form is 1815.

44. Two hundred sixty million, one hundred thirty-eight thousand, five hundred sixty-nine dollars in standard form is $260,138,569.

46. Seven hundred fifteen in standard form is 715.

48. $789 = 700 + 80 + 9$

50. $6040 = 6000 + 40$

52. $20{,}215 = 20{,}000 + 200 + 10 + 5$

54. $99{,}032 = 90{,}000 + 9000 + 30 + 2$

56. $47{,}703{,}029 = 40{,}000{,}000 + 7{,}000{,}000 + 700{,}000 + 3000 + 20 + 9$

58. Mount Baker erupted in 1792, which is in standard form.

60. Mount Shasta and Mount St. Helens have each had two eruptions listed.

62. Mount St. Helens has an eruption listed in 1980. All other eruptions listed in the table occurred before this one.

64. More Golden retrievers are registered than German shepherds.

66. French bulldogs are second in popularity. 24 is written as twenty-four.

68. The maximum height of an average-size standard dachsund is 9 inches.

70. The largest number is 77,753.

72. Yes

74. answers may vary

76. A quadrillion in standard form is 1,000,000,000,000,000.

Section 1.3 Practice Exercises

1.
$$\begin{array}{r} 4135 \\ +\ 252 \\ \hline 4387 \end{array}$$

2.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1\ 1} \\ 47{,}364 \\ +\ 135{,}898 \\ \hline 183{,}262 \end{array}$$

3. Notice $12 + 8 = 20$ and $4 + 6 = 10$.
$12 + 4 + 8 + 6 + 5 = 20 + 10 + 5 = 35$

4.
$$\begin{array}{r} {\scriptstyle 1\ 2\ 2} \\ 6432 \\ 789 \\ 54 \\ +\ \ 28 \\ \hline 7303 \end{array}$$

5. a. $14 - 6 = 8$ because $8 + 6 = 14$.

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

c. $93 - 93 = 0$ because $0 + 93 = 93$.

d. $42 - 0 = 42$ because $42 + 0 = 42$.

6. a.
$$\begin{array}{r} 9143 \\ -\ 122 \\ \hline 9021 \end{array} \qquad \textit{Check:}\ \begin{array}{r} 9021 \\ +\ 122 \\ \hline 9143 \end{array}$$

b.
$$\begin{array}{r} 978 \\ -\ 851 \\ \hline 127 \end{array} \qquad \textit{Check:}\ \begin{array}{r} 127 \\ +\ 851 \\ \hline 978 \end{array}$$

7. a.
$$\begin{array}{r} {\scriptstyle 8\ 17} \\ 6\not{9}\ \not{7} \\ -\ 4\ 9 \\ \hline 64\ 8 \end{array} \qquad \textit{Check:}\ \begin{array}{r} 648 \\ +\ 49 \\ \hline 697 \end{array}$$

b.
$$\begin{array}{r} {\scriptstyle 2\ 12} \\ \not{3}\not{2}6 \\ -\ 245 \\ \hline 81 \end{array} \qquad \textit{Check:}\ \begin{array}{r} 81 \\ +\ 245 \\ \hline 326 \end{array}$$

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c. $\begin{array}{r} 1234 \\ -\ 822 \\ \hline 412 \end{array}$ *Check:* $\begin{array}{r} 412 \\ +\ 822 \\ \hline 1234 \end{array}$

8. a. $\begin{array}{r} {\scriptstyle 9\ \ 10\ 10} \\ 3\not{4}\not{0}\not{0} \\ -\ 1\ 6\ 4 \\ \hline 2\ 3\ 6 \end{array}$ *Check:* $\begin{array}{r} 236 \\ +\ 164 \\ \hline 400 \end{array}$

b. $\begin{array}{r} {\scriptstyle 9\ \ 10\ 10} \\ 9\not{1}\not{0}\not{0} \\ -\ 7\ 6\ 2 \\ \hline 2\ 3\ 8 \end{array}$ *Check:* $\begin{array}{r} 238 \\ +\ 762 \\ \hline 1000 \end{array}$

9. 2 cm + 8 cm + 15 cm + 5 cm = 30 cm
The perimeter is 30 centimeters.

10. 647 + 647 + 647 = 1941
The perimeter is 1941 feet.

11. $\begin{array}{r} 15,759 \\ -\ \ 458 \\ \hline 15,301 \end{array}$
The radius of Neptune is 15,301 miles.

12. a. The country with the fewest threatened amphibians corresponds to the shortest bar, which is Peru.

b. To find the total number of threatened amphibians for Brazil, Peru, and Mexico, we add.

$\begin{array}{r} 110 \\ 78 \\ +\ 191 \\ \hline 379 \end{array}$

The total number of threatened amphibians for Brazil, Peru, and Mexico is 379.

Calculator Explorations

1. 89 + 45 = 134

2. 76 + 97 = 173

3. 285 + 55 = 340

4. 8773 + 652 = 9425

5. 985 + 1210 + 562 + 77 = 2834

6. 465 + 9888 + 620 + 1550 = 12,523

7. 865 – 95 = 770

8. 76 – 27 = 49

9. 147 – 38 = 109

10. 366 – 87 = 279

11. 9625 – 647 = 8978

12. 10,711 – 8925 = 1786

Vocabulary, Readiness & Video Check 1.3

1. The sum of 0 and any number is the same number.

2. In 35 + 20 = 55, the number 55 is called the sum and 35 and 20 are each called an 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.

9. To add whole numbers, we line up place values and add from right to left.

10. We cannot take 7 from 2 in the ones place, so we borrow one ten from the tens place and move it over to the ones place to give us 10 + 2, or 12.

11. triangle; 3

12. To find the additional money needed to purchase, subtract the savings account amount from the purchase price.

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Exercise Set 1.3

2.
$$\begin{array}{r} 27 \\ +\ 31 \\ \hline 58 \end{array}$$

4.
$$\begin{array}{r} 37 \\ +\ 542 \\ \hline 579 \end{array}$$

6.
$$\begin{array}{r} 23 \\ 45 \\ +\ 30 \\ \hline 98 \end{array}$$

8.
$$\begin{array}{r} 236 \\ +\ 6243 \\ \hline 6479 \end{array}$$

10.
$$\begin{array}{r} {\scriptstyle 1} \\ 17,427 \\ +\ 821,059 \\ \hline 838,486 \end{array}$$

12.
$$\begin{array}{r} 3 \\ 5 \\ 8 \\ 5 \\ +\ 7 \\ \hline 28 \end{array}$$

14.
$$\begin{array}{r} {\scriptstyle 2\,2} \\ 64 \\ 28 \\ 56 \\ 25 \\ +\ 32 \\ \hline 205 \end{array}$$

16.
$$\begin{array}{r} {\scriptstyle 1\,1\ 2} \\ 16 \\ 1056 \\ 748 \\ +\ 7770 \\ \hline 9590 \end{array}$$

18.
$$\begin{array}{r} {\scriptstyle 1\,1\,1\,1} \\ 6789 \\ 4321 \\ +\ 5555 \\ \hline 16,665 \end{array}$$

20.
$$\begin{array}{r} {\scriptstyle 1\,1\,1} \\ 26 \\ 582 \\ 4\,763 \\ +\ 62,511 \\ \hline 67,882 \end{array}$$

22.
$$\begin{array}{r} {\scriptstyle 1\,1\,1\,2\,1\,2} \\ 504,218 \\ 321,920 \\ 38,507 \\ +\ 594,687 \\ \hline 1,459,332 \end{array}$$

24.
$$\begin{array}{r} 957 \\ -\ 257 \\ \hline 700 \end{array}$$
Check:
$$\begin{array}{r} 700 \\ +\ 257 \\ \hline 957 \end{array}$$

26.
$$\begin{array}{r} 55 \\ -\ 29 \\ \hline 26 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1} \\ 26 \\ +\ 29 \\ \hline 55 \end{array}$$

28.
$$\begin{array}{r} 674 \\ -\ 299 \\ \hline 375 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 375 \\ +\ 299 \\ \hline 674 \end{array}$$

30.
$$\begin{array}{r} 300 \\ -\ 149 \\ \hline 151 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 151 \\ +\ 149 \\ \hline 300 \end{array}$$

32.
$$\begin{array}{r} 5349 \\ -\ 720 \\ \hline 4629 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1} \\ 4629 \\ +\ 720 \\ \hline 5349 \end{array}$$

34.
$$\begin{array}{r} 724 \\ -\ 16 \\ \hline 708 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1} \\ 708 \\ +\ 16 \\ \hline 724 \end{array}$$

36.
$$\begin{array}{r} 1983 \\ -\ 1914 \\ \hline 69 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1} \\ 69 \\ +\ 1914 \\ \hline 1983 \end{array}$$

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38.
$$\begin{array}{r} 40,000 \\ -\ 23,582 \\ \hline 16,418 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 11\ 11} \\ 16,418 \\ +\ 23,582 \\ \hline 40,000 \end{array}$$

40.
$$\begin{array}{r} 6050 \\ -\ 1878 \\ \hline 4172 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 111} \\ 4172 \\ +\ 1878 \\ \hline 6050 \end{array}$$

42.
$$\begin{array}{r} 62,222 \\ -\ 39,898 \\ \hline 22,324 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 11\ 11} \\ 22,324 \\ +\ 39,898 \\ \hline 62,222 \end{array}$$

44.
$$\begin{array}{r} 986 \\ -\ 48 \\ \hline 938 \end{array}$$

46.
$$\begin{array}{r} {\scriptstyle 2} \\ 80 \\ 93 \\ 17 \\ 9 \\ +\ 2 \\ \hline 201 \end{array}$$

48.
$$\begin{array}{r} 10,000 \\ -\ 1786 \\ \hline 8214 \end{array}$$

50.
$$\begin{array}{r} {\scriptstyle 1\ 11} \\ 12,468 \\ 3\ 211 \\ +\ 1\ 988 \\ \hline 17,667 \end{array}$$

52. $3 + 4 + 5 = 12$
The perimeter is 12 centimeters.

54. Opposite sides of a rectangle have the same length.
$9 + 3 + 9 + 3 = 12 + 12 = 24$
The perimeter is 24 miles.

56. $6 + 5 + 7 + 3 + 4 + 7 + 5 = 37$
The perimeter is 37 inches.

58. The unknown vertical side has length $3 + 5 = 8$ feet. The unknown horizontal side has length $8 + 4 = 12$ feet.
$8 + 3 + 4 + 5 + 12 + 8 = 40$
The perimeter is 40 feet.

60. "Find the sum" indicates addition.
$$\begin{array}{r} {\scriptstyle 1} \\ 802 \\ +\ 6487 \\ \hline 7289 \end{array}$$
The sum of 802 and 6487 is 7289.

62. "Find the total" indicates addition.
$$\begin{array}{r} {\scriptstyle 1\ 2} \\ 89 \\ 45 \\ 2 \\ 19 \\ +\ 341 \\ \hline 496 \end{array}$$
The total of 89, 45, 2, 19, and 341 is 496.

64. "Find the difference" indicates subtraction.
$$\begin{array}{r} 16 \\ -\ 5 \\ \hline 11 \end{array}$$
The difference of 16 and 5 is 11.

66. "Increased by" indicates addition.
$$\begin{array}{r} 712 \\ +\ 38 \\ \hline 750 \end{array}$$
712 increased by 38 is 750.

68. "Less" indicates subtraction.
$$\begin{array}{r} 25 \\ -\ 12 \\ \hline 13 \end{array}$$
25 less 12 is 13.

70. "Subtracted from" indicates subtraction.
$$\begin{array}{r} 90 \\ -\ 86 \\ \hline 4 \end{array}$$
86 subtracted from 90 is 4.

72. Subtract 7953 million from 8687 million.
$$\begin{array}{r} 8687 \\ -\ 7953 \\ \hline 734 \end{array}$$
The world's projected population increase is 734 million.

74. Subtract the discount from the regular price.
$$\begin{array}{r} 276 \\ -\ 69 \\ \hline 207 \end{array}$$
The first-year price is $207.

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76.
$$\begin{array}{r} 164,000 \\ +\ 40,000 \\ \hline 204,000 \end{array}$$
The total U.S. land area drained by the Ohio and Tennessee sub-basins is 204,000 square miles.

78.
$$\begin{array}{r} 189,000 \\ -\ 75,000 \\ \hline 114,000 \end{array}$$
The Upper Mississippi sub-basin drains 114,000 square miles more than the Lower Mississippi sub-basin.

80. Opposite sides of a rectangle have the same length.
$60 + 45 + 60 + 45 = 210$
The perimeter is 210 feet.

82.
$$\begin{array}{r} 59,320 \\ -\ 55,492 \\ \hline 3\ 828 \end{array}$$
They traveled 3828 miles on their trip.

84.
$$\begin{array}{r} 299,345 \\ +\ 259,516 \\ \hline 558,861 \end{array}$$
The total number of F-Series trucks and Silverados sold during the first six months of 2022 was 558,861.

86. The shortest bar corresponds to the quietest reading. Leaves rustling is the quietest.

88.
$$\begin{array}{r} 100 \\ -\ 70 \\ \hline 30 \end{array}$$
The difference in sound intensity between live rock music and loud television is 30 dB.

90.
$$\begin{array}{r} 119 \\ -\ 99 \\ \hline 20 \end{array}$$
The difference in volume between the mid-size and a sub-compact car is 20 cubic feet.

92. Opposite sides of a rectangle have the same length.
$18 + 12 + 18 + 12 = 60$
The perimeter of the puzzle is 60 inches.

94. North Carolina has the fewest Aldi locations.

96. $211 + 92 + 203 + 98 + 92 + 123 + 91 + 152 + 146 + 127 = 1335$
The total number of Aldi locations in the ten states listed is 1335.

98. The total number of Aldi locations in the states listed is 1335.
$$\begin{array}{r} 1335 \\ +\ 923 \\ \hline 2258 \end{array}$$
There are 2258 Aldi locations in the United States.

100.
$$\begin{array}{r} {\scriptstyle 1\,1\ \ 1} \\ 605 \\ +\ 9779 \\ \hline 10,384 \end{array}$$
The total highway mileage in Kansas is 10,384 miles.

102. The minuend is 2863 and the subtrahend is 1904.

104. The minuend is 86 and the subtrahend is 25.

106. answers may vary

108.
$$\begin{array}{r} {\scriptstyle 2\,1} \\ 773 \\ 659 \\ +\ 481 \\ \hline 1913 \end{array}$$
The given sum is correct.

110.
$$\begin{array}{r} {\scriptstyle 1\ 2} \\ 19 \\ 214 \\ 49 \\ +\ 651 \\ \hline 933 \end{array}$$
The given sum is incorrect, the correct sum is 933.

112.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 389 \\ +\ 89 \\ \hline 478 \end{array}$$
The given difference is correct.

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114.
$$\begin{array}{r} {\scriptstyle 11} \\ 7168 \\ +\ 547 \\ \hline 7715 \end{array}$$
The given difference is incorrect.
$$\begin{array}{r} 7615 \\ -\ 547 \\ \hline 7068 \end{array}$$

116.
$$\begin{array}{r} 10,244 \\ -\ 8\,534 \\ \hline 1\,710 \end{array}$$

118. answers may vary

Section 1.4 Practice Exercises

1. a. To round 57 to the nearest ten, observe that the digit in the ones place is 7. Since the digit is at least 5, we add 1 to the digit in the tens place. The number 57 rounded to the nearest ten is 60.

b. To round 641 to the nearest ten, observe that the digit in the ones place is 1. Since the digit is less than 5, we do not add 1 to the digit in the tens place. The number 641 rounded to the nearest ten is 640.

c. To round 325 to the nearest ten observe that the digit in the ones place is 5. Since the digit is at least 5, we add 1 to the digit in the tens place. The number 325 rounded to the nearest ten is 330.

2. a. To round 72,304 to the nearest thousand, observe that the digit in the hundreds place is 3. Since the digit is less than 5, we do not add 1 to the digit in the thousands place. The number 72,304 rounded to the nearest thousand is 72,000.

b. To round 9222 to the nearest thousand, observe that the digit in the hundreds place is 2. Since the digit is less than 5, we do not add 1 to the digit in the thousands place. The number 9222 rounded to the nearest thousand is 9000.

c. To round 671,800 to the nearest thousand, observe that the digit in the hundreds place is 8. Since this digit is at least 5, we add 1 to the digit in the thousands place. The number 671,800 rounded to the nearest thousand is 672,000.

3. a. To round 3474 to the nearest hundred, observe that the digit in the tens place is 7. Since this digit is at least 5, we add 1 to the digit in the hundreds place. The number 3474 rounded to the nearest hundred is 3500.

b. To round 76,243 to the nearest hundred, observe that the digit in the tens place is 4. Since this digit is less than 5, we do not add 1 to the digit in the hundreds place. The number 76,243 rounded to the nearest hundred is 76,200.

c. To round 978,965 to the nearest hundred, observe that the digit in the tens place is 6. Since this digit is at least 5, we add 1 to the digit in the hundreds place. The number 978,865 rounded to the nearest hundred is 979,000.

4.
$$\begin{array}{rcr} 49 & \text{rounds to} & 50 \\ 25 & \text{rounds to} & 30 \\ 32 & \text{rounds to} & 30 \\ 51 & \text{rounds to} & 50 \\ \underline{98} & \text{rounds to} & \underline{+\ 100} \\ & & 260 \end{array}$$

5.
$$\begin{array}{rcr} 3785 & \text{rounds to} & 4000 \\ \underline{-\ 2479} & \text{rounds to} & \underline{-\ 2000} \\ & & 2000 \end{array}$$

6.
$$\begin{array}{rcr} 11 & \text{rounds to} & 10 \\ 16 & \text{rounds to} & 20 \\ 19 & \text{rounds to} & 20 \\ \underline{+\ 31} & \text{rounds to} & \underline{+\ 30} \\ & & 80 \end{array}$$
The total distance is approximately 80 miles.

7.
$$\begin{array}{rcr} 18,617 & \text{rounds to} & 18,600 \\ \underline{-\ 1\ 607} & \text{rounds to} & \underline{-\ 1\ 600} \\ & & 17,000 \end{array}$$
The difference in the reported number of pertussis cases between 2019 and 2021 was 17,000.

Vocabulary, Readiness & Video Check 1.4

1. To graph a number on a number line, darken the point representing the location of the number.

2. Another word for approximating a whole number is rounding.

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3. The number 65 rounded to the nearest ten is 70, but the number 61 rounded to the nearest ten is 60.

4. An exact number of products is 1265, but an estimate is 1000.

5. 3 is in the place value we're rounding to (tens), and the digit to the right of this place value is 5 or greater, so we need to add 1 to the 3.

6. On a number line, 22 is closer to 20 than to 30. Thus, 22 rounded to the nearest ten is 20.

7. Each circled digit is to the right of the place value being rounded to and is used to determine whether or not we add 1 to the digit in the place value being rounded to.

Exercise Set 1.4

2. To round 273 to the nearest ten, observe that the digit in the ones place is 3. Since this digit is less than 5, we do not add 1 to the digit in the tens place. The number 273 rounded to the nearest ten is 270.

4. To round 846 to the nearest ten, observe that the digit in the ones place is 6. Since this digit is at least 5, we add 1 to the digit in the tens place. The number 846 rounded to the nearest ten is 850.

6. To round 8494 to the nearest hundred, observe that the digit in the tens place is 9. Since this digit is at least 5, we add 1 to the digit in the hundreds place. The number 8494 rounded to the nearest hundred is 8500.

8. To round 898 to the nearest ten, observe that the digit in the ones place is 8. Since this digit is at least 5, we add 1 to the digit in the tens place. The number 898 rounded to the nearest ten is 900.

10. To round 82,198 to the nearest thousand, observe that the digit in the hundreds place is 1. Since this digit is less than 5, we do not add 1 to the digit in the thousands place. The number 82,198 rounded to the nearest thousand is 82,000.

12. To round 42,682 to the nearest ten-thousand, observe that the digit in the thousands place is 2. Since this digit is less than 5, we do not add 1 to the digit in the ten-thousands place. The number 42,682 rounded to the nearest ten-thousand is 40,000.

14. To round 179,406 to the nearest hundred, observe that the digit in the tens place is 0. Since this digit is less than 5, we do not add 1 to the digit in the hundreds place. The number 179,406 rounded to the nearest hundred is 179,400.

16. To round 96,501 to the nearest thousand, observe that the digit in the hundreds place is 5. Since this digit is at least 5, we add 1 to the digit in the thousands place. The number 96,501 rounded to the nearest thousand is 97,000.

18. To round 99,995 to the nearest ten, observe that the digit in the ones place is 5. Since this digit is at least 5, we add 1 to the digit in the tens place. The number 99,995 rounded to the nearest ten is 100,000.

20. To round 39,523,698 to the nearest million, observe that the digit in the hundred-thousands place is 5. Since this digit is at least 5, we add 1 to the digit in the millions place. The number 39,523,698 rounded to the nearest million is 40,000,000.

22. Estimate 7619 to a given place value by rounding it to that place value. 7619 rounded to the tens place is 7620, to the hundreds place is 7600, and to the thousands place is 8000.

24. Estimate 7777 to a given place value by rounding it to that place value. 7777 rounded to the tens place is 7780, to the hundreds place is 7800, and to the thousands place is 8000.

26. Estimate 85,049 to a given place value by rounding it to that place value. 85,049 rounded to the tens place is 85,050, to the hundreds place is 85,000, and to the thousands place is 85,000.

28. To round 41,529 to the nearest thousand, observe that the digit in the hundreds place is 5. Since this digit is at least 5, we add 1 to the digit in the thousands place. Therefore 41,529 miles rounded to the nearest thousand is 42,000 miles.

30. To round 60,149 to the nearest hundred, observe that the digit in the tens place is 4. Since this digit is less than 5, we do not add 1 to the digit in the hundreds place. Therefore, 60,149 days rounded to the nearest hundred is 60,100 days.

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32. To round 334,696,947 to the nearest million, observe that the digit in the hundred-thousands place is 6. Since this digit is at least 5, we add 1 to the digit in the millions place. Therefore, 334,696,947 rounded to the nearest million is 335,000,000.

34. To round 74,686 to the nearest hundred, observe that the digit in the tens place is 8. Since this digit is at least 5, we add 1 to the digit in the hundreds place. Therefore, $74,686 rounded to the nearest hundred is $74,700.

36. 2022: To round 13,700,000,000 to the nearest billion, observe that the digit in the hundred-millions place is 7. Since this digit is at least 5, we add 1 to the digit in the billions place. The number 13,700,000,000 rounded to the nearest billion is 14,000,000,000.
2021: To round 15,100,000,000 to the nearest billion, observe that the digit in the hundred-millions place is 1. Since this digit is less than 5, we do not add 1 to the digit in the billions place. The number 15,100,000,000 rounded to the nearest billion is 15,000,000,000.

38.

52	rounds to	50
33	rounds to	30
15	rounds to	20
+ 29	rounds to	+ 30
		130

40.

555	rounds to	560
− 235	rounds to	− 240
		320

42.

4050	rounds to	4100
3133	rounds to	3100
+ 1220	rounds to	+ 1200
		8400

44.

1989	rounds to	2000
− 1870	rounds to	− 1900
		100

46.

799	rounds to	800
1655	rounds to	1700
+ 271	rounds to	+ 300
		2800

48. 522 + 785 is approximately 520 + 790 = 1310.
The answer of 1307 is correct.

50. 542 + 789 + 198 is approximately 540 + 790 + 200 = 1530.
The answer of 2139 is incorrect.

52. 5233 + 4988 is approximately 5200 + 5000 = 10,200.
The answer of 9011 is incorrect.

54.

89	rounds to	90
97	rounds to	100
100	rounds to	100
79	rounds to	80
75	rounds to	80
+ 82	rounds to	+ 80
		530

The total score is approximately 530.

56.

588	rounds to	600
689	rounds to	700
277	rounds to	300
143	rounds to	100
59	rounds to	100
+ 802	rounds to	+ 800
		2600

The total distance is approximately 2600 miles.

58.

1360	rounds to	1400
− 1240	rounds to	− 1200
		200

The difference in price is approximately $200.

60.

64	rounds to	60
41	rounds to	40
+ 133	rounds to	+ 130
		230

The total distance is approximately 230 miles.

62.

6615	rounds to	6600
+ 1737	rounds to	+ 1700
		8300

The total enrollment is approximately 8300 students.

64. 588 hundred-thousands is 58,800,000 in standard form. 58,800,000 rounded to the nearest million is 59,000,000. 58,800,000 rounded to the nearest ten-million is 60,000,000.

66. 433 hundred-thousands is 43,300,000 in standard form. 43,300,000 rounded to the nearest million is 43,000,000. 43,300,000 rounded to the nearest ten-million is 40,000,000.

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68. 5698, for example, rounded to the nearest ten is 5700.

70. The largest possible number that rounds to 1,500,000 when rounded to the nearest hundred-thousand is 1,549,999.

72. answers may vary

74.

5950	rounds to	6 000
7693	rounds to	7 700
+ 8203	rounds to	+ 8 200
		21,900

The perimeter is approximately 21,900 miles.

Section 1.5 Practice Exercises

1. a. $6 \times 0 = 0$

b. $(1)8 = 8$

c. $(50)(0) = 0$

d. $75 \cdot 1 = 75$

2. a. $6(4 + 5) = 6 \cdot 4 + 6 \cdot 5$

b. $30(2 + 3) = 30 \cdot 2 + 30 \cdot 3$

c. $7(2 + 8) = 7 \cdot 2 + 7 \cdot 8$

3. a.
$$\begin{array}{r} {\scriptstyle 5}\\ 29\\ \times\ 6\\ \hline 174 \end{array}$$

b.
$$\begin{array}{r} {\scriptstyle 44}\\ 648\\ \times\ 5\\ \hline 3240 \end{array}$$

4.
$$\begin{array}{r} 306\\ \times\ 81\\ \hline 306\\ 24\,480\\ \hline 24,786 \end{array}$$

5.
$$\begin{array}{r} 726\\ \times\ 142\\ \hline 1\,452\\ 29\,040\\ 72\,600\\ \hline 103,092 \end{array}$$

6. Area = length · width
= (360 miles)(280 miles)
= 100,800 square miles

The area of Wyoming is 100,800 square miles.

7.
$$\begin{array}{r} 16\\ \times\ 45\\ \hline 80\\ 640\\ \hline 720 \end{array}$$

The printer can print 720 pages in 45 minutes.

8.

$5 \times 84 = 420$	420
$12 \times 3 = 36$	+ 36
	456

The total cost is $456.

9.

163	rounds to	200
× 391	rounds to	× 400
		80,000

There are approximately 80,000 words on 391 pages.

Calculator Explorations

1. $72 \times 48 = 3456$

2. $81 \times 92 = 7452$

3. $163 \cdot 94 = 15,322$

4. $285 \cdot 144 = 41,040$

5. $983(277) = 272,291$

6. $1562(843) = 1,316,766$

Vocabulary, Readiness & Video Check 1.5

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 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.

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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 · width.

8. We know $9(10 + 8) = 9 \cdot 10 + 9 \cdot 8$ by the distributive property.

9. distributive

10. to show that 8649 is actually multiplied by 70 and not by just 7

11. Area is measured in square units, and here we have meters by meters, or square meters; the answer is 63 *square* meters, or the correct units are square meters.

12. Multiplication is also an application of addition since it is addition of the same addend.

Exercise Set 1.5

2. $55 \cdot 1 = 55$

4. $27 \cdot 0 = 0$

6. $7 \cdot 6 \cdot 0 = 0$

8. $1 \cdot 41 = 41$

10. $5(8 + 2) = 5 \cdot 8 + 5 \cdot 2$

12. $6(1 + 4) = 6 \cdot 1 + 6 \cdot 4$

14. $12(12 + 3) = 12 \cdot 12 + 12 \cdot 3$

16.
$$\begin{array}{r} 79 \\ \times\ 3 \\ \hline 237 \end{array}$$

18.
$$\begin{array}{r} 638 \\ \times\ 5 \\ \hline 3190 \end{array}$$

20.
$$\begin{array}{r} 882 \\ \times\ 2 \\ \hline 1764 \end{array}$$

22.
$$\begin{array}{r} 9021 \\ \times\ 3 \\ \hline 27,063 \end{array}$$

24.
$$\begin{array}{r} 91 \\ \times\ 72 \\ \hline 182 \\ 6370 \\ \hline 6552 \end{array}$$

26.
$$\begin{array}{r} 526 \\ \times\ 23 \\ \hline 1\,578 \\ 10\,520 \\ \hline 12,098 \end{array}$$

28.
$$\begin{array}{r} 708 \\ \times\ 21 \\ \hline 708 \\ 14\,160 \\ \hline 14,868 \end{array}$$

30.
$$\begin{array}{r} 720 \\ \times\ 80 \\ \hline 57,600 \end{array}$$

32. $(593)(47)(0) = 0$

34. $(240)(1)(20) = (240)(20) = 4800$

36.
$$\begin{array}{r} 1357 \\ \times\ 79 \\ \hline 12\,213 \\ 94\,990 \\ \hline 107,203 \end{array}$$

38.
$$\begin{array}{r} 807 \\ \times\ 127 \\ \hline 5\,649 \\ 16\,140 \\ 80\,700 \\ \hline 102,489 \end{array}$$

40.
$$\begin{array}{r} 1234 \\ \times\ 567 \\ \hline 8\,638 \\ 74\,040 \\ 617\,000 \\ \hline 699,678 \end{array}$$

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42.
$$\begin{array}{r} 426 \\ \times\ 110 \\ \hline 4\,260 \\ 42\,600 \\ \hline 46{,}860 \end{array}$$

44.
$$\begin{array}{r} 1876 \\ \times\ 1407 \\ \hline 13\,132 \\ 750\,400 \\ 1\,876\,000 \\ \hline 2{,}639{,}532 \end{array}$$

46. Area = (length)(width)
= (13 inches)(3 inches)
= 39 square inches

Perimeter = length + width + length + width
= 13 + 3 + 13 + 3
= 32 inches

48. Area = (length)(width)
= (25 centimeters)(20 centimeters)
= 500 square centimeters

Perimeter = length + width + length + width
= 25 + 20 + 25 + 20
= 90 centimeters

50. 982 rounds to 1000
$\times 650$ rounds to $\times\ 700$
$700{,}000$

52. 111 rounds to 100
$\times 999$ rounds to $\times\ 1000$
$100{,}000$

54. 2872×12 is approximately 2872×10, which is 28,720.
The best estimate is b.

56. 706×409 is approximately 700×400, which is 280,000.
The best estimate is d.

58. $70 \times 12 = (7 \times 10) \times 12$
$= 7 \times (10 \times 12)$
$= 7 \times 120$
$= 840$

60. $9 \times 900 = 8100$

62.
$$\begin{array}{r} 3310 \\ \times\ 3 \\ \hline 9930 \end{array}$$

64.
$$\begin{array}{r} 14 \\ \times\ 8 \\ \hline 112 \end{array}$$
There are 112 grams of fat in 8 ounces of hulled sunflower seeds.

66.
$$\begin{array}{r} 34 \\ \times 14 \\ \hline 136 \\ 340 \\ \hline 476 \end{array}$$
There are 476 seats in the room.

68. a. $5 \times 4 = 20$
There are 20 apartments on one floor.

b.
$$\begin{array}{r} 20 \\ \times\ 3 \\ \hline 60 \end{array}$$
There are 60 apartments in the building.

70. Area = (length)(width)
= (60 feet)(45 feet)
= 2700 square feet

The area is 2700 square feet.

72. Area = (length)(width)
= (776 meters)(639 meters)
= 495,864 square meters

The area is 495,864 square meters.

74.
$$\begin{array}{r} 64 \\ \times\ 17 \\ \hline 448 \\ 640 \\ \hline 1088 \end{array}$$
The 17 flash drives hold 1088 GB.

76.
$$\begin{array}{r} 365 \\ \times\ 3 \\ \hline 1095 \end{array}$$
A cow eats 1095 pounds of grain each year.

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78.
$$\begin{array}{r} 13 \\ \times 16 \\ \hline 78 \\ 130 \\ \hline 208 \end{array}$$
There are 208 grams of fat in 16 ounces.

80.

Person	Number of persons	Cost per person	Cost per Category
Student	24	\$5	\$120
Nonstudent	4	\$7	\$28
Children under 12	5	\$2	\$10
Total Cost			\$158

82. $3 \times 26 = 78$
There were 78 million Americans age 65+ in 2022.

84.
$$\begin{array}{r} 126 \\ - \ 8 \\ \hline 118 \end{array}$$

86. $47 + 26 + 10 + 231 + 50 = 364$

88.
$$\begin{array}{r} 19 \\ \times \ 4 \\ \hline 76 \end{array}$$
The product of 19 and 4 is 76.

90.
$$\begin{array}{r} 14 \\ + \ 9 \\ \hline 23 \end{array}$$
The total of 14 and 9 is 23.

92. $11 + 11 + 11 + 11 + 11 + 11 = 6 \cdot 11$ or $11 \cdot 6$

94. a. $4 \cdot 5 = 5 + 5 + 5 + 5$ or $4 + 4 + 4 + 4 + 4$

b. answers may vary

96.
$$\begin{array}{r} 31 \\ \times \ 50 \\ \hline 1550 \end{array}$$

98. $57 \times 3 = 171$
$57 \times 6 = 342$
The problem is
$$\begin{array}{r} 57 \\ \times 63 \\ \hline \end{array}$$

100. answers may vary

102. $3 \times 161 = 483$
$2 \times 479 = 958$
$483 + 958 + 254 = 1695$
LeBron James scored 1695 points during the 2021–2022 regular season.

Section 1.6 Practice Exercises

1. a. $9\overline{)72}$ $\begin{array}{r} 8 \\ \end{array}$ because $8 \cdot 9 = 72$.

b. $40 \div 5 = 8$ because $8 \cdot 5 = 40$.

c. $\frac{24}{6} = 4$ because $4 \cdot 6 = 24$.

2. a. $\frac{7}{7} = 1$ because $1 \cdot 7 = 7$.

b. $5 \div 1 = 5$ because $5 \cdot 1 = 5$.

c. $1\overline{)11}$ $\begin{array}{r} 11 \\ \end{array}$ because $11 \cdot 1 = 11$.

d. $4 \div 1 = 4$ because $4 \cdot 1 = 4$.

e. $\frac{10}{1} = 10$ because $10 \cdot 1 = 10$.

f. $21 \div 21 = 1$ because $1 \cdot 21 = 21$.

3. a. $\frac{0}{7} = 0$ because $0 \cdot 7 = 0$.

b. $8\overline{)0}$ $\begin{array}{r} 0 \\ \end{array}$ because $0 \cdot 8 = 0$.

c. $7 \div 0$ is undefined because if $7 \div 0$ is a number, then the number times 0 would be 7.

d. $0 \div 14 = 0$ because $0 \cdot 14 = 0$.

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4. a.
$$\begin{array}{r} 818 \\ 6\overline{)\,4908} \\ \underline{-48} \\ 10 \\ \underline{-6} \\ 48 \\ \underline{-48} \\ 0 \end{array}$$
Check: $818 \times 6 = 4908$

b.
$$\begin{array}{r} 553 \\ 4\overline{)\,2212} \\ \underline{-20} \\ 21 \\ \underline{-20} \\ 12 \\ \underline{-12} \\ 0 \end{array}$$
Check: $553 \times 4 = 2212$

c.
$$\begin{array}{r} 251 \\ 3\overline{)\,753} \\ \underline{-6} \\ 15 \\ \underline{-15} \\ 03 \\ \underline{-3} \\ 0 \end{array}$$
Check: $251 \times 3 = 753$

5. a.
$$\begin{array}{r} 304 \\ 7\overline{)\,2128} \\ \underline{-21} \\ 02 \\ \underline{-0} \\ 28 \\ \underline{-28} \\ 0 \end{array}$$
Check: $304 \times 7 = 2128$

b.
$$\begin{array}{r} 5\,100 \\ 9\overline{)\,45{,}900} \\ \underline{-45} \\ 0\,9 \\ \underline{-9} \\ 000 \end{array}$$
Check: $5100 \times 9 = 45{,}900$

6. a.
$$\begin{array}{r} 234 \text{ R } 3 \\ 4\overline{)\,939} \\ \underline{-8} \\ 13 \\ \underline{-12} \\ 19 \\ \underline{-16} \\ 3 \end{array}$$
Check: $234 \cdot 4 + 3 = 939$

b.
$$\begin{array}{r} 657 \text{ R } 2 \\ 5\overline{)\,3287} \\ \underline{-30} \\ 28 \\ \underline{-25} \\ 37 \\ \underline{-35} \\ 2 \end{array}$$
Check: $657 \cdot 5 + 2 = 3287$

7. a.
$$\begin{array}{r} 9067 \text{ R } 2 \\ 9\overline{)\,81{,}605} \\ \underline{-81} \\ 0\,6 \\ \underline{-0} \\ 60 \\ \underline{-54} \\ 65 \\ \underline{-63} \\ 2 \end{array}$$
Check: $9067 \cdot 9 + 2 = 81{,}605$

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b.
$$\begin{array}{r} 5827 \text{ R } 2 \\ 4\overline{)\ 23,310} \\ -20 \\ \hline 33 \\ -32 \\ \hline 11 \\ -8 \\ \hline 30 \\ -28 \\ \hline 2 \end{array}$$

Check: $5827 \cdot 4 + 2 = 23{,}310$

8.
$$\begin{array}{r} 524 \text{ R } 12 \\ 17\overline{)\ 8920} \\ -85 \\ \hline 42 \\ -34 \\ \hline 80 \\ -68 \\ \hline 12 \end{array}$$

9.
$$\begin{array}{r} 49 \text{ R } 60 \\ 678\overline{)\ 33,282} \\ -27\,12 \\ \hline 6\,162 \\ -6\,102 \\ \hline 60 \end{array}$$

10.
$$\begin{array}{r} 57 \\ 3\overline{)\ 171} \\ -15 \\ \hline 21 \\ -21 \\ \hline 0 \end{array}$$

Each student got 57 printer cartridges.

11.
$$\begin{array}{r} 44 \\ 12\overline{)\ 532} \\ -48 \\ \hline 52 \\ -48 \\ \hline 4 \end{array}$$

There will be 44 full boxes and 4 printers left over.

12. Find the sum and divide by 7.

$$\begin{array}{r} 4 \\ 7 \\ 35 \\ 16 \\ 9 \\ 3 \\ +\ 52 \\ \hline 126 \end{array} \qquad \begin{array}{r} 18 \\ 7\overline{)\ 126} \\ -7 \\ \hline 56 \\ -56 \\ \hline 0 \end{array}$$

The average time is 18 minutes.

Calculator Explorations

1. $848 \div 16 = 53$

2. $564 \div 12 = 47$

3. $5890 \div 95 = 62$

4. $1053 \div 27 = 39$

5. $\dfrac{32{,}886}{126} = 261$

6. $\dfrac{143{,}088}{264} = 542$

7. $0 \div 315 = 0$

8. $315 \div 0$ is an error.

Vocabulary, Readiness & Video Check 1.6

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.

7. 0

8. zero; this zero becomes a placeholder in the quotient.

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9. $202 \cdot 102 + 15 = 20{,}619$

10. This tells us we have a division problem since division may be used to separate a quantity into equal parts.

11. addition and division

Exercise Set 1.6

2. $72 \div 9 = 8$

4. $24 \div 6 = 4$

6. $0 \div 4 = 0$

8. $38 \div 1 = 38$

10. $\frac{49}{49} = 1$

12. $\frac{45}{9} = 5$

14. $\frac{12}{0}$ is undefined

16. $6 \div 6 = 1$

18. $7 \div 0$ is undefined

20. $18 \div 3 = 6$

22.
$$\begin{array}{r} 17 \\ 5\overline{)\,85} \\ -5 \\ \hline 35 \\ -35 \\ \hline 0 \end{array}$$

Check: $17 \cdot 5 = 85$

24.
$$\begin{array}{r} 80 \\ 8\overline{)\,640} \\ -64 \\ \hline 00 \end{array}$$

Check: $80 \cdot 8 = 640$

26.
$$\begin{array}{r} 526 \\ 4\overline{)\,2104} \\ -20 \\ \hline 10 \\ -8 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$

Check: $526 \cdot 4 = 2104$

28. $\frac{0}{30} = 0$

Check: $0 \cdot 30 = 0$

30.
$$\begin{array}{r} 7 \\ 8\overline{)\,56} \\ -56 \\ \hline 0 \end{array}$$

Check: $7 \cdot 8 = 56$

32.
$$\begin{array}{r} 11 \\ 11\overline{)\,121} \\ -11 \\ \hline 11 \\ -11 \\ \hline 0 \end{array}$$

Check: $11 \cdot 11 = 121$

34.
$$\begin{array}{r} 60 \text{ R } 6 \\ 7\overline{)\,426} \\ -42 \\ \hline 06 \end{array}$$

Check: $60 \cdot 7 + 6 = 426$

36.
$$\begin{array}{r} 413 \text{ R } 1 \\ 3\overline{)\,1240} \\ -12 \\ \hline 04 \\ -3 \\ \hline 10 \\ -9 \\ \hline 1 \end{array}$$

Check: $413 \cdot 3 + 1 = 1240$

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38.
$$\begin{array}{r} 55 \text{ R } 2 \\ 3\overline{)\ 167} \\ \underline{-15} \\ 17 \\ \underline{-15} \\ 2 \end{array}$$

Check: $55 \cdot 3 + 2 = 167$

40.
$$\begin{array}{r} 833 \text{ R } 1 \\ 4\overline{)\ 3333} \\ \underline{-32} \\ 13 \\ \underline{-12} \\ 13 \\ \underline{-12} \\ 1 \end{array}$$

Check: $833 \cdot 4 + 1 = 3333$

42.
$$\begin{array}{r} 32 \\ 23\overline{)\ 736} \\ \underline{-69} \\ 46 \\ \underline{-46} \\ 0 \end{array}$$

Check: $32 \cdot 23 = 736$

44.
$$\begin{array}{r} 48 \\ 42\overline{)\ 2016} \\ \underline{-168} \\ 336 \\ \underline{-336} \\ 0 \end{array}$$

Check: $48 \cdot 42 = 2016$

46.
$$\begin{array}{r} 44 \text{ R } 2 \\ 44\overline{)\ 1938} \\ \underline{-176} \\ 178 \\ \underline{-176} \\ 2 \end{array}$$

Check: $44 \cdot 44 + 2 = 1938$

48.
$$\begin{array}{r} 612 \text{ R } 10 \\ 12\overline{)\ 7354} \\ \underline{-72} \\ 15 \\ \underline{-12} \\ 34 \\ \underline{-24} \\ 10 \end{array}$$

Check: $612 \cdot 12 + 10 = 7354$

50.
$$\begin{array}{r} 405 \\ 14\overline{)\ 5670} \\ \underline{-56} \\ 07 \\ \underline{-0} \\ 70 \\ \underline{-70} \\ 0 \end{array}$$

Check: $405 \cdot 14 = 5670$

52.
$$\begin{array}{r} 39 \text{ R } 9 \\ 64\overline{)\ 2505} \\ \underline{-192} \\ 585 \\ \underline{-576} \\ 9 \end{array}$$

Check: $39 \cdot 64 + 9 = 2505$

54.
$$\begin{array}{r} 47 \\ 123\overline{)\ 5781} \\ \underline{-492} \\ 861 \\ \underline{-861} \\ 0 \end{array}$$

Check: $47 \cdot 123 = 5781$

56.
$$\begin{array}{r} 96 \text{ R } 52 \\ 240\overline{)\ 23{,}092} \\ \underline{-21\ 60} \\ 1\ 492 \\ \underline{-1\ 440} \\ 52 \end{array}$$

Check: $96 \cdot 240 + 52 = 23{,}092$

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58.
$$\begin{array}{r} 201 \text{ R } 50 \\ 203\overline{)\,40,853} \\ -40\,6 \\ \hline 25 \\ -0 \\ \hline 253 \\ -203 \\ \hline 50 \end{array}$$

Check: $201 \cdot 203 + 50 = 40{,}853$

60.
$$\begin{array}{r} 303 \text{ R } 63 \\ 543\overline{)\,164,592} \\ -162\,9 \\ \hline 1\,69 \\ -\ 0 \\ \hline 1\,692 \\ -1\,629 \\ \hline 63 \end{array}$$

Check: $303 \cdot 543 + 63 = 164{,}592$

62.
$$\begin{array}{r} 13 \\ 8\overline{)\,104} \\ -8 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$

64.
$$\begin{array}{r} 603 \text{ R } 2 \\ 5\overline{)\,3017} \\ -30 \\ \hline 01 \\ -0 \\ \hline 17 \\ -15 \\ \hline 2 \end{array}$$

66.
$$\begin{array}{r} 1714 \text{ R } 47 \\ 50\overline{)\,85,747} \\ -50 \\ \hline 35\,7 \\ -35\,0 \\ \hline 74 \\ -50 \\ \hline 247 \\ -200 \\ \hline 47 \end{array}$$

68.
$$\begin{array}{r} 3\,040 \\ 214\overline{)\,650,560} \\ -642 \\ \hline 8\,5 \\ -0 \\ \hline 8\,56 \\ -8\,56 \\ \hline 00 \\ -0 \\ \hline 0 \end{array}$$

70.
$$\begin{array}{r} 13 \text{ R } 3 \\ 7\overline{)\,94} \\ -7 \\ \hline 24 \\ -21 \\ \hline 3 \end{array}$$

The quotient is 13 R 3.

72.
$$\begin{array}{r} 3 \text{ R } 20 \\ 32\overline{)\,116} \\ -96 \\ \hline 20 \end{array}$$

116 divided by 32 is 3 R 20.

74.
$$\begin{array}{r} 15 \text{ R } 3 \\ 5\overline{)\,78} \\ -5 \\ \hline 28 \\ -25 \\ \hline 3 \end{array}$$

The quotient is 15 R 3.

76.
$$\begin{array}{r} 58 \\ 85\overline{)\,4930} \\ -425 \\ \hline 680 \\ -680 \\ \hline 0 \end{array}$$

There are 58 students in the group.

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78.
$$\begin{array}{r} 252000 \\ 21\overline{)\,5292000} \\ -42 \\ \hline 109 \\ -105 \\ \hline 42 \\ -42 \\ \hline 0 \end{array}$$

Each person received $252,000.

80.
$$\begin{array}{r} 412 \\ 14\overline{)\,5768} \\ -56 \\ \hline 16 \\ -14 \\ \hline 28 \\ -28 \\ \hline 0 \end{array}$$

The truck hauls 412 bushels on each trip.

82. Lane divider = 25 + 25 = 50

$$\begin{array}{r} 105 \\ 50\overline{)\,5280} \\ -50 \\ \hline 28 \\ -0 \\ \hline 280 \\ -250 \\ \hline 30 \end{array}$$

There are 105 whole lane dividers.

84.
$$\begin{array}{r} 23 \text{ R } 1 \\ 8\overline{)\,185} \\ -16 \\ \hline 25 \\ -24 \\ \hline 1 \end{array}$$

Yes, there is enough for a 22-student class. There is one 8-foot length and 1 additional foot of rope left over. That is, she has 9 feet of extra rope.

86.
$$\begin{array}{r} 16 \\ 6\overline{)\,96} \\ -6 \\ \hline 36 \\ -36 \\ \hline 0 \end{array}$$

The players each scored 16 touchdowns.

88.
$$\begin{array}{r} 16 \\ 320\overline{)\,5280} \\ -320 \\ \hline 2080 \\ -1920 \\ \hline 160 \end{array}$$

There are 16 whole feet in 1 rod.

90.
$$\begin{array}{r} {\scriptstyle 3} \\ 37 \\ 26 \\ 15 \\ 29 \\ 51 \\ +\ 22 \\ \hline 180 \end{array} \qquad \begin{array}{r} 30 \\ 6\overline{)\,180} \\ -18 \\ \hline 00 \end{array}$$

$$\text{Average} = \frac{180}{6} = 30$$

92.
$$\begin{array}{r} {\scriptstyle 2\,1} \\ 121 \\ 200 \\ 185 \\ 176 \\ +\ 163 \\ \hline 845 \end{array} \qquad \begin{array}{r} 169 \\ 5\overline{)\,845} \\ -5 \\ \hline 34 \\ -30 \\ \hline 45 \\ -45 \\ \hline 0 \end{array}$$

$$\text{Average} = \frac{845}{5} = 169$$

94.
$$\begin{array}{r} {\scriptstyle 2} \\ 92 \\ 96 \\ 90 \\ 85 \\ 92 \\ +\ 79 \\ \hline 534 \end{array} \qquad \begin{array}{r} 89 \\ 6\overline{)\,534} \\ -48 \\ \hline 54 \\ -54 \\ \hline 0 \end{array}$$

$$\text{Average} = \frac{534}{6} = 89$$

96.
$$\begin{array}{r} 53 \\ 40 \\ +\ 30 \\ \hline 123 \end{array} \qquad \begin{array}{r} 41 \\ 3\overline{)\,123} \\ -12 \\ \hline 03 \\ -3 \\ \hline 0 \end{array}$$

The average temperature is 41°.

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98.
$$\begin{array}{r} {\scriptstyle 11} \\ 23 \\ 407 \\ 92 \\ +\ 7011 \\ \hline 7533 \end{array}$$

100.
$$\begin{array}{r} 712 \\ \times\ \ 54 \\ \hline 2\,848 \\ 35\,600 \\ \hline 38{,}448 \end{array}$$

102.
$$\begin{array}{r} 712 \\ -\ \ 54 \\ \hline 658 \end{array}$$

104. $\frac{0}{23} = 0$ because $0 \cdot 23 = 0$

106.
$$\begin{array}{r} 9 \text{ R } 25 \\ 31\overline{)\ 304} \\ \underline{-279} \\ 25 \end{array}$$

108. The quotient of 200 and 20 is $200 \div 20$, which is choice b.

110. 40 divided by 8 is $40 \div 8$, which is choice c.

112.
$$\begin{array}{r} 2{,}700{,}000{,}000 \\ 1{,}980{,}000{,}000 \\ 1{,}540{,}000{,}000 \\ +\ 1{,}600{,}000{,}000 \\ \hline 7{,}820{,}000{,}000 \end{array}$$

$$\begin{array}{r} 1{,}955{,}000{,}000 \\ 4\overline{)\ 7{,}820{,}000{,}000} \\ -\ 4 \\ \hline 3\ 8 \\ -\ 3\ 6 \\ \hline 22 \\ -\ 20 \\ \hline 2\ 0 \\ -2\ 0 \\ \hline 0\ 000\ 000 \end{array}$$

The advertisers shown spent an average of $1,955,000,000.

114. The average will decrease; answers may vary.

116. No; answers may vary
Possible answer: The average cannot be less than each of the four numbers.

118. $84 \div 21 = 4$
The width is 4 inches.

120. answers may vary
Possible answer: 2 and 2

122.
$$\begin{array}{r} 86 \\ -\ 10 \\ \hline 76 \\ -\ 10 \\ \hline 66 \\ -\ 10 \\ \hline 56 \\ -\ 10 \\ \hline 46 \end{array} \qquad \begin{array}{r} 46 \\ -\ 10 \\ \hline 36 \\ -\ 10 \\ \hline 26 \\ -\ 10 \\ \hline 16 \\ -\ 10 \\ \hline 6 \end{array}$$

Therefore, $86 \div 10 = 8$ R 6.

Mid-Chapter Review

1.
$$\begin{array}{r} {\scriptstyle 1} \\ 42 \\ 63 \\ +\ 89 \\ \hline 194 \end{array}$$

2.
$$\begin{array}{r} 7006 \\ -\ \ 451 \\ \hline 6555 \end{array}$$

3.
$$\begin{array}{r} 87 \\ \times\ 52 \\ \hline 174 \\ 4350 \\ \hline 4524 \end{array}$$

4.
$$\begin{array}{r} 562 \\ 8\overline{)\ 4496} \\ \underline{-40} \\ 49 \\ \underline{-48} \\ 16 \\ \underline{-16} \\ 0 \end{array}$$

5. $1 \cdot 67 = 67$

6. $\frac{36}{0}$ is undefined.

7. $16 \div 16 = 1$

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8. $5 \div 1 = 5$

9. $0 \cdot 21 = 0$

10. $7 \cdot 0 \cdot 8 = 0$

11. $0 \div 7 = 0$

12. $12 \div 4 = 3$

13. $9 \cdot 7 = 63$

14. $45 \div 5 = 9$

15.
$$\begin{array}{r} 207 \\ -\ 69 \\ \hline 138 \end{array}$$

16.
$$\begin{array}{r} {\scriptstyle 1} \\ 207 \\ +\ 69 \\ \hline 276 \end{array}$$

17.
$$\begin{array}{r} 3718 \\ -\ 2549 \\ \hline 1169 \end{array}$$

18.
$$\begin{array}{r} {\scriptstyle 11} \\ 1861 \\ +\ 7965 \\ \hline 9826 \end{array}$$

19.
$$\begin{array}{r} 182 \text{ R } 4 \\ 7\overline{)1278} \\ -7 \\ \hline 57 \\ -56 \\ \hline 18 \\ -14 \\ \hline 4 \end{array}$$

20.
$$\begin{array}{r} 1259 \\ \times\ \ 63 \\ \hline 3\,777 \\ 75\,540 \\ \hline 79{,}317 \end{array}$$

21.
$$\begin{array}{r} 1099 \text{ R } 2 \\ 7\overline{)7695} \\ -7 \\ \hline 06 \\ -0 \\ \hline 69 \\ -63 \\ \hline 65 \\ -63 \\ \hline 2 \end{array}$$

22.
$$\begin{array}{r} 111 \text{ R } 1 \\ 9\overline{)1000} \\ -9 \\ \hline 10 \\ -9 \\ \hline 10 \\ -9 \\ \hline 1 \end{array}$$

23.
$$\begin{array}{r} 663 \text{ R } 24 \\ 32\overline{)\ 21{,}240} \\ -19\ 2 \\ \hline 2\ 04 \\ -1\ 92 \\ \hline 120 \\ -96 \\ \hline 24 \end{array}$$

24.
$$\begin{array}{r} 1\ 076 \text{ R } 60 \\ 65\overline{)\ 70{,}000} \\ -65 \\ \hline 5\ 0 \\ -\ 0 \\ \hline 5\ 00 \\ -4\ 55 \\ \hline 450 \\ -390 \\ \hline 60 \end{array}$$

25.
$$\begin{array}{r} 4000 \\ -\ 2963 \\ \hline 1037 \end{array}$$

26.
$$\begin{array}{r} 10{,}000 \\ -\ \ 101 \\ \hline 9\,899 \end{array}$$

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27.
$$\begin{array}{r} 303 \\ \times\ 101 \\ \hline 303 \\ 30\,300 \\ \hline 30{,}603 \end{array}$$

28. $(475)(100) = 47{,}500$

29.
$$\begin{array}{r} {\scriptstyle 1} \\ 62 \\ +\ 9 \\ \hline 71 \end{array}$$
The total of 62 and 9 is 71.

30.
$$\begin{array}{r} 62 \\ \times\ 9 \\ \hline 558 \end{array}$$
The product of 62 and 9 is 558.

31.
$$9\overline{)\,62}$$
$$\begin{array}{r} 6 \text{ R } 8 \\ -54 \\ \hline 8 \end{array}$$
The quotient of 62 and 9 is 6 R 8.

32.
$$\begin{array}{r} 62 \\ -\ 9 \\ \hline 53 \end{array}$$
The difference of 62 and 9 is 53.

33.
$$\begin{array}{r} 200 \\ -\ 17 \\ \hline 183 \end{array}$$
17 subtracted from 200 is 183.

34.
$$\begin{array}{r} 432 \\ -\ 201 \\ \hline 231 \end{array}$$
The difference of 432 and 201 is 231.

35. 9735 rounded to the nearest ten is 9740.
9735 rounded to the nearest hundred is 9700.
9735 rounded to the nearest thousand is 10,000.

36. 1429 rounded to the nearest ten is 1430.
1429 rounded to the nearest hundred is 1400.
1429 rounded to the nearest thousand is 1000.

37. 20,801 rounded to the nearest ten is 20,800.
20,801 rounded to the nearest hundred is 20,800.
20,801 rounded to the nearest thousand is 21,000.

38. 432,198 rounded to the nearest ten is 432,200.
432,198 rounded to the nearest hundred is 432,200.
432,198 rounded to the nearest thousand is 432,000.

39. $6 + 6 + 6 + 6 = 24$
$6 \times 6 = 36$
The perimeter is 24 feet and the area is 36 square feet.

40. $14 + 7 + 14 + 7 = 42$
$$\begin{array}{r} 14 \\ \times\ 7 \\ \hline 98 \end{array}$$
The perimeter is 42 inches and the area is 98 square inches.

41.
$$\begin{array}{r} 13 \\ 9 \\ +\ 6 \\ \hline 28 \end{array}$$
The perimeter is 28 miles.

42. The unknown vertical side has length $4 + 3 = 7$ meters. The unknown horizontal side has length $3 + 3 = 6$ meters.
$$\begin{array}{r} 3 \\ 4 \\ 3 \\ 7 \\ 6 \\ +\ 3 \\ \hline 26 \end{array}$$
The perimeter is 26 meters.

43.
$$\begin{array}{r} {\scriptstyle 3} \\ 19 \\ 15 \\ 25 \\ 37 \\ +\ 24 \\ \hline 120 \end{array}$$
$$5\overline{)\,120}$$
$$\begin{array}{r} 24 \\ -10 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$
$$\text{Average} = \frac{120}{5} = 24$$

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44.
$$\begin{array}{r} {\scriptstyle 1\,2} \\ 108 \\ 131 \\ 98 \\ +\,159 \\ \hline 496 \end{array} \qquad 4\overline{)\,496} = 124 \text{ R } 0$$

$$\text{Average} = \frac{496}{4} = 124$$

45.
$$\begin{array}{r} 28{,}547 \\ -\,26{,}372 \\ \hline 2\,175 \end{array}$$

The Twin Span Bridge is longer by 2175 feet.

46.
$$\begin{array}{r} 329 \\ \times\ 18 \\ \hline 2632 \\ 3290 \\ \hline 5922 \end{array}$$

The amount spent on toys is \$5922.

Section 1.7 Practice Exercises

1. $8 \cdot 8 \cdot 8 \cdot 8 = 8^4$

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

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

4. $5 \cdot 5 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 5^2 \cdot 4^6$

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

6. $7^3 = 7 \cdot 7 \cdot 7 = 343$

7. $11^1 = 11$

8. $2 \cdot 3^2 = 2 \cdot 3 \cdot 3 = 18$

9. $9 \cdot 3 - 8 \div 4 = 27 - 8 \div 4 = 27 - 2 = 25$

10. $48 \div 3 \cdot 2^2 = 48 \div 3 \cdot 4 = 16 \cdot 4 = 64$

11.
$$\begin{aligned} (10-7)^4 + 2 \cdot 3^2 &= 3^4 + 2 \cdot 3^2 \\ &= 81 + 2 \cdot 9 \\ &= 81 + 18 \\ &= 99 \end{aligned}$$

12.
$$\begin{aligned} 36 \div [20 - (4 \cdot 2)] + 4^3 - 6 &= 36 \div [20 - 8] + 4^3 - 6 \\ &= 36 \div 12 + 4^3 - 6 \\ &= 36 \div 12 + 64 - 6 \\ &= 3 + 64 - 6 \\ &= 61 \end{aligned}$$

13.
$$\begin{aligned} \frac{25 + 8 \cdot 2 - 3^3}{2(3-2)} &= \frac{25 + 8 \cdot 2 - 27}{2(1)} \\ &= \frac{25 + 16 - 27}{2} \\ &= \frac{14}{2} \\ &= 7 \end{aligned}$$

14. $36 \div 6 \cdot 3 + 5 = 6 \cdot 3 + 5 = 18 + 5 = 23$

15.
$$\begin{aligned} \text{Area} &= (\text{side})^2 \\ &= (12 \text{ centimeters})^2 \\ &= 144 \text{ square centimeters} \end{aligned}$$

The area of the square is 144 square centimeters.

Calculator Explorations

1. $4^6 = 4096$

2. $5^6 = 15{,}625$

3. $5^5 = 3125$

4. $7^6 = 117{,}649$

5. $2^{11} = 2048$

6. $6^8 = 1{,}679{,}616$

7. $7^4 + 5^3 = 2526$

8. $12^4 - 8^4 = 16{,}640$

9. $63 \cdot 75 - 43 \cdot 10 = 4295$

10. $8 \cdot 22 + 7 \cdot 16 = 288$

11. $4(15 \div 3 + 2) - 10 \cdot 2 = 8$

12. $155 - 2(17 + 3) + 185 = 300$

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Vocabulary, Readiness & Video Check 1.7

1. In $2^5 = 32$, the 2 is called the base and the 5 is called the exponent.

2. To simplify $8 + 2 \cdot 6$, 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

6. exponent; base

7. 1

8. division, multiplication, addition

9. The area of a rectangle is length · width. A square is a special rectangle where length = width. Thus, the area of a square is side · side, or $(\text{side})^2$.

Exercise Set 1.7

2. $5 \cdot 5 \cdot 5 \cdot 5 = 5^4$

4. $6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 = 6^7$

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

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

10. $7 \cdot 4 \cdot 4 \cdot 4 = 7 \cdot 4^3$

12. $4 \cdot 6 \cdot 6 \cdot 6 \cdot 6 = 4 \cdot 6^4$

14. $6 \cdot 6 \cdot 2 \cdot 9 \cdot 9 \cdot 9 \cdot 9 = 6^2 \cdot 2 \cdot 9^4$

16. $6^2 = 6 \cdot 6 = 36$

18. $6^3 = 6 \cdot 6 \cdot 6 = 216$

20. $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243$

22. $1^{12} = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$

24. $8^1 = 8$

26. $5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$

28. $3^3 = 3 \cdot 3 \cdot 3 = 27$

30. $4^3 = 4 \cdot 4 \cdot 4 = 64$

32. $8^3 = 8 \cdot 8 \cdot 8 = 512$

34. $11^2 = 11 \cdot 11 = 121$

36. $10^3 = 10 \cdot 10 \cdot 10 = 1000$

38. $14^1 = 14$

40. $4^5 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 1024$

42. $5 \cdot 3^2 = 5 \cdot 3 \cdot 3 = 45$

44. $2 \cdot 7^2 = 2 \cdot 7 \cdot 7 = 98$

46. $24 + 6 \cdot 3 = 24 + 18 = 42$

48. $100 \div 10 \cdot 5 + 4 = 10 \cdot 5 + 4 = 50 + 4 = 54$

50. $42 \div 7 - 6 = 6 - 6 = 0$

52. $32 + \frac{8}{2} = 32 + 4 = 36$

54. $3 \cdot 4 + 9 \cdot 1 = 12 + 9 = 21$

56. $\frac{6 + 9 \div 3}{3^2} = \frac{6 + 3}{9} = \frac{9}{9} = 1$

58. $6^2 \cdot (10 - 8) = 6^2 \cdot 2 = 36 \cdot 2 = 72$

60. $5^3 \div (10 + 15) + 9^2 + 3^3 = 5^3 \div 25 + 9^2 + 3^3$
$= 125 \div 25 + 81 + 27$
$= 5 + 81 + 27$
$= 113$

62. $\frac{40 + 8}{5^2 - 3^2} = \frac{48}{25 - 9} = \frac{48}{16} = 3$

64. $(9 - 7) \cdot (12 + 18) = 2 \cdot 30 = 60$

66. $\frac{5(12 - 7) - 4}{5^2 - 18} = \frac{5(5) - 4}{25 - 18} = \frac{25 - 4}{25 - 18} = \frac{21}{7} = 3$

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68. $18 - 7 \div 0 = \text{undefined}$

70. $2^3 \cdot 3 - (100 \div 10) = 2^3 \cdot 3 - 10$
$= 8 \cdot 3 - 10$
$= 24 - 10$
$= 14$

72. $[40 - (8 - 2)] - 2^5 = [40 - 6] - 2^5$
$= 34 - 2^5$
$= 34 - 32$
$= 2$

74. $(18 \div 6) + [(3 + 5) \cdot 2] = (18 \div 6) + (8 \cdot 2)$
$= 3 + (8 \cdot 2)$
$= 3 + 16$
$= 19$

76. $35 \div [3^2 + (9 - 7) - 2^2] + 10 \cdot 3$
$= 35 \div [3^2 + 2 - 2^2] + 10 \cdot 3$
$= 35 \div [9 + 2 - 4] + 10 \cdot 3$
$= 35 \div 7 + 10 \cdot 3$
$= 5 + 10 \cdot 3$
$= 5 + 30$
$= 35$

78. $\dfrac{5^2 - 2^3 + 1^4}{10 \div 5 \cdot 4 \cdot 1 \div 4} = \dfrac{25 - 8 + 1}{2 \cdot 4 \cdot 1 \div 4} = \dfrac{18}{8 \div 4} = \dfrac{18}{2} = 9$

80. $\dfrac{3 + 9^2}{3(10 - 6) - 2^2 - 1} = \dfrac{3 + 81}{3(4) - 2^2 - 1}$
$= \dfrac{84}{3(4) - 4 - 1}$
$= \dfrac{84}{12 - 4 - 1}$
$= \dfrac{84}{8 - 1}$
$= \dfrac{84}{7}$
$= 12$

82. $10 \div 2 + 3^3 \cdot 2 - 20 = 10 \div 2 + 27 \cdot 2 - 20$
$= 5 + 27 \cdot 2 - 20$
$= 5 + 54 - 20$
$= 39$

84. $[15 \div (11 - 6) + 2^2] + (5 - 1)^2 = [15 \div 5 + 2^2] + 4^2$
$= [15 \div 5 + 4] + 4^2$
$= [3 + 4] + 4^2$
$= 7 + 4^2$
$= 7 + 16$
$= 23$

86. $29 - \{5 + 3[8 \cdot (10 - 8)] - 50\}$
$= 29 - \{5 + 3[8 \cdot 2] - 50\}$
$= 29 - \{5 + 3(16) - 50\}$
$= 29 - \{5 + 48 - 50\}$
$= 29 - 3$
$= 26$

88. Area of a square $= (\text{side})^2$
$= (9 \text{ centimeters})^2$
$= 81$ square centimeters
Perimeter $= 4(\text{side})$
$= 4(9 \text{ centimeters})$
$= 36$ centimeters

90. Area of a square $= (\text{side})^2$
$= (41 \text{ feet})^2$
$= 1681$ square feet
Perimeter $= 4(\text{side}) = 4(41 \text{ feet}) = 164$ feet

92. The statement is true.

94. $4^9 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$
The statement is false.

96. $(2 + 3) \cdot (6 - 2) = (5) \cdot (4) = 20$

98. $24 \div (3 \cdot 2 + 2) \cdot 5 = 24 \div (6 + 2) \cdot 5$
$= 24 \div 8 \cdot 5$
$= 3 \cdot 5$
$= 15$

100. The total perimeter is 1260 feet.
$4 \times 1260 = 5040$
The total charge is \$5040.

102. $25^3 \cdot (45 - 7 \cdot 5) \cdot 5 = 25^3 \cdot (45 - 35) \cdot 5$
$= 25^3 \cdot (10) \cdot 5$
$= 15,625 \cdot 10 \cdot 5$
$= 156,250 \cdot 5$
$= 781,250$

104. answers may vary

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Section 1.8 Practice Exercises

1. $x - 2 = 7 - 2 = 5$

2. $y(x - 3) = 4(8 - 3) = 4(5) = 20$

3. $\frac{y+6}{x} = \frac{18+6}{6} = \frac{24}{6} = 4$

4. $25 - z^3 + x = 25 - 2^3 + 1 = 25 - 8 + 1 = 18$

5. $\frac{5(F-32)}{9} = \frac{5(41-32)}{9} = \frac{5(9)}{9} = \frac{45}{9} = 5$

6. $3(y-6) = 6$
$3(8-6) \stackrel{?}{=} 6$
$3(2) \stackrel{?}{=} 6$
$6 = 6$ True
Yes, 8 is a solution.

7. $5n + 4 = 34$
Let n be 10.
$5(10) + 4 \stackrel{?}{=} 34$
$50 + 4 \stackrel{?}{=} 34$
$54 = 34$ False
No, 10 is not a solution.
Let n be 6.
$5(6) + 4 \stackrel{?}{=} 34$
$30 + 4 \stackrel{?}{=} 34$
$34 = 34$ True
Yes, 6 is a solution.
Let n be 8.
$5(8) + 4 \stackrel{?}{=} 34$
$40 + 4 \stackrel{?}{=} 34$
$44 = 34$ False
No, 8 is not a solution.

8. a. Twice a number is $2x$.

b. 8 increased by a number is $8 + x$ or $x + 8$.

c. 10 minus a number is $10 - x$.

d. 10 subtracted from a number is $x - 10$.

e. The quotient of 6 and a number is $6 \div x$ or $\frac{6}{x}$.

Vocabulary, Readiness & Video Check 1.8

1. A combination of operations on letters (variables) and numbers is an expression.

2. A letter that represents a number is a variable.

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3. $3x - 2y$ is called an 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 an equation.

6. A value for the variable that makes an equation a true statement is called a solution.

7. When a letter and a variable are next to each other, the operation is an understood multiplication.

8. When first replacing f with 8, we don't know if the statement is true or false.

9. decreased by

Exercise Set 1.8

2.

a	b	$a + b$	$a - b$	$a \cdot b$	$a \div b$
24	6	$24 + 6 = 30$	$24 - 6 = 18$	$24 \cdot 6 = 144$	$24 \div 6 = 4$

4.

a	b	$a + b$	$a - b$	$a \cdot b$	$a \div b$
298	0	$298 + 0 = 298$	$298 - 0 = 298$	$298 \cdot 0 = 0$	$298 \div 0$ is undefined.

6.

a	b	$a + b$	$a - b$	$a \cdot b$	$a \div b$
82	1	$82 + 1 = 83$	$82 - 1 = 81$	$82 \cdot 1 = 82$	$82 \div 1 = 82$

8. $7 + 3z = 7 + 3(3) = 7 + 9 = 16$

10. $4yz + 2x = 4(5)(3) + 2(2) = 60 + 4 = 64$

12. $x + 5y - z = 2 + 5(5) - 3 = 2 + 25 - 3 = 24$

14. $2y + 5z = 2(5) + 5(3) = 10 + 15 = 25$

16. $y^3 - z = 5^3 - 3 = 125 - 3 = 122$

18.
$$\begin{aligned} 3yz^2 + 1 &= 3(5)(3)^2 + 1 \\ &= 3 \cdot 5 \cdot 9 + 1 \\ &= 135 + 1 \\ &= 136 \end{aligned}$$

20.
$$\begin{aligned} 3 + (2y - 4) &= 3 + (2 \cdot 5 - 4) \\ &= 3 + (10 - 4) \\ &= 3 + 6 \\ &= 9 \end{aligned}$$

22. $x^4 - (y - z) = 2^4 - (5 - 3) = 2^4 - 2 = 16 - 2 = 14$

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24. $\dfrac{8yz}{15} = \dfrac{8 \cdot 5 \cdot 3}{15} = \dfrac{120}{15} = 8$

26. $\dfrac{6+3x}{z} = \dfrac{6+3(2)}{3} = \dfrac{6+6}{3} = \dfrac{12}{3} = 4$

28. $\dfrac{2z+6}{3} = \dfrac{2 \cdot 3+6}{3} = \dfrac{6+6}{3} = \dfrac{12}{3} = 4$

30. $\dfrac{70}{2y} - \dfrac{15}{z} = \dfrac{70}{2 \cdot 5} - \dfrac{15}{3} = \dfrac{70}{10} - \dfrac{15}{3} = 7 - 5 = 2$

32. $\begin{aligned} 3x^2 + 2x - 5 &= 3 \cdot 2^2 + 2 \cdot 2 - 5 \\ &= 3 \cdot 4 + 2 \cdot 2 - 5 \\ &= 12 + 4 - 5 \\ &= 11 \end{aligned}$

34. $\begin{aligned} (4y+3z)^2 &= (4 \cdot 5 + 3 \cdot 3)^2 \\ &= (20+9)^2 \\ &= 29^2 \\ &= 841 \end{aligned}$

36. $(xz-5)^4 = (2 \cdot 3 - 5)^4 = (6-5)^4 = 1^4 = 1$

38. $3x(y+z) = 3 \cdot 2(5+3) = 3 \cdot 2(8) = 6(8) = 48$

40. $\begin{aligned} xz(2y+x-z) &= 2 \cdot 3(2 \cdot 5 + 2 - 3) \\ &= 2 \cdot 3(10 + 2 - 3) \\ &= 2 \cdot 3(9) \\ &= 6(9) \\ &= 54 \end{aligned}$

42. $\begin{aligned} \dfrac{6z+2y}{4} &= \dfrac{6 \cdot 3 + 2 \cdot 5}{4} \\ &= \dfrac{18+10}{4} \\ &= \dfrac{28}{4} \\ &= 7 \end{aligned}$

44.

F	50	59	68	77
$\dfrac{5(F-32)}{9}$	$\dfrac{5(50-32)}{9} = \dfrac{5(18)}{9} = 10$	$\dfrac{5(59-32)}{9} = \dfrac{5(27)}{9} = 15$	$\dfrac{5(68-32)}{9} = \dfrac{5(36)}{9} = 20$	$\dfrac{5(77-32)}{9} = \dfrac{5(45)}{9} = 25$

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46. Let n be 9.
$n-2=7$
$9-2 \stackrel{?}{=} 7$
$7=7$ True
Yes, 9 is a solution.

48. Let n be 50.
$250=5n$
$250 \stackrel{?}{=} 5(50)$
$250=250$ True
Yes, 50 is a solution.

50. Let n be 8.
$11n+3=91$
$11(8)+3 \stackrel{?}{=} 91$
$88+3 \stackrel{?}{=} 91$
$91=91$ True
Yes, 8 is a solution.

52. Let n be 0.
$5(n+9)=40$
$5(0+9) \stackrel{?}{=} 40$
$5(9) \stackrel{?}{=} 40$
$45=40$ False
No, 0 is not a solution.

54. Let x be 2.
$3x-6=5x-10$
$3(2)-6 \stackrel{?}{=} 5(2)-10$
$6-6 \stackrel{?}{=} 10-10$
$0=0$ True
Yes, 2 is a solution.

56. Let x be 5.
$8x-30=2x$
$8(5)-30 \stackrel{?}{=} 2(5)$
$40-30 \stackrel{?}{=} 10$
$10=10$ True
Yes, 5 is a solution.

58. $n+3=16$
Let n be 9.
$9+3 \stackrel{?}{=} 16$
$12=16$ False
Let n be 11.
$11+3 \stackrel{?}{=} 16$
$14=16$ False
Let n be 13.
$13+3 \stackrel{?}{=} 16$
$16=16$ True
13 is a solution.

60. $3n=45$
Let n be 15.
$3 \cdot 15 \stackrel{?}{=} 45$
$45=45$ True
Let n be 30.
$3 \cdot 30 \stackrel{?}{=} 45$
$90=45$ False
Let n be 45.
$3 \cdot 45 \stackrel{?}{=} 45$
$135=45$ False
15 is a solution.

62. $4n+4=24$
Let n be 0.
$4 \cdot 0+4 \stackrel{?}{=} 24$
$0+4 \stackrel{?}{=} 24$
$4=24$ False
Let n be 5.
$4 \cdot 5+4 \stackrel{?}{=} 24$
$20+4 \stackrel{?}{=} 24$
$24=24$ True
Let n be 10.
$4 \cdot 10+4 \stackrel{?}{=} 24$
$40+4 \stackrel{?}{=} 24$
$44=24$ False
5 is a solution.

64. $6(n+2)=23$
Let n be 1.
$6(1+2) \stackrel{?}{=} 23$
$6(3) \stackrel{?}{=} 23$
$18=23$ False
Let n be 3.
$6(3+2) \stackrel{?}{=} 23$
$6(5) \stackrel{?}{=} 23$
$30=23$ False
Let n be 5.
$6(5+2) \stackrel{?}{=} 23$
$6(7) \stackrel{?}{=} 23$
$42=23$ False
None are solutions.

66. $9x-15=5x+1$
Let x be 2.
$9 \cdot 2-15 \stackrel{?}{=} 5 \cdot 2+1$
$18-15 \stackrel{?}{=} 10+1$
$3=11$ False
Let x be 4.
$9 \cdot 4-15 \stackrel{?}{=} 5 \cdot 4+1$
$36-15 \stackrel{?}{=} 20+1$
$21=21$ True

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Let x be 11.
$9 \cdot 11 - 15 \stackrel{?}{=} 5 \cdot 11 + 1$
$99 - 15 \stackrel{?}{=} 55 + 1$
$84 = 56$ False
4 is a solution.

68. The sum of three and a number is $3 + x$.

70. The difference of a number and five hundred is $x - 500$.

72. A number less thirty is $x - 30$.

74. A number times twenty is $20x$.

76. A number divided by 11 is $x \div 11$ or $\frac{x}{11}$.

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

80. The difference of twice a number, and four is $2x - 4$.

82. Twelve subtracted from a number is $x - 12$.

84. The sum of a number and 7 is $x + 7$.

86. The product of a number and 7 is $7x$.

88. Twenty decreased by twice a number is $20 - 2x$.

90. Replace x with 3 and y with 5.
$6y + 3x = 6(5) + 3(3) = 30 + 9 = 39$

92. Replace x with 3 and y with 5.
$x^3 + 4y = 3^3 + 4(5) = 27 + 20 = 47$

94.
$$\begin{aligned} 2(x+y)^2 &= 2(23+72)^2 \\ &= 2(95)^2 \\ &= 2(9025) \\ &= 18,050 \end{aligned}$$

96.
$$\begin{aligned} 16y - 20x + x^3 &= 16 \cdot 72 - 20 \cdot 23 + 23^3 \\ &= 1152 - 460 + 12,167 \\ &= 12,859 \end{aligned}$$

98. $\frac{x}{3}$ is the smallest; answers may vary.

100. As F gets larger, $\frac{5(F-32)}{9}$ gets larger.

Chapter 1 Vocabulary Check

1. The whole numbers are 0, 1, 2, 3, ...

2. The perimeter of a polygon is its distance around or the sum of the lengths of its sides.

3. The position of each digit in a number determines its place value.

4. An exponent is a shorthand notation for repeated multiplication of the same factor.

5. To find the area of a rectangle, multiply length times width.

6. The digits used to write numbers are 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

7. A letter used to represent a number is called a variable.

8. An equation can be written in the form "expression = expression."

9. A combination of operations on variables and numbers is called an expression.

10. A solution of an equation is a value of the variable that makes the equation a true statement.

11. A collection of numbers (or objects) enclosed by braces is called a set.

12. The 21 above is called the sum.

13. The 5 above is called the divisor.

14. The 35 above is called the dividend.

15. The 7 above is called the quotient.

16. The 3 above is called a factor.

17. The 6 above is called the product.

18. The 20 above is called the minuend.

19. The 9 above is called the subtrahend.

20. The 11 above is called the difference.

21. The 4 above is called an addend.

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Chapter 1 Review

1. The place value of 4 in 7640 is tens.

2. The place value of 4 in 46,200,120 is ten-millions.

3. 7640 is written as seven thousand, six hundred forty.

4. 46,200,120 is written as forty-six million, two hundred thousand, one hundred twenty.

5. $3158 = 3000 + 100 + 50 + 8$

6. $403{,}225{,}000 = 400{,}000{,}000 + 3{,}000{,}000 + 200{,}000 + 20{,}000 + 5000$

7. Eighty-one thousand, nine hundred in standard form is 81,900.

8. Six billion, three hundred four million in standard form is 6,304,000,000.

9. Locate Europe in the first column and read across to the number in the 2022 column. There were 750,000,000 Internet users in Europe in 2022.

10. Locate Middle East in the first column and read across to the number in the 2022 column. There were 212,000,000 Internet users in Middle East in 2022.

11. Locate the smallest number in the 2016 column. Oceania/Australia had the fewest Internet users in 2016.

12. Locate the largest number in the 2013 column. Asia had the greatest number of Internet users in 2013.

13.
$$\begin{array}{r} {\scriptstyle 1} \\ 18 \\ +\ 49 \\ \hline 67 \end{array}$$

14.
$$\begin{array}{r} {\scriptstyle 1} \\ 28 \\ +\ 39 \\ \hline 67 \end{array}$$

15.
$$\begin{array}{r} 462 \\ -\ 397 \\ \hline 65 \end{array}$$

16.
$$\begin{array}{r} 583 \\ -\ 279 \\ \hline 304 \end{array}$$

17.
$$\begin{array}{r} 428 \\ +\ 21 \\ \hline 449 \end{array}$$

18.
$$\begin{array}{r} {\scriptstyle 1} \\ 819 \\ +\ 21 \\ \hline 840 \end{array}$$

19.
$$\begin{array}{r} 4000 \\ -\ 86 \\ \hline 3914 \end{array}$$

20.
$$\begin{array}{r} 8000 \\ -\ 92 \\ \hline 7908 \end{array}$$

21.
$$\begin{array}{r} {\scriptstyle 1\,2\,1} \\ 91 \\ 3623 \\ +\ 497 \\ \hline 4211 \end{array}$$

22.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 82 \\ 1647 \\ +\ 238 \\ \hline 1967 \end{array}$$

23.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 74 \\ 342 \\ +\ 918 \\ \hline 1334 \end{array}$$

The sum of 74, 342, and 918 is 1334.

24.
$$\begin{array}{r} {\scriptstyle 2} \\ 49 \\ 529 \\ +\ 308 \\ \hline 886 \end{array}$$

The sum of 49, 529, and 308 is 886.

25.
$$\begin{array}{r} 25{,}862 \\ -\ 7\,965 \\ \hline 17{,}897 \end{array}$$

7965 subtracted from 25,862 is 17,897.

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26.
$$\begin{array}{r} 39,007 \\ -\ 4\,349 \\ \hline 34,658 \end{array}$$
4349 subtracted from 39,007 is 34,658.

27.
$$\begin{array}{r} {\scriptstyle 1} \\ 205 \\ +\ 7318 \\ \hline 7523 \end{array}$$
The total distance is 7523 miles.

28.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 62,589 \\ 65,340 \\ +\ 69,770 \\ \hline 197,699 \end{array}$$
Their total earnings were $197,699.

29. $40 + 52 + 52 + 72 = 216$
The perimeter is 216 feet.

30. $11 + 20 + 35 = 66$
The perimeter is 66 kilometers.

31.
$$\begin{array}{r} 653 \\ -\ 341 \\ \hline 312 \end{array}$$
The number of Internet users in Africa increased by 312 million or 312,000,000.

32.
$$\begin{array}{r} 543 \\ -\ 350 \\ \hline 193 \end{array}$$
There were 193 million or 193,000,000 more Internet users in Latin America/Caribbean than in North America in 2022.

33. Find the shortest bar. The balance was the least in May.

34. Find the tallest bar. The balance was the greatest in August.

35.
$$\begin{array}{r} 280 \\ -\ 170 \\ \hline 110 \end{array}$$
The balance decreased by $110 from February to April.

36.
$$\begin{array}{r} 490 \\ -\ 250 \\ \hline 240 \end{array}$$
The balance increased by $240 from June to August.

37. To round 43 to the nearest ten, observe that the digit in the ones place is 3. Since this digit is less than 5, we do not add 1 to the digit in the tens place. The number 43 rounded to the nearest ten is 40.

38. To round 45 to the nearest ten, observe that the digit in the ones place is 5. Since this digit is at least 5, we add 1 to the digit in the tens place. The number 45 rounded to the nearest ten is 50.

39. To round 876 to the nearest ten, observe that the digit in the ones place is 6. Since this digit is at least 5, we add 1 to the digit in the tens place. The number 876 rounded to the nearest ten is 880.

40. To round 493 to the nearest hundred, observe that the digit in the tens place is 9. Since this digit is at least 5, we add 1 to the digit in the hundreds place. The number 493 rounded to the nearest hundred is 500.

41. To round 3829 to the nearest hundred, observe that the digit in the tens place is 2. Since this digit is less than 5, we do not add 1 to the digit in the hundreds place. The number 3829 rounded to the nearest hundred is 3800.

42. To round 57,534 to the nearest thousand, observe that the digit in the hundreds place is 5. Since this digit is at least 5, we add 1 to the digit in the thousands place. The number 57,534 rounded to the nearest thousand is 58,000.

43. To round 39,583,819 to the nearest million, observe that the digit in the hundred-thousands place is 5. Since this digit is at least 5, we add 1 to the digit in the millions place. The number 39,583,819 rounded to the nearest million is 40,000,000.

44. To round 768,542 to the nearest hundred-thousand, observe that the digit in the ten-thousands place is 6. Since this digit is at least 5, we add 1 to the digit in the hundred-thousands place. The number 768,542 rounded to the nearest hundred-thousand is 800,000.

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45.

3785	rounds to	3800
648	rounds to	600
+ 2866	rounds to	+ 2900
		7300

46.

5925	rounds to	5900
− 1787	rounds to	− 1800
		4100

47.

630	rounds to	600
192	rounds to	200
271	rounds to	300
56	rounds to	100
703	rounds to	700
454	rounds to	500
+ 329	rounds to	+ 300
		2700

They traveled approximately 2700 miles.

48.

837,427,045	rounds to	837,000,000
− 664,099,841	rounds to	− 664,000,000
		173,000,000

The population of Europe was approximately 837,000,000 and the population of Latin America/Caribbean was approximately 664,000,000. The difference in population was about 173,000,000.

49.
$$\begin{array}{r} 276 \\ \times\ 8 \\ \hline 2208 \end{array}$$

50.
$$\begin{array}{r} 349 \\ \times\ 4 \\ \hline 1396 \end{array}$$

51.
$$\begin{array}{r} 57 \\ \times\ 40 \\ \hline 2280 \end{array}$$

52.
$$\begin{array}{r} 69 \\ \times\ 42 \\ \hline 138 \\ 2760 \\ \hline 2898 \end{array}$$

53. $20(7)(4) = 140(4) = 560$

54. $25(9)(4) = 225(4) = 900$
or
$25(4)(9) = 100(9) = 900$

55. $26 \cdot 34 \cdot 0 = 0$

56. $62 \cdot 88 \cdot 0 = 0$

57.
$$\begin{array}{r} 586 \\ \times\ 29 \\ \hline 5\,274 \\ 11\,720 \\ \hline 16,994 \end{array}$$

58.
$$\begin{array}{r} 242 \\ \times\ 37 \\ \hline 1694 \\ 7260 \\ \hline 8954 \end{array}$$

59.
$$\begin{array}{r} 642 \\ \times\ 177 \\ \hline 4\,494 \\ 44\,940 \\ 64\,200 \\ \hline 113,634 \end{array}$$

60.
$$\begin{array}{r} 347 \\ \times\ 129 \\ \hline 3\,123 \\ 6\,940 \\ 34\,700 \\ \hline 44,763 \end{array}$$

61.
$$\begin{array}{r} 1026 \\ \times\ 401 \\ \hline 1\,026 \\ 410\,400 \\ \hline 411,426 \end{array}$$

62.
$$\begin{array}{r} 2107 \\ \times\ 302 \\ \hline 4\,214 \\ 632\,100 \\ \hline 636,314 \end{array}$$

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63. "Product" indicates multiplication.

$$\begin{array}{r} 250 \\ \times\ \ 6 \\ \hline 1500 \end{array}$$

The product of 6 and 250 is 1500.

64. "Product" indicates multiplication.

$$\begin{array}{r} 820 \\ \times\ \ 6 \\ \hline 4920 \end{array}$$

The product of 6 and 820 is 4920.

65.
$$\begin{array}{r} 32 \\ \times\ 15 \\ \hline 160 \\ 320 \\ \hline 480 \end{array} \qquad \begin{array}{r} 38 \\ \times 11 \\ \hline 38 \\ 380 \\ \hline 418 \end{array}$$

$$\begin{array}{r} 480 \\ +\ 418 \\ \hline 898 \end{array}$$

The total cost is \$898.

66.
$$\begin{array}{r} 17,265 \\ \times\ \ \ 20 \\ \hline 345,300 \end{array}$$

The total cost for 20 students is \$345,300.

67. Area = (length)(width)
= (13 miles)(7 miles)
= 91 square miles

68. Area = (length)(width)
= (25 centimeters)(20 centimeters)
= 500 square centimeters

69. $\frac{49}{7} = 7$ Check: $\begin{array}{r} 7 \\ \times\ 7 \\ \hline 49 \end{array}$

70. $\frac{36}{9} = 4$ Check: $\begin{array}{r} 9 \\ \times\ 4 \\ \hline 36 \end{array}$

71.
$$\begin{array}{r} 5 \text{ R } 2 \\ 5\overline{)\ 27} \\ \underline{-25} \\ 2 \end{array}$$

Check: $5 \times 5 + 2 = 27$

72.
$$\begin{array}{r} 4 \text{ R } 2 \\ 4\overline{)\ 18} \\ \underline{-16} \\ 2 \end{array}$$

Check: $4 \times 4 + 2 = 18$

73. $918 \div 0$ is undefined.

74. $0 \div 668 = 0$ Check: $0 \cdot 668 = 0$

75.
$$\begin{array}{r} 33 \text{ R } 2 \\ 5\overline{)\ 167} \\ \underline{-15} \\ 17 \\ \underline{-15} \\ 2 \end{array}$$

Check: $33 \times 5 + 2 = 167$

76.
$$\begin{array}{r} 19 \text{ R } 7 \\ 8\overline{)\ 159} \\ \underline{-8} \\ 79 \\ \underline{-72} \\ 7 \end{array}$$

Check: $19 \times 8 + 7 = 159$

77.
$$\begin{array}{r} 24 \text{ R } 2 \\ 26\overline{)\ 626} \\ \underline{-52} \\ 106 \\ \underline{-104} \\ 2 \end{array}$$

Check: $24 \times 26 + 2 = 626$

78.
$$\begin{array}{r} 35 \text{ R } 15 \\ 19\overline{)\ 680} \\ \underline{-57} \\ 110 \\ \underline{-95} \\ 15 \end{array}$$

Check: $35 \times 19 + 15 = 680$

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79.
$$\begin{array}{r} 506 \text{ R } 10 \\ 47\overline{)\,23,792} \\ -23\,5 \\ \hline 29 \\ -0 \\ \hline 292 \\ -282 \\ \hline 10 \end{array}$$

Check: $506 \times 47 + 10 = 23{,}792$

80.
$$\begin{array}{r} 907 \text{ R } 40 \\ 53\overline{)\,48,111} \\ -47\,7 \\ \hline 41 \\ -0 \\ \hline 411 \\ -371 \\ \hline 40 \end{array}$$

Check: $907 \times 53 + 40 = 48{,}111$

81.
$$\begin{array}{r} 2793 \text{ R } 140 \\ 207\overline{)\,578,291} \\ -414 \\ \hline 164\,2 \\ -144\,9 \\ \hline 19\,39 \\ -18\,63 \\ \hline 761 \\ -621 \\ \hline 140 \end{array}$$

Check: $2793 \times 207 + 140 = 578{,}291$

82.
$$\begin{array}{r} 2012 \text{ R } 60 \\ 306\overline{)\,615,732} \\ -612 \\ \hline 3\,7 \\ -0 \\ \hline 3\,73 \\ -3\,06 \\ \hline 672 \\ -612 \\ \hline 60 \end{array}$$

Check: $2012 \times 306 + 60 = 615{,}732$

83.
$$\begin{array}{r} 18 \text{ R } 2 \\ 5\overline{)\,92} \\ -5 \\ \hline 42 \\ -40 \\ \hline 2 \end{array}$$

The quotient of 92 and 5 is 18 R 2.

84.
$$\begin{array}{r} 21 \text{ R } 2 \\ 4\overline{)\,86} \\ -8 \\ \hline 06 \\ -4 \\ \hline 2 \end{array}$$

The quotient of 86 and 4 is 21 R 2.

85.
$$\begin{array}{r} 27 \\ 24\overline{)\,648} \\ -48 \\ \hline 168 \\ -168 \\ \hline 0 \end{array}$$

27 boxes can be filled with cans of corn.

86.
$$\begin{array}{r} 13 \\ 1760\overline{)\,22,880} \\ -17\,60 \\ \hline 5\,280 \\ -5\,280 \\ \hline 0 \end{array}$$

There are 13 miles in 22,880 yards.

87. Divide the sum by 4.

$$\begin{array}{r} 76 \\ 49 \\ 32 \\ +\,47 \\ \hline 204 \end{array} \qquad \begin{array}{r} 51 \\ 4\overline{)\,204} \\ -20 \\ \hline 04 \\ -4 \\ \hline 0 \end{array}$$

The average is 51.

88. Divide the sum by 4.

$$\begin{array}{r} 23 \\ 85 \\ 62 \\ +\,66 \\ \hline 236 \end{array} \qquad \begin{array}{r} 59 \\ 4\overline{)\,236} \\ -20 \\ \hline 36 \\ -36 \\ \hline 0 \end{array}$$

The average is 59.

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89. $8^2 = 8 \cdot 8 = 64$

90. $5^3 = 5 \cdot 5 \cdot 5 = 125$

91. $5 \cdot 9^2 = 5 \cdot 9 \cdot 9 = 405$

92. $4 \cdot 10^2 = 4 \cdot 10 \cdot 10 = 400$

93. $18 \div 2 + 7 = 9 + 7 = 16$

94. $12 - 8 \div 4 = 12 - 2 = 10$

95. $\dfrac{5(6^2-3)}{3^2+2} = \dfrac{5(36-3)}{9+2} = \dfrac{5(33)}{11} = \dfrac{165}{11} = 15$

96. $\dfrac{7(16-8)}{2^3} = \dfrac{7(8)}{8} = \dfrac{56}{8} = 7$

97. $48 \div 8 \cdot 2 = 6 \cdot 2 = 12$

98. $27 \div 9 \cdot 3 = 3 \cdot 3 = 9$

99.
$$\begin{aligned} &2+3[1^5+(20-17)\cdot 3]+5\cdot 2 \\ &= 2+3[1^5+3\cdot 3]+5\cdot 2 \\ &= 2+3[1+3\cdot 3]+5\cdot 2 \\ &= 2+3[1+9]+5\cdot 2 \\ &= 2+3\cdot 10+5\cdot 2 \\ &= 2+30+10 \\ &= 42 \end{aligned}$$

100.
$$\begin{aligned} &21-[2^4-(7-5)-10]+8\cdot 2 \\ &= 21-[2^4-2-10]+8\cdot 2 \\ &= 21-[16-2-10]+8\cdot 2 \\ &= 21-4+8\cdot 2 \\ &= 21-4+16 \\ &= 33 \end{aligned}$$

101.
$$\begin{aligned} 19-2(3^2-2^2) &= 19-2(9-4) \\ &= 19-2(5) \\ &= 19-10 \\ &= 9 \end{aligned}$$

102.
$$\begin{aligned} 16-2(4^2-3^2) &= 16-2(16-9) \\ &= 16-2(7) \\ &= 16-14 \\ &= 2 \end{aligned}$$

103. $4 \cdot 5 - 2 \cdot 7 = 20 - 14 = 6$

104. $8 \cdot 7 - 3 \cdot 9 = 56 - 27 = 29$

105.
$$\begin{aligned} (6-4)^3 \cdot [10^2 \div (3+17)] &= (6-4)^3 \cdot [10^2 \div 20] \\ &= (6-4)^3 \cdot [100 \div 20] \\ &= 2^3 \cdot 5 \\ &= 8 \cdot 5 \\ &= 40 \end{aligned}$$

106.
$$\begin{aligned} (7-5)^3 \cdot [9^2 \div (2+7)] &= (7-5)^3 \cdot [9^2 \div 9] \\ &= (7-5)^3 \cdot [81 \div 9] \\ &= 2^3 \cdot 9 \\ &= 8 \cdot 9 \\ &= 72 \end{aligned}$$

107. $\dfrac{5 \cdot 7 - 3 \cdot 5}{2(11-3^2)} = \dfrac{35-15}{2(11-9)} = \dfrac{20}{2(2)} = \dfrac{20}{4} = 5$

108. $\dfrac{4 \cdot 8 - 1 \cdot 11}{3(9-2^3)} = \dfrac{32-11}{3(9-8)} = \dfrac{21}{3(1)} = \dfrac{21}{3} = 7$

109. Area $= (\text{side})^2 = (7 \text{ meters})^2 = 49$ square meters

110. Area $= (\text{side})^2 = (3 \text{ inches})^2 = 9$ square inches

111. $\dfrac{2x}{z} = \dfrac{2 \cdot 5}{2} = \dfrac{10}{2} = 5$

112. $4x - 3 = 4 \cdot 5 - 3 = 20 - 3 = 17$

113. $\dfrac{x+7}{y} = \dfrac{5+7}{0}$ is undefined.

114. $\dfrac{y}{5x} = \dfrac{0}{5 \cdot 5} = \dfrac{0}{25} = 0$

115. $x^3 - 2z = 5^3 - 2 \cdot 2 = 125 - 2 \cdot 2 = 125 - 4 = 121$

116. $\dfrac{7+x}{3z} = \dfrac{7+5}{3 \cdot 2} = \dfrac{12}{6} = 2$

117. $(y+z)^2 = (0+2)^2 = 2^2 = 4$

118. $\dfrac{100}{x} + \dfrac{y}{3} = \dfrac{100}{5} + \dfrac{0}{3} = 20 + 0 = 20$

119. Five subtracted from a number is $x - 5$.

120. Seven more than a number is $x + 7$.

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121. Ten divided by a number is $10 \div x$ or $\frac{10}{x}$.

122. The product of 5 and a number is $5x$.

123. Let n be 5.
$n+12=20-3$
$5+12 \stackrel{?}{=} 20-3$
$17=17$ True
Yes, 5 is a solution.

124. Let n be 23.
$n-8=10+6$
$23-8 \stackrel{?}{=} 10+6$
$15=16$ False
No, 23 is not a solution.

125. Let n = 14.
$30=3(n-3)$
$30 \stackrel{?}{=} 3(14-3)$
$30 \stackrel{?}{=} 3(11)$
$30=33$ False
No, 14 is not a solution.

126. Let n be 20.
$5(n-7)=65$
$5(20-7) \stackrel{?}{=} 65$
$5(13) \stackrel{?}{=} 65$
$65=65$ True
Yes, 20 is a solution.

127. $7n = 77$
Let n be 6.
$7 \cdot 6 \stackrel{?}{=} 77$
$42=77$ False
Let n be 11.
$7 \cdot 11 \stackrel{?}{=} 77$
$77=77$ True
Let n be 20.
$7 \cdot 20 \stackrel{?}{=} 77$
$140=77$ False
11 is a solution.

128. $n - 25 = 150$
Let n be 125.
$125-25 \stackrel{?}{=} 150$
$100=150$ False
Let n be 145.
$145-25 \stackrel{?}{=} 150$
$120=150$ False
Let n be 175.
$175-25 \stackrel{?}{=} 150$
$150=150$ True
175 is a solution.

129. $5(n + 4) = 90$
Let n be 14.
$5(14+4) \stackrel{?}{=} 90$
$5(18) \stackrel{?}{=} 90$
$90=90$ True
Let n be 16.
$5(16+4) \stackrel{?}{=} 90$
$5(20) \stackrel{?}{=} 90$
$100=90$ False
Let n be 26.
$5(26+4) \stackrel{?}{=} 90$
$5(30) \stackrel{?}{=} 90$
$150=90$ False
14 is a solution.

130. $3n - 8 = 28$
Let n be 3.
$3(3)-8 \stackrel{?}{=} 28$
$9-8 \stackrel{?}{=} 28$
$1=28$ False
Let n be 7.
$3(7)-8 \stackrel{?}{=} 28$
$21-8 \stackrel{?}{=} 28$
$13=28$ False
Let n be 15.
$3(15)-8 \stackrel{?}{=} 28$
$45-8 \stackrel{?}{=} 28$
$37=28$ False
None are solutions.

131.
$$\begin{array}{r} 485 \\ -\ 68 \\ \hline 417 \end{array}$$

132.
$$\begin{array}{r} 729 \\ -\ 47 \\ \hline 682 \end{array}$$

133.
$$\begin{array}{r} 732 \\ \times\ 3 \\ \hline 2196 \end{array}$$

134.
$$\begin{array}{r} 629 \\ \times\ 4 \\ \hline 2516 \end{array}$$

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135.
$$\begin{array}{r} {\scriptstyle 2\,2} \\ 374 \\ 29 \\ +\,698 \\ \hline 1101 \end{array}$$

136.
$$\begin{array}{r} {\scriptstyle 2\,1} \\ 593 \\ 52 \\ +\,766 \\ \hline 1411 \end{array}$$

137.
$$\begin{array}{r} 458 \text{ R } 8 \\ 13\overline{)\,5962} \\ \underline{-52} \\ 76 \\ \underline{-65} \\ 112 \\ \underline{-104} \\ 8 \end{array}$$

138.
$$\begin{array}{r} 237 \text{ R } 1 \\ 18\overline{)\,4267} \\ \underline{-36} \\ 66 \\ \underline{-54} \\ 127 \\ \underline{-126} \\ 1 \end{array}$$

139.
$$\begin{array}{r} 1968 \\ \times\ \ 36 \\ \hline 11\,808 \\ 59\,040 \\ \hline 70{,}848 \end{array}$$

140.
$$\begin{array}{r} 5324 \\ \times\ \ 18 \\ \hline 42\,592 \\ 53\,240 \\ \hline 95{,}832 \end{array}$$

141.
$$\begin{array}{r} 2000 \\ -\ 356 \\ \hline 1644 \end{array}$$

142.
$$\begin{array}{r} 9000 \\ -\ 519 \\ \hline 8481 \end{array}$$

143. To round 842 to the nearest ten, observe that the digit in the ones place is 2. Since this digit is less than 5, we do not add 1 to the digit in the tens place. The number 842 rounded to the nearest ten is 840.

144. To round 258,371 to the nearest hundred-thousand, observe that the digit in the ten-thousands place is 5. Since this digit is at least 5, we add 1 to the digit in the hundred-thousands place. The number 258,371 rounded to the nearest hundred-thousand is 300,000.

145. $24 \div 4 \cdot 2 = 6 \cdot 2 = 12$

146. $\dfrac{(15+3)\cdot(8-5)}{2^3+1} = \dfrac{(18)(3)}{8+1} = \dfrac{54}{9} = 6$

147. Let n be 9.

$$\begin{aligned} 5n-6 &= 40 \\ 5\cdot 9-6 &\stackrel{?}{=} 40 \\ 45-6 &\stackrel{?}{=} 40 \\ 39 &= 40 \quad \text{False} \end{aligned}$$

No, 9 is not a solution.

148. Let n be 3.

$$\begin{aligned} 2n-6 &= 5n-15 \\ 2(3)-6 &\stackrel{?}{=} 5(3)-15 \\ 6-6 &\stackrel{?}{=} 15-15 \\ 0 &= 0 \quad \text{True} \end{aligned}$$

Yes, 3 is a solution.

149.
$$\begin{array}{r} 53 \\ 32\overline{)\,1714} \\ \underline{-160} \\ 114 \\ \underline{-96} \\ 18 \end{array}$$

There are 53 full boxes with 18 left over.

150.
$$\begin{array}{r} 27 \\ \times\ \ 2 \\ \hline 54 \end{array} \qquad \begin{array}{r} 8 \\ \times\ 4 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 54 \\ +\ 32 \\ \hline 86 \end{array}$$

The total bill before taxes is \$86.

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Chapter 1 Getting Ready for the Test

1. In the number 28,690,357,004, the digit 5 is in the ten-thousands place; D.

2. In the number 28,690,357,004, the digit 8 is in the billions place; E.

3. In the number 28,690,357,004, the digit 6 is in the hundred-millions place; F.

4. In the number 28,690,357,004, the digit 0 to the far left is in the millions place; B.

5. To simplify $6 - 3 \cdot 2$, the first operation to perform is multiplying $3 \cdot 2$; C.

6. To simplify $(6 - 3) \cdot 2$, the first operation to perform is subtracting 3 from 6; B.

7. To simplify $6 \div 3 \cdot 2$, the first operation to perform is dividing 6 by 3; D.

8. To simplify $6 + 3 - 2$, the first operation to perform is adding 6 and 3; A.

9. $5 \cdot 2^3 = 5 \cdot 8 = 40$; C

10. Since $35 \div 5 = 7$, the expression is $a \div b$; B.

11. since $35 \cdot 5 = 175$, the expression is ab; D.

12. Since $35 - 5 = 30$, the expression is $a - b$; A.

13. Since $35 + 5 = 40$, the expression is $a + b$; C.

Chapter 1 Test

1. 82,426 in words is eighty-two thousand, four hundred twenty-six.

2. Four hundred two thousand, five hundred fifty in standard form is 402,550.

3.
$$\begin{array}{r} {\scriptstyle 1} \\ 59 \\ +\ 82 \\ \hline 141 \end{array}$$

4.
$$\begin{array}{r} 600 \\ -\ 487 \\ \hline 113 \end{array}$$

5.
$$\begin{array}{r} 496 \\ \times\ \ 30 \\ \hline 14{,}880 \end{array}$$

6.
$$\begin{array}{r} 766 \text{ R } 42 \\ 69\overline{)\ 52{,}896} \\ -48\ 3 \\ \hline 4\ 59 \\ -4\ 14 \\ \hline 456 \\ -414 \\ \hline 42 \end{array}$$

7. $2^3 \cdot 5^2 = 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 = 200$

8. $98 \div 1 = 98$

9. $0 \div 49 = 0$

10. $62 \div 0$ is undefined.

11. $(2^4 - 5) \cdot 3 = (16 - 5) \cdot 3 = 11 \cdot 3 = 33$

12.
$$\begin{aligned} 16 + 9 \div 3 \cdot 4 - 7 &= 16 + 3 \cdot 4 - 7 \\ &= 16 + 12 - 7 \\ &= 28 - 7 \\ &= 21 \end{aligned}$$

13. $6^1 \cdot 2^3 = 6 \cdot 2 \cdot 2 \cdot 2 = 48$

14.
$$\begin{aligned} 2[(6-4)^2 + (22-19)^2] + 10 &= 2[2^2 + 3^2] + 10 \\ &= 2[4 + 9] + 10 \\ &= 2[13] + 10 \\ &= 26 + 10 \\ &= 36 \end{aligned}$$

15. $5698 \cdot 1000 = 5{,}698{,}000$

16. Divide the sum by 5.

$$\begin{array}{r} {\scriptstyle 2} \\ 62 \\ 79 \\ 84 \\ 90 \\ +\ 95 \\ \hline 410 \end{array} \qquad \begin{array}{r} 82 \\ 5\overline{)\ 410} \\ -40 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

The average is 82.

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17. To round 52,369 to the nearest thousand, observe that the digit in the hundreds place is 3. Since this digit is less than 5, we do not add 1 to the digit in the thousands place. The number 52,369 rounded to the nearest thousand is 52,000.

18.

6289	rounds to	6 300
5403	rounds to	5 400
+ 1957	rounds to	+ 2 000
		13,700

19.

4267	rounds to	4300
− 2738	rounds to	− 2700
		1600

20.
$$\begin{array}{r} 107 \\ -\ 15 \\ \hline 92 \end{array}$$

21.
$$\begin{array}{r} 15 \\ +\ 107 \\ \hline 122 \end{array}$$

22.
$$\begin{array}{r} 107 \\ \times\ 15 \\ \hline 535 \\ 1070 \\ \hline 1605 \end{array}$$

23.
$$\begin{array}{r} 7 \text{ R } 2 \\ 15\overline{)\ 107} \\ \underline{-105} \\ 2 \end{array}$$

24.
$$\begin{array}{r} 17 \\ 29\overline{)\ 493} \\ \underline{-29} \\ 203 \\ \underline{-203} \\ 0 \end{array}$$

Each can cost $17.

25.
$$\begin{array}{r} 320 \\ -\ 139 \\ \hline 91 \end{array}$$

The higher-priced one is $91 more.

26.
$$\begin{array}{r} 45 \\ \times\ 8 \\ \hline 360 \end{array}$$

There are 360 calories in 8 tablespoons of white granulated sugar.

27.
$$\begin{array}{r} 53 \\ \times\ 16 \\ \hline 318 \\ 530 \\ \hline 848 \end{array} \qquad \begin{array}{r} 129 \\ \times\ 12 \\ \hline 258 \\ 1290 \\ \hline 1548 \end{array}$$

$$\begin{array}{r} 848 \\ +\ 1548 \\ \hline 2396 \end{array}$$

The total cost is $2396.

28. Perimeter $= (5+5+5+5)$ centimeters
$= 20$ centimeters

Area $= (\text{side})^2$
$= (5 \text{ centimeters})^2$
$= 25$ square centimeters

29. Perimeter $= (20+10+20+10)$ yards $= 60$ yards

Area $= (\text{length})(\text{width})$
$= (20 \text{ yards})(10 \text{ yards})$
$= 200$ square yards

30. Replace x with 2.

$5(x^3-2) = 5(2^3-2) = 5(8-2) = 5(6) = 30$

31. Replace x with 7 and y with 8.

$$\frac{3x-5}{2y} = \frac{3(7)-5}{2\cdot 8} = \frac{21-5}{16} = \frac{16}{16} = 1$$

32. a. The quotient of a number and 17 is $x \div 17$ or $\frac{x}{17}$.

b. Twice a number, decreased by 20 is $2x - 20$.

33. Replace n with 6.

$5n-11=19$
$5(6)-11 \stackrel{?}{=} 19$
$30-11 \stackrel{?}{=} 19$
$19=19$ True

6 is a solution.

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34. $n + 32 = 4n + 2$

Replace n with 0.

$$0 + 32 \stackrel{?}{=} 4(0) + 2$$
$$32 \stackrel{?}{=} 0 + 2$$
$$32 = 2 \quad \text{False}$$

Replace n with 10.

$$10 + 32 \stackrel{?}{=} 4(10) + 2$$
$$42 \stackrel{?}{=} 40 + 2$$
$$42 = 42 \quad \text{True}$$

Replace n with 20.

$$20 + 32 \stackrel{?}{=} 4(20) + 2$$
$$52 \stackrel{?}{=} 80 + 2$$
$$52 = 82 \quad \text{False}$$

10 is a solution.

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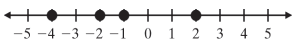
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Chapter 2

Section 2.1 Practice Exercises

1. **a.** If 0 represents the surface of the earth, then 3805 below the surface of the earth is −3805.

   b. If zero degrees Fahrenheit is represented by 0°F, then 85 degrees below zero, Fahrenheit is represented by −85°F.

2. 

3. **a.** $0 > -5$ since 0 is to the right of −5 on a number line.

   b. $-3 < 3$ since −3 is to the left of 3 on a number line.

   c. $-7 > -12$ since −7 is to the right of −12 on a number line.

4. **a.** $|-6| = 6$ because −6 is 6 units from 0.

   b. $|4| = 4$ because 4 is 4 units from 0.

   c. $|-12| = 12$ because −12 is 12 units from 0.

5. **a.** The opposite of 14 is −14.

   b. The opposite of −9 is $-(-9)$ or 9.

6. **a.** $-|-7| = -7$

   b. $-|4| = -4$

   c. $-(-12) = 12$

7. $-|x| = -|-6| = -6$

8. The planet with the highest average daytime surface temperature is the one that corresponds to the bar that extends the furthest in the positive direction (upward). Venus has the highest average daytime surface temperature.

Vocabulary, Readiness & Video Check 2.1

1. The numbers ...−3, −2, −1, 0, 1, 2, 3, ... are called integers.

2. Positive numbers, negative numbers, and zero together are called signed numbers.

3. The symbols "<" and ">" are called inequality symbols.

4. Numbers greater than 0 are called positive numbers while numbers less than 0 are called negative numbers.

5. The sign "<" means is less than and ">" means is greater than.

6. On a number line, the greater number is to the right of the lesser number.

7. A number's distance from 0 on the number line is the number's absolute value.

8. The numbers −5 and 5 are called opposites.

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9. number of feet a miner works underground

10. The tick marks are labeled with the integers.

11. 0 will always be greater than any of the negative integers.

12. 8; $|8| = 8$

13. A negative sign can be translated into the phrase "opposite of."

14. Lake Eyre

Exercise Set 2.1

2. If 0 represents the surface of the water, then 25 feet below the surface of the water is –25.

4. If 0 represents sea level, then 282 feet below sea level is –282.

6. If 0 represents 0 degrees Fahrenheit, then 134 degrees above zero is +134.

8. If 0 represents the surface of the ocean, then 14,040 below the surface of the ocean is –14,040.

10. If 0 represents a loss of \$0, then a loss of \$400 million is –400 million.

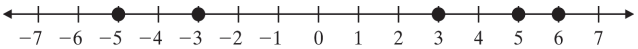
12. If 0 represents 0° Celsius, then 10° below 0° Celsius is –10. Since 5° below 0° Celsius is –5 and –10 is less than –5, –10 (or 10° below 0° Celsius) is cooler.

14. From the blue map, the coldest temperature on record for the state of Arkansas is –29°F.

16.



18.



20.



22.



24. $-8 < 0$ since –8 is to the left of 0 on a number line.

26. $-12 < -10$ since –12 is to the left of –10 on a number line.

28. $-27 > -29$ since –27 is to the right of –29 on a number line.

30. $13 > -13$ since 13 is to the right of –13 on a number line.

32. $|7| = 7$ since 7 is 7 units from 0 on a number line.

34. $|-19| = 19$ since –19 is 19 units from 0 on a number line.

36. $|100| = 100$ since 100 is 100 units from 0 on a number line.

38. $|-10| = 10$ since –10 is 10 units from 0 on a number line.

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40. The opposite of 8 is negative 8.
$-(8) = -8$

42. The opposite of negative 6 is 6.
$-(-6) = 6$

44. The opposite of 123 is negative 123.
$-(123) = -123$

46. The opposite of negative 13 is 13.
$-(-13) = 13$

48. $|-11| = 11$

50. $-|43| = -43$

52. $-|-18| = -18$

54. $-(-27) = 27$

56. $-(-14) = 14$

58. $-|-29| = -29$

60. $-|x| = -|-8| = -8$

62. $-|-x| = -|-10| = -10$

64. $|x| = |32| = 32$

66. $|-x| = |-1| = 1$

68. $-4 > -17$ since -4 is to the right of -17 on a number line.

70. $|-8| = 8$
$|-4| = 4$
Since $8 > 4$, $|-8| > |-4|$.

72. $-|17| = -17$
$-(-17) = 17$
Since $-17 < 17$, $-|17| < -(-17)$.

74. $|-24| = 24$
$-(-24) = 24$
Since $24 = 24$, $|-24| = -(-24)$.

76. $-45 < 0$ since -45 is to the left of 0 on a number line.

78. $|-45| = 45$
$|0| = 0$
Since $45 > 0$, $|-45| > |0|$.

80. $-|-8| = -8$
$-|-4| = -4$
Since $-8 < -4$, $-|-8| < -|-4|$.

82. $-(-38) = 38$
Since $-22 < 38$, $-22 < -(-38)$.

84. If the number is -13, then the absolute value of -13 is 13 and the opposite of -13 is 13.

86. If the opposite of a number is 90, then the number is -90 and its absolute value is 90.

88. The 'bar' that is equal to 0 corresponds to Lake Maracaibo, so Lake Maracaibo has an elevation at sea level.

90. The bar that extends second to the farthest in the negative direction corresponds to Lake Eyre, so Lake Eyre has the second lowest elevation.

92. The smallest number on the graph is $-269°C$, which corresponds to helium.

94. The number on the graph closest to $+300°C$ is $280°C$, which corresponds to phosphorus.

96. $9 + 0 = 9$

98.
$$\begin{array}{r} 20 \\ +\,15 \\ \hline 35 \end{array}$$

100.
$$\begin{array}{r} {\scriptstyle 1} \\ 362 \\ 37 \\ +\;\;90 \\ \hline 489 \end{array}$$

102. $|10| = 10$, $2^3 = 8$, $-|-5| = -5$, and $-(-4) = 4$, so the numbers in order from least to greatest are $-|-5|$, $-(-4)$, 2^3, $|10|$.

104. $1^4 = 1$, $-(-3) = 3$, $-|7| = -7$, and $|-20| = 20$, so the numbers in order from least to greatest are $-|7|$, 1^4, $-(-3)$, $|-20|$.

106. $3^3 = 27$, $-|-11| = -11$, $-(-10) = 10$, $-4 = -4$, $-|2| = -2$, so the numbers in order from least to greatest are $-|-11|$, -4, $-|2|$, $-(-10)$, and 3^3.

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108. a. $|0| = 0$; since $0 < 4$, then $|0| > 4$ is false.

b. $|-4| = 4$; since $4 = 4$, then $|-4| > 4$ is false.

c. $|5| = 5$; since $5 > 4$, then $|5| > 4$ is true.

d. $|-100| = 100$; since $100 > 4$, then $|-100| > 4$ is true.

110. $(-|-(-7)|) = (-|7|) = -7$

112. False; consider 0, where $|0| = 0$ and 0 is not positive.

114. True; zero is always less than a positive number since it is to the left of it on a number line.

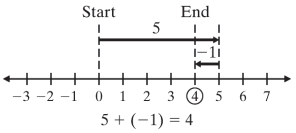
116. No; $b > a$ because b is to the right of a on the number line.

118. answers may vary

120. no; answers may vary

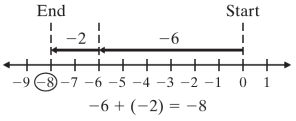
Section 2.2 Practice Exercises

1.



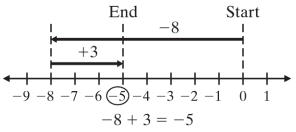
$5 + (-1) = 4$

2.



$-6 + (-2) = -8$

3.



$-8 + 3 = -5$

4. $|-3| + |-19| = 3 + 19 = 22$
The common sign is negative, so $(-3) + (-19) = -22$.

5. $-12 + (-30) = -42$

6. $9 + 4 = 13$

7. $|-1| = 1$, $|26| = 26$, and $26 - 1 = 25$
$26 > 1$, so the answer is positive.
$-1 + 26 = 25$

8. $|2| = 2$, $|-18| = 18$, and $18 - 2 = 16$
$18 > 2$, so the answer is negative.
$2 + (-18) = -16$

9. $-54 + 20 = -34$

10. $7 + (-2) = 5$

11. $-3 + 0 = -3$

12. $18 + (-18) = 0$

13. $-64 + 64 = 0$

14. $6 + (-2) + (-15) = 4 + (-15) = -11$

15.
$$\begin{aligned} 5+(-3)+12+(-14) &= 2+12+(-14) \\ &= 14+(-14) \\ &= 0 \end{aligned}$$

16. $x + 3y = -6 + 3(2) = -6 + 6 = 0$

17. $x + y = -13 + (-9) = -22$

18.
$$\begin{aligned} \text{Temperature at 8 a.m.} &= -7+(+4)+(+7) \\ &= -3+(+7) \\ &= 4 \end{aligned}$$
The temperature was 4°F at 8 a.m.

Calculator Explorations

1. $-256 + 97 = -159$

2. $811 + (-1058) = -247$

3. $6(15) + (-46) = 44$

4. $-129 + 10(48) = 351$

5. $-108{,}650 + (-786{,}205) = -894{,}855$

6. $-196{,}662 + (-129{,}856) = -326{,}518$

Vocabulary, Readiness & Video Check 2.2

1. If n is a number, then $-n + n = \underline{0}$.

2. Since $x + n = n + x$, we say that addition is commutative.

3. If a is a number, then $-(-a) = \underline{a}$.

4. Since $n + (x + a) = (n + x) + a$, we say that addition is associative.

5. Negative; the numbers have different signs and the sign of the sum is the same as the sign of the number with the larger absolute value, -6.

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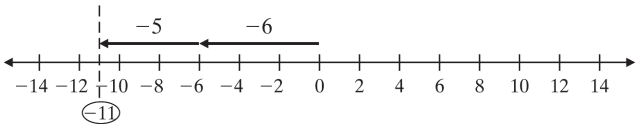
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6. Negative; the numbers have the same sign (both are negative) and we keep this common sign in the sum.

7. The diver's current depth is 231 feet below the surface.

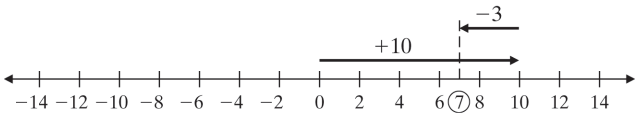
Exercise Set 2.2

2.



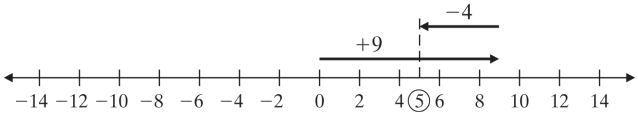
$-6 + (-5) = -11$

4.



$10 + (-3) = 7$

6.



$9 + (-4) = 5$

8. $15 + 42 = 57$

10. $|-5| + |-4| = 5 + 4 = 9$
The common sign is negative, so $-5 + (-4) = -9$.

12. $-62 + 62 = 0$

14. $|8| - |-3| = 8 - 3 = 5$
$8 > 3$, so the answer is positive.
$8 + (-3) = 5$

16. $-8 + 0 = -8$

18. $|-9| - |5| = 9 - 5 = 4$
$9 > 5$, so the answer is negative.
$5 + (-9) = -4$

20. $|-6| + |-1| = 6 + 1 = 7$
The common sign is negative, so $-6 + (-1) = -7$.

22. $|-23| + |-23| = 23 + 23 = 46$
The common sign is negative, so $-23 + (-23) = -46$.

24. $|-400| + |-256| = 400 + 256 = 656$
The common sign is negative, so $-400 + (-256) = -656$.

26. $|24| - |-10| = 24 - 10 = 14$
$24 > 10$, so the answer is positive.
$24 + (-10) = 14$

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28. $|-8| - |4| = 8 - 4 = 4$
$8 > 4$, so the answer is negative.
$-8 + 4 = -4$

30. $|-89| - |37| = 89 - 37 = 52$
$89 > 37$, so the answer is negative.
$-89 + 37 = -52$

32. $|62| - |-32| = 62 - 32 = 30$
$62 > 32$, so the answer is positive.
$-32 + 62 = 30$

34. $|-375| - |325| = 375 - 325 = 50$
$375 > 325$, so the answer is negative.
$325 + (-375) = -50$

36. $|-56| + |-33| = 56 + 33 = 89$
The common sign is negative, so
$-56 + (-33) = -89$.

38. $-1 + 5 + (-8) = 4 + (-8) = -4$

40. $-103 + (-32) + (-27) = -135 + (-27) = -162$

42. $18 + (-9) + 5 + (-2) = 9 + 5 + (-2)$
$= 14 + (-2)$
$= 12$

44. $34 + (-12) + (-11) + 213 = 22 + (-11) + 213$
$= 11 + 213$
$= 224$

46. $-12 + (-3) + (-5) = -15 + (-5) = -20$

48. $-35 + (-12) = -47$

50. $3 + (-23) + 6 = -20 + 6 = -14$

52. $-100 + 70 = -30$

54. $(-45) + 22 + 20 = -23 + 20 = -3$

56. $-87 + 0 = -87$

58. $-16 + 6 + (-14) + (-20) = -10 + (-14) + (-20)$
$= -24 + (-20)$
$= -44$

60. $x + y = -1 + (-29) = -30$

62. $3x + y = 3(7) + (-11) = 21 + (-11) = 10$

64. $3x + y = 3(13) + (-17) = 39 + (-17) = 22$

66. The sum of -30 and 15 is $-30 + 15 = -15$.

68. The sum of -49, -2, and 40 is
$-49 + (-2) + 40 = -51 + 40 = -11$.

70. $0 + (-248) + 8 + (-16) + (-28) + 32$
$= -248 + 8 + (-16) + (-28) + 32$
$= -240 + (-16) + (-28) + 32$
$= -256 + (-28) + 32$
$= -284 + 32$
$= -252$
The diver's final depth is 252 meters below the surface.

72. Since $-6 < -3$, Smith won Round 4.

74. The bar for 2021 has a height of 94,680 so the net income in 2021 was \$94,680,000,000.

76.
$$\begin{array}{r} 57,410 \\ 94,680 \\ +\ 99,800 \\ \hline 251,890 \end{array}$$
The total net income for 2020, 2021, and 2022 was \$251,890,000,000.

78. $14 + (-5) + (-8) + 7 = 9 + (-8) + 7 = 1 + 7 = 8$
Their total score was 8.

80. $-10,412 + (-1786) + 15,395 + 31,418$
$= -12,198 + 15,395 + 31,418$
$= 3197 + 31,418$
$= 34,615$
The net income for all the years shown is \$34,615.

82. $-60 + 43 = -17$
Georgia's all-time record low temperature is $-17°$F.

84. $-10,924 + 3245 = -7679$
The depth of the Aleutian Trench is -7679 meters.

86. $91 - 0 = 91$

88.
$$\begin{array}{r} 400 \\ -\ 18 \\ \hline 382 \end{array}$$

90. answers may vary

92. $-4 + 14 = 10$

94. $-15 + (-17) = -32$

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96. True

98. True

100. answers may vary

Section 2.3 Practice Exercises

1. $13 - 4 = 13 + (-4) = 9$

2. $-8 - 2 = -8 + (-2) = -10$

3. $11 - (-15) = 11 + 15 = 26$

4. $-9 - (-1) = -9 + 1 = -8$

5. $6 - 9 = 6 + (-9) = -3$

6. $-14 - 5 = -14 + (-5) = -19$

7. $-3 - (-4) = -3 + 4 = 1$

8. $-15 - 6 = -15 + (-6) = -21$

9. $$\begin{aligned} -6-5-2-(-3) &= -6+(-5)+(-2)+3 \\ &= -11+(-2)+3 \\ &= -13+3 \\ &= -10 \end{aligned}$$

10. $$\begin{aligned} 8+(-2)-9-(-7) &= 8+(-2)+(-9)+7 \\ &= 6+(-9)+7 \\ &= -3+7 \\ &= 4 \end{aligned}$$

11. $x - y = -5 - 13 = -5 + (-13) = -18$

12. $3y - z = 3(9) - (-4) = 27 + 4 = 31$

13. $29{,}028 - (-1312) = 29{,}028 + 1312 = 30{,}340$
Mount Everest is 30,340 feet higher than the Dead Sea.

Vocabulary, Readiness & Video Check 2.3

1. It is true that $a - b = \underline{a + (-b)}$. b

2. The opposite of n is $\underline{-n}$. a

3. To evaluate $x - y$ for $x = -10$ and $y = -14$, we replace x with -10 and y with -14 and evaluate $\underline{-10 - (-14)}$. d

4. The expression $-5 - 10$ equals $\underline{-5 + (-10)}$. c

5. additive inverse

6. $-3 + 4 + (23) + (-10)$; all the subtraction operations are rewritten as additions in one step rather than changing one operation at a time as you work from left to right.

7. to follow the order of operations

8. The warmest temperature is 263°F warmer than the coldest temperature.

Exercise Set 2.3

2. $-6 - (-6) = -6 + 6 = 0$

4. $15 - 12 = 15 + (-12) = 3$

6. $2 - 5 = 2 + (-5) = -3$

8. $12 - (-12) = 12 + 12 = 24$

10. $-25 - (-25) = -25 + 25 = 0$

12. $-2 - 42 = -2 + (-42) = -44$

14. $8 - 9 = 8 + (-9) = -1$

16. $17 - 63 = 17 + (-63) = -46$

18. $844 - (-20) = 844 + 20 = 864$

20. $-5 - 8 = -5 + (-8) = -13$

22. $-12 - (-5) = -12 + 5 = -7$

24. $16 - 45 = 16 + (-45) = -29$

26. $-22 - 10 = -22 + (-10) = -32$

28. $-8 - (-13) = -8 + 13 = 5$

30. $-50 - (-50) = -50 + 50 = 0$

32. $-35 + (-11) = -46$

34. $4 - 21 = 4 + (-21) = -17$

36. $-105 - 68 = -105 + (-68) = -173$

38. $86 - 98 = 86 + (-98) = -12$

40. $8 - 4 - 1 = 8 + (-4) + (-1) = 4 + (-1) = 3$

42. $$\begin{aligned} 30-18-12 &= 30+(-18)+(-12) \\ &= 12+(-12) \\ &= 0 \end{aligned}$$

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44. $-10-6-(-9)=-10+(-6)+9=-16+9=-7$

46. $-15+(-8)-4=-15+(-8)+(-4)$
$=-23+(-4)$
$=-27$

48. $23-(-17)+(-9)=23+17+(-9)$
$=40+(-9)$
$=31$

50. $-(-9)-14+(-23)=9+(-14)+(-23)$
$=-5+(-23)$
$=-28$

52. $-6-(-8)+(-12)-7=-6+8+(-12)+(-7)$
$=2+(-12)+(-7)$
$=-10+(-7)$
$=-17$

54. $5+(-18)-(-21)-2=5+(-18)+21+(-2)$
$=-13+21+(-2)$
$=8+(-2)$
$=6$

56. $x-y=-7-1=-7+(-1)=-8$

58. $x-y=9-(-2)=9+2=11$

60. $2x-y=2(8)-(-10)=16+10=26$

62. $2x-y=2(14)-(-12)=28+12=40$

64. From the graph, the maximum and minimum temperatures for Texas are 120°F and –23°F.
120 – (–23) = 120 + 23 = 143
The temperature extreme for Texas is 143°F.

66. The state with the hottest maximum is California. The maximum and minimum temperatures for California are 134°F and –45°F.
134 – (–45) = 134 + 45 = 179
The temperature extreme for California is 179°F.

68. 134 – (–80) = 134 + 80 = 214
Therefore, 134°F is 214°F warmer than –80°F.

70. $93-18-26=93+(-18)+(-26)$
$=75+(-26)$
$=49$
$49 is now owed on the account.

72. 13,796 – (–21,857) = 13,796 + 21,857 = 35,653
The difference in elevation is 35,653 feet.

74. –384 – (–505) = –384 + 505 = 121
The difference in elevation is 121 feet.

76. –236 – (–505) = –236 + 505 = 269
The difference in elevation is 269 feet.

78. 512 – (–92) = 512 + 92 = 604
The difference in elevation is 604 feet.

80. –52 – (–92) = –52 + 92 = 40
The difference in elevation is 40 feet.

82. 845 – (–162) = 845 + 162 = 1007
The difference in temperature is 1007°F.

84. 6037 – 4948 = 6037 + (–4948) = 1089
The trade balance was 1089 thousand barrels of crude oil per day that week.

86. The difference of –3 and a number is $-3-x$.

88. Add a number and –36 is $x+(-36)$.

90. $\frac{96}{3}=32$

$$3\overline{)\,96}\quad 32$$
$$\underline{-9}$$
$$06$$
$$\underline{-6}$$
$$0$$

92.
$$\begin{array}{r} 51 \\ \times\ 89 \\ \hline 459 \\ \underline{4080} \\ 4539 \end{array}$$

94. answers may vary

96. –4 – 8 = –4 + (–8) = –12

98. –3 – (–10) = –3 + 10 = 7

100. |–12| – |–5| = 12 – 5 = 12 + (–5) = 7

102. |–8| – |8| = 8 – 8 = 0

104. |–23| – |–42| = 23 – 42 = 23 + (–42) = –19

106. |–2 – (–6)| = |–2 + 6| = |4| = 4
|–2| – |–6| = 2 – 6 = 2 + (–6) = –4
Since $4 \neq -4$, the statement is false.

108. no; answers may vary

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Section 2.4 Practice Exercises

1. $-3 \cdot 8 = -24$
2. $-5(-2) = 10$
3. $0 \cdot (-20) = 0$
4. $10(-5) = -50$
5. $8(-6)(-2) = -48(-2) = 96$
6. $(-9)(-2)(-1) = 18(-1) = -18$
7. $(-3)(-4)(-5)(-1) = 12(-5)(-1) = -60(-1) = 60$
8. $(-2)^4 = (-2)(-2)(-2)(-2)$
   $= 4(-2)(-2)$
   $= -8(-2)$
   $= 16$
9. $-8^2 = -(8 \cdot 8) = -64$
10. $\frac{42}{-7} = -6$
11. $-16 \div (-2) = 8$
12. $\frac{-80}{10} = -8$
13. $\frac{-6}{0}$ is undefined.
14. $\frac{0}{-7} = 0$
15. $xy = 5 \cdot (-8) = -40$
16. $\frac{x}{y} = \frac{-12}{-3} = 4$
17. total score $= 4 \cdot (-13) = -52$
    The card player's total score was -52.

Vocabulary, Readiness & Video Check 2.4

1. The product of a negative number and a positive number is a negative number.
2. The product of two negative numbers is a positive number.
3. The quotient of two negative numbers is a positive number.
4. The quotient of a negative number and a positive number is a negative number.
5. The product of a negative number and zero is 0.
6. The quotient of 0 and a negative number is 0.
7. The quotient of a negative number and 0 is undefined.
8. When a negative sign is involved in an expression with an exponent, parentheses tell you whether or not the exponent applies to the negative sign. In Video Notebook Number 3, $(-3)^2$, the exponent applies to everything within the parentheses, so -3 is squared; in Video Notebook Number 4, -3^2, the exponent does *not* apply to the sign and only 3 is squared.
9. We can find out about sign rules for division because we know sign rules for multiplication.
10. that ab means $a \cdot b$
11. The phrase "lost four yards" in the example translates to the negative number -4.

Exercise Set 2.4

2. $5(-3) = -15$
4. $-7(-2) = 14$
6. $-9(7) = -63$
8. $-6(0) = 0$
10. $-2(3)(-7) = -6(-7) = 42$
12. $-8(-3)(-3) = 24(-3) = -72$
14. $2(-5)(-4) = -10(-4) = 40$
16. $3(0)(-4)(-8) = 0$
18. $-2(-1)(3)(-2) = 2(3)(-2) = 6(-2) = -12$
20. $-2^4 = -(2)(2)(2)(2) = -4(2)(2) = -8(2) = -16$

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22. $(-1)^4 = (-1)(-1)(-1)(-1)$
$= 1(-1)(-1)$
$= -1(-1)$
$= 1$

24. $-4^3 = -(4 \cdot 4 \cdot 4) = -64$

26. $(-3)^2 = (-3)(-3) = 9$

28. $90 \div (-9) = -10$

30. $\frac{56}{-8} = -7$

32. $\frac{-32}{4} = -8$

34. $\frac{-13}{0}$ is undefined.

36. $\frac{0}{-15} = 0$

38. $\frac{-24}{-12} = 2$

40. $0(-100) = 0$

42. $-6 \cdot 2 = -12$

44. $-12(13) = -156$

46. $-9(-5) = 45$

48. $-7(-5)(-3) = 35(-3) = -105$

50. $(-5)^2 = (-5)(-5) = 25$

52. $-\frac{30}{5} = -6$

54. $-\frac{49}{7} = -7$

56. $-15 \div 3 = -5$

58. $6(-5)(-2) = -30(-2) = 60$

60. $-20 \cdot 5 \cdot (-5) \cdot (-3) = -100 \cdot (-5) \cdot (-3)$
$= 500 \cdot (-3)$
$= -1500$

62. $\frac{0}{-14} = 0$

64. $\frac{63}{-9} = -7$

66. $480 \div (-8) = \frac{480}{-8} = -60$

68. $\frac{-36}{-3} = 12$

70. $-2^3 = -(2 \cdot 2 \cdot 2) = -8$

72. $(-11)^2 = (-11)(-11) = 121$

74. $-1(2)(7)(-3) = -2(7)(-3) = -14(-3) = 42$

76. $(-1)^{33} = -1$, since there are an odd number of factors.

78. $-2(-2)(-3)(-2) = 4(-3)(-2) = -12(-2) = 24$

80.
$$\begin{array}{r} 56 \\ \times\ 43 \\ \hline 168 \\ \underline{2240} \\ 2408 \end{array}$$
$-56 \cdot 43 = -2408$

82.
$$\begin{array}{r} 23 \\ \times\ 70 \\ \hline 1610 \end{array}$$
$70 \cdot (-23) = -1610$

84. $ab = 5(-1) = -5$

86. $ab = (-8)(8) = -64$

88. $ab = (-9)(-6) = 54$

90. $\frac{x}{y} = \frac{9}{-3} = -3$

92. $\frac{x}{y} = \frac{0}{-5} = 0$

94. $\frac{x}{y} = \frac{-10}{-10} = 1$

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96. $xy = 20 \cdot (-5) = -100$

$$\frac{x}{y} = \frac{20}{-5} = -4$$

98. $xy = -3 \cdot 0 = 0$

$\frac{x}{y} = \frac{-3}{0}$ is undefined.

100. $-63 \div (-3) = 21$

The quotient of -63 and -3 is 21.

102.
$$\begin{array}{r} 49 \\ \times\ 5 \\ \hline 245 \end{array}$$

$-49(5) = -245$

The product of -49 and 5 is -245.

104. The quotient of -8 and a number is $\frac{-8}{x}$ or $-8 \div x$.

106. The sum of a number and -12 is $x + (-12)$.

108. The difference of a number and -10 is $x - (-10)$.

110. Multiply a number by -17 is $x \cdot (-17)$ or $-17x$.

112. A loss of \$400 is represented by -400.

$7 \cdot (-400) = -2800$

His total loss was \$2800.

114. A drop of 5 degrees is represented by -5.

$6 \cdot (-5) = -30$

The total drop in temperature was 30 degrees.

116. $-1 \cdot (-39) = 39$

The melting point of rubidium is 39°C.

118. $-11 \cdot (-70) = 770$

The melting point of strontium is 770°C.

120. 2015 to 2021 is 6 years.

$$\begin{array}{r} 1\,969 \\ 6\overline{)11{,}814} \\ \underline{-6} \\ 58 \\ \underline{-54} \\ 41 \\ \underline{-36} \\ 54 \\ \underline{-54} \\ 0 \end{array}$$

1969 fewer birds would be banded per year, or -1969 birds per year.

122. a. $27{,}200 - 12{,}700 = 14{,}500$

There were about 14,500 more digital non-3D movie screens in 2021 than in 2011. This is a change of 14,500 screens.

b. 2011 to 2021 is 10 years.

$$\begin{array}{r} 1\,450 \\ 10\overline{)14{,}500} \\ \underline{-10} \\ 45 \\ \underline{-40} \\ 50 \\ \underline{-50} \\ 00 \end{array}$$

The average change was 1450 screens per year.

124.
$$\begin{aligned} 3 \cdot (7-4) + 2 \cdot 5^2 &= 3 \cdot 3 + 2 \cdot 5^2 \\ &= 3 \cdot 3 + 2 \cdot 25 \\ &= 9 + 2 \cdot 25 \\ &= 9 + 50 \\ &= 59 \end{aligned}$$

126. $12 \div (4 - 2) + 7 = 12 \div 2 + 7 = 6 + 7 = 13$

128. $-9(-11) = 99$

130. $-4 + (-3) + 21 = -7 + 21 = 14$

132. $-16 - (-2) = -16 + 2 = -14$

134. The product of an even number of negative numbers is positive, so the product of ten negative numbers is positive.

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136. $(-1)^{50}$ and $(-7)^{20}$ are positive since there are an even number of factors. Note that $(-7)^{20} > (-1)^{50}$ since $(-1)^{50} = 1$.

$(-1)^{55}$ and $(-7)^{23}$ are negative since there are an odd number of factors. Note that $(-7)^{23} < (-1)^{55}$ since $(-1)^{55} = -1$.

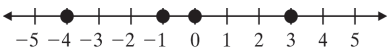
$0^{15} = 0$

The numbers from least to greatest are $(-7)^{23}, (-1)^{55}, 0^{15}, (-1)^{50}, (-7)^{20}$.

138. answers may vary

Mid-Chapter Review

1. Let 0 represent 0°F. Then 50 degrees below zero is represented by −50 and 122 degrees above zero is represented by +122 or 122.

2. 

3. $0 > -10$ since 0 is to the right of −10 on a number line.

4. $-4 < 4$ since −4 is to the left of 4 on a number line.

5. $-15 < -5$ since −15 is to the left of −5 on a number line.

6. $-2 > -7$ since −2 is to the right of −7 on a number line.

7. $|-3| = 3$ because −3 is 3 units from 0.

8. $|-9| = 9$ because −9 is 9 units from 0.

9. $-|-4| = -4$

10. $-(-5) = 5$

11. The opposite of 11 is −11.

12. The opposite of −3 is $-(-3) = 3$.

13. The opposite of 64 is −64.

14. The opposite of 0 is $-0 = 0$.

15. $-3 + 15 = 12$

16. $-9 + (-11) = -20$

17. $-8(-6)(-1) = 48(-1) = -48$

18. $-18 \div 2 = -9$

19. $65 + (-55) = 10$

20. $1000 - 1002 = 1000 + (-1002) = -2$

21. $53 - (-53) = 53 + 53 = 106$

22. $-2 - 1 = -2 + (-1) = -3$

23. $\dfrac{0}{-47} = 0$

24. $\dfrac{-36}{-9} = 4$

25. $-17 - (-59) = -17 + 59 = 42$

26. $-8 + (-6) + 20 = -14 + 20 = 6$

27. $\dfrac{-95}{-5} = 19$

28. $-9(100) = -900$

29. $-12 - 6 - (-6) = -12 + (-6) + 6 = -18 + 6 = -12$

30.
$$\begin{aligned} -4 + (-8) - 16 - (-9) &= -4 + (-8) + (-16) + 9 \\ &= -12 + (-16) + 9 \\ &= -28 + 9 \\ &= -19 \end{aligned}$$

31. $\dfrac{-105}{0}$ is undefined.

32. $7(-16)(0)(-3) = 0$ (since one factor is 0)

33. Subtract −8 from −12 is $-12 - (-8) = -12 + 8 = -4$.

34. The sum of −17 and −27 is $-17 + (-27) = -44$.

35. The product of −5 and −25 is $-5(-25) = 125$.

36. The quotient of −100 and −5 is $\dfrac{-100}{-5} = 20$.

37. Divide a number by −17 is $\dfrac{x}{-17}$ or $x \div (-17)$.

38. The sum of −3 and a number is $-3 + x$.

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39. A number decreased by -18 is $x-(-18)$.

40. The product of -7 and a number is $-7 \cdot x$ or $-7x$.

41. $x+y=-3+12=9$

42. $x-y=-3-12=-3+(-12)=-15$

43. $2y-x=2(12)-(-3)=24-(-3)=24+3=27$

44. $3y+x=3(12)+(-3)=36+(-3)=33$

45. $5x=5(-3)=-15$

46. $\dfrac{y}{x}=\dfrac{12}{-3}=-4$

Section 2.5 Practice Exercises

1. $(-2)^4=(-2)(-2)(-2)(-2)=16$

2. $-2^4=-(2)(2)(2)(2)=-16$

3. $3\cdot 6^2=3\cdot(6\cdot 6)=3\cdot 36=108$

4. $\dfrac{-25}{5(-1)}=\dfrac{-25}{-5}=5$

5. $\dfrac{-18+6}{-3-1}=\dfrac{-12}{-4}=3$

6. $30+50+(-4)^3=30+50+(-64)$
$=80+(-64)$
$=16$

7. $-2^3+(-4)^2+1^5=-8+16+1=8+1=9$

8. $2(2-9)+(-12)-3=2(-7)+(-12)-3$
$=-14+(-12)-3$
$=-26-3$
$=-29$

9. $(-5)\cdot|-8|+(-3)+2^3=(-5)\cdot 8+(-3)+2^3$
$=(-5)\cdot 8+(-3)+8$
$=-40+(-3)+8$
$=-43+8$
$=-35$

10. $-4[-6+5(-3+5)]-7=-4[-6+5(2)]-7$
$=-4[-6+10]-7$
$=-4(4)-7$
$=-16-7$
$=-23$

11. $x^2=(-15)^2=(-15)(-15)=225$
$-x^2=-(-15)^2=-(-15)(-15)=-225$

12. $5y^2=5(4)^2=5(16)=80$
$5y^2=5(-4)^2=5(16)=80$

13. $x^2+y=(-6)^2+(-3)=36+(-3)=33$

14. $4-x^2=4-(-8)^2=4-64=-60$

15. average
$=\dfrac{\text{sum of numbers}}{\text{number of numbers}}$
$=\dfrac{17+(-1)+(-11)+(-13)+(-16)+(-13)+2}{7}$
$=\dfrac{-35}{7}$
$=-5$
The average of the temperatures is $-5°$F.

Calculator Explorations

1. $\dfrac{-120-360}{-10}=48$

2. $\dfrac{4750}{-2+(-17)}=-250$

3. $\dfrac{-316+(-458)}{28+(-25)}=-258$

4. $\dfrac{-234+86}{-18+16}=74$

Vocabulary, Readiness & Video Check 2.5

1. To simplify $-2\div 2\cdot(3)$, which operation should be performed first? division

2. To simplify $-9-3\cdot 4$, which operation should be performed first? multiplication

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3. The average of a list of numbers is $\frac{\text{sum of numbers}}{\text{number of numbers}}$.

4. To simplify $5[-9 + (-3)] \div 4$, which operation should be performed first? addition

5. To simplify $-2 + 3(10 - 12) \cdot (-8)$, which operation should be performed first? subtraction

6. To evaluate $x - 3y$ for $x = -7$ and $y = -1$, replace x with -7 and y with -1 and evaluate $-7 - 3(-1)$.

7. A fraction bar means divided by and it is a grouping symbol.

8. to make sure that the entire value of -2, including the sign, is squared

9. Finding an average is a good application of both order of operations and adding and dividing integers.

Exercise Set 2.5

2. $-2^4 = -(2)(2)(2)(2) = -16$

4. $(-2)^4 = (-2)(-2)(-2)(-2) = 16$

6. $5 \cdot 2^3 = 5 \cdot 8 = 40$

8. $10 - 23 - 12 = -13 - 12 = -25$

10. $-8 + 4(3) = -8 + 12 = 4$

12. $7(-6) + 3 = -42 + 3 = -39$

14. $-12 + 6 \div 3 = -12 + 2 = -10$

16. $\begin{aligned} 5+9\cdot 4-20 &= 5+36-20 \\ &= 41-20 \\ &= 21 \end{aligned}$

18. $\frac{20-15}{-1} = \frac{5}{-1} = -5$

20. $\frac{88}{-8-3} = \frac{88}{-11} = -8$

22. $7(-4) - (-6) = -28 + 6 = -22$

24. $[9+(-2)]^3 = [7]^3 = 343$

26. $\begin{aligned} 7\cdot 6-6\cdot 5+(-10) &= 42-6\cdot 5+(-10) \\ &= 42-30+(-10) \\ &= 12+(-10) \\ &= 2 \end{aligned}$

28. $7-(-5)^2 = 7-25 = -18$

30. $|-3+7|\cdot 7^2 = |4|\cdot 7^2 = 4\cdot 7^2 = 4\cdot 49 = 196$

32. $10\cdot 5^3 + 7 = 10\cdot 125 + 7 = 1250 + 7 = 1257$

34. $8^2 - (5-2)^4 = 8^2 - 3^4 = 64 - 81 = -17$

36. $|12 - 19| \div 7 = |-7| \div 7 = 7 \div 7 = 1$

38. $-(-2)^3 = -(-8) = 8$

40. $(2-7)^2 \div (4-3)^4 = (-5)^2 \div 1^4 = 25 \div 1 = 25$

42. $\begin{aligned} |3-15|\cdot(-4)\div(-16) &= |-12|\cdot(-4)\div(-16) \\ &= 12\cdot(-4)\div(-16) \\ &= -48\div(-16) \\ &= 3 \end{aligned}$

44. $(-20-5)\div 5-15 = (-25)\div 5-15 = -5-15 = -20$

46. $\begin{aligned} 3\cdot(8-3)+(-4)-10 &= 3\cdot(5)+(-4)-10 \\ &= 15+(-4)-10 \\ &= 11-10 \\ &= 1 \end{aligned}$

48. $(4-12)\cdot(8-17) = (-8)\cdot(-9) = 72$

50. $(-4 \div 4) - (8 \div 8) = (-1) - (1) = -2$

52. $(11-3^2)^3 = (11-9)^3 = 2^3 = 8$

54. $\begin{aligned} -3(4-8)^2+5(14-16)^3 &= -3(-4)^2+5(-2)^3 \\ &= -3(16)+5(-8) \\ &= -48+(-40) \\ &= -88 \end{aligned}$

56. $\begin{aligned} &12-[7-(3-6)]+(2-3)^3 \\ &= 12-[7-(-3)]+(2-3)^3 \\ &= 12-(7+3)+(-1)^3 \\ &= 12-10+(-1) \\ &= 2+(-1) \\ &= 1 \end{aligned}$

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58. $\dfrac{10(-1)-(-2)(-3)}{2[-8\div(-2-2)]}=\dfrac{-10-6}{2[-8\div(-4)]}$
$=\dfrac{-16}{2(2)}$
$=\dfrac{-16}{4}$
$=-4$

60. $-2[6+4(2-8)]-25=-2[6+4(-6)]-25$
$=-2[6+(-24)]-25$
$=-2(-18)-25$
$=36-25$
$=11$

62. $x-y-z=-2-4-(-1)$
$=-2-4+1$
$=-6+1$
$=-5$

64. $5x-y+4z=5(-2)-4+4(-1)$
$=-10-4+(-4)$
$=-14+(-4)$
$=-18$

66. $x^2+z=(-2)^2+(-1)=4+(-1)=3$

68. $\dfrac{4x}{y}=\dfrac{4(-2)}{4}=\dfrac{-8}{4}=-2$

70. $z^2=(-4)^2=16$

72. $-x^2=-(-3)^2=-9$

74. $3x^2=3(-3)^2=3(9)=27$

76. $3-z^2=3-(-4)^2=3-16=-13$

78. $3z^2-x=3(-4)^2-(-3)=3(16)+3=48+3=51$

80. average $=\dfrac{-18+(-8)+(-1)+(-1)+0+4}{6}$
$=\dfrac{-24}{6}$
$=-4$

82. average $=\dfrac{-40+(-20)+(-10)+(-15)+(-5)}{5}$
$=\dfrac{-90}{5}$
$=-18$

84. The two lowest scores are –20 and –5.
$-5-(-20)=-5+20=15$
The difference between the two lowest scores is 15.

86. average $=\dfrac{-20+(-5)+(-5)}{3}=\dfrac{-30}{3}=-10$
The average of the scores is –10.

88. no; answers may vary

90. $90\div 45=2$

92. $45+90=135$

94. $3+5+3+5=16$
The perimeter is 16 centimeters.

96. $17+23+32=72$
The perimeter is 72 meters.

98. $(7\cdot 3-4)\cdot 2=(21-4)\cdot 2=17\cdot 2=34$

100. $2\cdot(8\div 4-20)=2\cdot(2-20)=2\cdot(-18)=-36$

102. answers may vary

104. answers may vary

106. $(-17)^6=(-17)(-17)(-17)(-17)(-17)(-17)$
$=24{,}137{,}569$

108. $3x^2+2x-y=3(-18)^2+2(-18)-2868$
$=3(324)+(-36)-2868$
$=972+(-36)-2868$
$=936-2868$
$=-1932$

110. $5(ab+3)^b=5(-2\cdot 3+3)^3$
$=5(-6+3)^3$
$=5(-3)^3$
$=5(-27)$
$=-135$

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Section 2.6 Practice Exercises

1. $-4x-3=5$
$-4(-2)-3 \stackrel{?}{=} 5$
$8-3 \stackrel{?}{=} 5$
$5=5$ True

Since 5 = 5 is true, –2 is a solution of the equation.

2. $y-6=-2$
$y-6+6=-2+6$
$y=4$
Check: $y-6=-2$
$4-6 \stackrel{?}{=} -2$
$-2=-2$ True

The solution is 4.

3. $-2=z+8$
$-2-8=z+8-8$
$-10=z$
Check: $-2=z+8$
$-2 \stackrel{?}{=} -10+8$
$-2=-2$ True

The solution is –10.

4. $x=-2+90+(-100)$
$x=88+(-100)$
$x=-12$
The solution is –12.

5. $3y=-18$
$\frac{3y}{3}=\frac{-18}{3}$
$\frac{3}{3}\cdot y=\frac{-18}{3}$
$y=-6$
Check: $3y=-18$
$3(-6) \stackrel{?}{=} -18$
$-18=-18$ True

The solution is –6.

6. $-32=8x$
$\frac{-32}{8}=\frac{8x}{8}$
$\frac{-32}{8}=\frac{8}{8}\cdot x$
$-4=x$
Check: $-32=8x$
$-32 \stackrel{?}{=} 8(-4)$
$-32=-32$ True

The solution is –4.

7. $-3y=-27$
$\frac{-3y}{-3}=\frac{-27}{-3}$
$\frac{-3}{-3}\cdot y=\frac{-27}{-3}$
$y=9$
Check: $-3y=-27$
$-3\cdot 9 \stackrel{?}{=} -27$
$-27=-27$ True

The solution is 9.

8. $\frac{x}{-4}=7$
$-4\cdot\frac{x}{-4}=-4\cdot 7$
$\frac{-4}{-4}\cdot x=-4\cdot 7$
$x=-28$
Check: $\frac{x}{-4}=7$
$\frac{-28}{-4} \stackrel{?}{=} 7$
$7=7$ True

The solution is –28.

Vocabulary, Readiness & Video Check 2.6

1. A combination of operations on variables and numbers is called an expression.

2. A statement of the form "expression = expression" is called an equation.

3. An equation contains an equal sign (=) while an expression does not.

4. An expression may be simplified and evaluated while an equation may be solved.

5. A solution of an equation is a number that when substituted for the variable makes the equation a true statement.

6. Equivalent equations have the same solution.

7. By the addition property of equality, the same number may be added to or subtracted from both sides of an equation without changing the solution of the equation.

8. By the multiplication property of equality, both sides of an equation may be multiplied or divided by the same nonzero number without changing the solution of the equation.

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9. an equal sign

10. We can add the same number to both sides of an equation and we'll have an equivalent equation. Also, we can subtract the same number from both sides of an equation and have an equivalent equation.

11. To check a solution, we go back to the original equation, replace the variable with the proposed solution, and see if we get a true statement.

Exercise Set 2.6

2. $y-16=-7$
$9-16 \stackrel{?}{=} -7$
$-7=-7$ True

Since $-7=-7$ is true, 9 is a solution of the equation.

4. $a+23=-16$
$-7+23 \stackrel{?}{=} -16$
$16=-16$ False

Since $16=-16$ is false, -7 is not a solution of the equation.

6. $-3k=12-k$
$-3(-6) \stackrel{?}{=} 12-(-6)$
$18 \stackrel{?}{=} 12+6$
$18=18$ True

Since $18=18$ is true, -6 is a solution of the equation.

8. $2(b-3)=10$
$2(2-3) \stackrel{?}{=} 10$
$2(-1) \stackrel{?}{=} 10$
$-2=10$ False

Since $-2=10$ is false, 2 is not a solution of the equation.

10. $f+4=-6$
$f+4-4=-6-4$
$f=-10$

Check: $f+4=-6$
$-10+\stackrel{?}{=}-6$
$-6=-6$ True

The solution is -10.

12. $s-7=-15$
$s-7+7=-15+7$
$s=-8$

Check: $s-7=-15$
$-8-7 \stackrel{?}{=} -15$
$-15=-15$ True

The solution is -8.

14. $1=y+7$
$1-7=y+7-7$
$-6=y$

Check: $1=y+7$
$1 \stackrel{?}{=} -6+7$
$1=1$ True

The solution is -6.

16. $-50+40-5=z$
$-10-5=z$
$-15=z$

Check: $-50+40-5=z$
$-50+40-5 \stackrel{?}{=} -15$
$-10-5 \stackrel{?}{=} -15$
$-15=-15$ True

The solution is -15.

18. $6y=48$
$\frac{6y}{6}=\frac{48}{6}$
$\frac{6}{6}\cdot y=\frac{48}{6}$
$y=8$

Check: $6y=48$
$6(8) \stackrel{?}{=} 48$
$48=48$ True

The solution is 8.

20. $-2x=26$
$\frac{-2x}{-2}=\frac{26}{-2}$
$\frac{-2}{-2}\cdot x=\frac{26}{-2}$
$x=-13$

Check: $-2x=26$
$-2(-13) \stackrel{?}{=} 26$
$26=26$ True

The solution is -13.

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22. $\frac{n}{11} = -5$

$11 \cdot \frac{n}{11} = 11 \cdot (-5)$

$\frac{11}{11} \cdot n = 11 \cdot (-5)$

$n = -55$

Check: $\frac{n}{11} = -5$

$\frac{-55}{11} \stackrel{?}{=} -5$

$-5 = -5$ True

The solution is -55.

24. $7y = -21$

$\frac{7y}{7} = \frac{-21}{7}$

$\frac{7}{7} \cdot y = \frac{-21}{7}$

$y = -3$

Check: $7y = -21$

$7 \cdot (-3) \stackrel{?}{=} -21$

$-21 = -21$ True

The solution is -3.

26. $-9x = 0$

$\frac{-9x}{-9} = \frac{0}{-9}$

$\frac{-9}{-9} \cdot x = \frac{0}{-9}$

$x = 0$

Check: $-9x = 0$

$-9 \cdot 0 \stackrel{?}{=} 0$

$0 = 0$ True

The solution is 0.

28. $-31x = -31$

$\frac{-31x}{-31} = \frac{-31}{-31}$

$\frac{-31}{-31} \cdot x = \frac{-31}{-31}$

$x = 1$

Check: $-31x = -31$

$-31 \cdot 1 \stackrel{?}{=} -31$

$-31 = -31$ True

The solution is 1.

30. $3y = -27$

$\frac{3y}{3} = \frac{-27}{3}$

$\frac{3}{3} \cdot y = \frac{-27}{3}$

$y = -9$

The solution is -9.

32. $n - 4 = -48$

$n - 4 + 4 = -48 + 4$

$n = -44$

The solution is -44.

34. $-36 = y + 12$

$-36 - 12 = y + 12 - 12$

$-48 = y$

The solution is -48.

36. $\frac{x}{-9} = -9$

$-9 \cdot \frac{x}{-9} = -9 \cdot (-9)$

$\frac{-9}{-9} \cdot x = -9 \cdot (-9)$

$x = 81$

The solution is 81.

38. $z = -28 + 36$

$z = 8$

The solution is 8.

40. $-11x = -121$

$\frac{-11x}{-11} = \frac{-121}{-11}$

$\frac{-11}{-11} \cdot x = \frac{-121}{-11}$

$x = 11$

The solution is 11.

42. $\frac{n}{5} = -20$

$5 \cdot \frac{n}{5} = 5 \cdot (-20)$

$\frac{5}{5} \cdot n = 5 \cdot (-20)$

$n = -100$

The solution is -100.

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44. $-81 = 27x$

$$\frac{-81}{27} = \frac{27x}{27}$$

$$\frac{-81}{27} = \frac{27}{27} \cdot x$$

$$-3 = x$$

The solution is -3.

46. A number increased by -5 is $x + (-5)$.

48. The quotient of a number and -20 is $x \div (-20)$ or $\frac{x}{-20}$.

50. -32 multiplied by a number is $-32 \cdot x$ or $-32x$.

52. Subtract a number from -18 is $-18 - x$.

54. $n + 961 = 120$

$$n + 961 - 961 = 120 - 961$$

$$n = -841$$

The solution is -841.

56. $\frac{y}{-18} = 1098$

$$-18 \cdot \frac{y}{-18} = -18 \cdot 1098$$

$$\frac{-18}{-18} \cdot y = -18 \cdot 1098$$

$$y = -19,764$$

The solution is $-19{,}764$.

58. answers may vary

60. answers may vary

Chapter 2 Vocabulary Check

1. Two numbers that are the same distance from 0 on a number line but are on opposite sides of 0 are called opposites.

2. The absolute value of a number is that number's distance from 0 on a number line.

3. The integers are ..., -3, -2, -1, 0, 1, 2, 3, ...

4. The negative numbers are numbers less than zero.

5. The positive numbers are numbers greater than zero.

6. The symbols < and > are called inequality symbols.

7. A solution of an equation is a number that when substituted for the variable makes the equation a true statement.

8. The average of a list of numbers is $\frac{\text{sum of numbers}}{\textit{number of numbers}}$.

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9. A combination of operations on variables and numbers is called an expression.

10. A statement of the form "expression = expression" is called an equation.

11. The sign "<" means is less than and ">" means is greater than.

12. By the addition property of equality, the same number may be added to or subtracted from both sides of an equation without changing the solution of the equation.

13. By the multiplication property of equality, both sides of an equation may be multiplied or divided by the same nonzero number without changing the solution of the equation.

Chapter 2 Review

1. If 0 represents sea level, then 1572 feet below sea level is −1572.

2. If 0 represents sea level, then an elevation of 11,239 feet is +11,239.

3.



4.



5. |−11| = 11 since −11 is 11 units from 0 on a number line.

6. |0| = 0 since 0 is 0 units from 0 on a number line.

7. −|8| = −8

8. −(−9) = 9

9. −|−16| = −16

10. −(−2) = 2

11. −18 > −20 since −18 is to the right of −20 on a number line.

12. −5 < 5 since −5 is to the left of 5 on a number line.

13. |−123| = 123
−|−198| = −198
Since 123 > −198, |−123| > −|−198|.

14. |−12| = 12
−|−16| = −16
Since 12 > −16, |−12| > −|−16|.

15. The opposite of −18 is 18.
−(−18) = 18

16. The opposite of 42 is negative 42.
−(42) = −42

17. False; consider $a = 1$ and $b = 2$, then $1 < 2$.

18. True

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19. True

20. True

21. $|y| = |-2| = 2$

22. $|-x| = |-(-3)| = |3| = 3$

23. $-|-z| = -|-(-5)| = -|5| = -5$

24. $-|-n| = -|-(-10)| = -|10| = -10$

25. The bar that extends the farthest in the negative direction corresponds to elevator D, so elevator D extends the farthest below ground.

26. The bar that extends the farthest in the positive direction corresponds to elevator B, so elevator B extends the highest above ground.

27. $|5| - |-3| = 5 - 3 = 2$
$5 > 3$, so the answer is positive.
$5 + (-3) = 2$

28. $|18| - |-4| = 18 - 4 = 14$
$18 > 4$, so the answer is positive.
$18 + (-4) = 14$

29. $|16| - |-12| = 16 - 12 = 4$
$16 > 12$, so the answer is positive.
$-12 + 16 = 4$

30. $|40| - |-23| = 40 - 23 = 17$
$40 > 23$, so the answer is positive.
$-23 + 40 = 17$

31. $|-8| + |-15| = 8 + 15 = 23$
The common sign is negative, so
$-8 + (-15) = -23$.

32. $|-5| + |-17| = 5 + 17 = 22$
The common sign is negative, so
$-5 + (-17) = -22$.

33. $|-24| - |3| = 24 - 3 = 21$
$24 > 3$, so the answer is negative.
$-24 + 3 = -21$

34. $|-89| - |19| = 89 - 19 = 70$
$89 > 19$, so the answer is negative.
$-89 + 19 = -70$

35. $15 + (-15) = 0$

36. $-24 + 24 = 0$

37. $|-43| + |-108| = 43 + 108 = 151$
The common sign is negative, so
$-43 + (-108) = -151$.

38. $|-100| + |-506| = 100 + 506 = 606$
The common sign is negative, so
$-100 + (-506) = -606$.

39. $-15 + (-5) = -20$
The temperature at 6 a.m. is $-20°$C.

40. $-127 + (-23) = -150$
The diver's current depth is -150 feet.

41. $$\begin{aligned} -7+(-6)+(-2)+(-2) &= -13+(-2)+(-2) \\ &= -15+(-2) \\ &= -17 \end{aligned}$$
Her total score was -17.

42. $19 - 10 = 19 + (-10) = 9$
The team's score was 9.

43. $12 - 4 = 12 + (-4) = 8$

44. $-12 - 4 = -12 + (-4) = -16$

45. $-7 - 17 = -7 + (-17) = -24$

46. $7 - 17 = 7 + (-17) = -10$

47. $7 - (-13) = 7 + 13 = 20$

48. $-6 - (-14) = -6 + 14 = 8$

49. $16 - 16 = 16 + (-16) = 0$

50. $-16 - 16 = -16 + (-16) = -32$

51. $-12 - (-12) = -12 + 12 = 0$

52. $-5 - (-12) = -5 + 12 = 7$

53. $$\begin{aligned} -(-5)-12+(-3) &= 5+(-12)+(-3) \\ &= -7+(-3) \\ &= -10 \end{aligned}$$

54. $$\begin{aligned} -8+(-12)-10-(-3) &= -8+(-12)+(-10)+3 \\ &= -20+(-10)+3 \\ &= -30+3 \\ &= -27 \end{aligned}$$

55. $600 - (-92) = 600 + 92 = 692$
The difference in elevations is 692 feet.

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56. $142-125+43-85=142+(-125)+43+(-85)$
$=17+43+(-85)$
$=60+(-85)$
$=-25$
The balance in the account is –25.

57. $223-245=223+(-245)=-22$
You are –22 feet or 22 feet below ground at the end of the drop.

58. $66-(-16)=66+16=82$
The total length of the elevator shaft for elevator C is 82 feet.

59. $|-5|-|-6|=5-6=5+(-6)=-1$
$5-6=5+(-6)=-1$
$|-5|-|-6|=5-6$ is true.

60. $|-5-(-6)|=|-5+6|=|1|=1$
$5+6=11$
Since $1\neq 11$, the statement is false.

61. $-3(-7)=21$

62. $-6(3)=-18$

63. $-4(16)=-64$

64. $-5(-12)=60$

65. $(-5)^2=(-5)(-5)=25$

66. $(-1)^5=(-1)(-1)(-1)(-1)(-1)=-1$

67. $12(-3)(0)=0$

68. $-1(6)(2)(-2)=-6(2)(-2)=-12(-2)=24$

69. $-15\div 3=-5$

70. $\dfrac{-24}{-8}=3$

71. $\dfrac{0}{-3}=0$

72. $\dfrac{-46}{0}$ is undefined.

73. $\dfrac{100}{-5}=-20$

74. $\dfrac{-72}{8}=-9$

75. $\dfrac{-38}{-1}=38$

76. $\dfrac{45}{-9}=-5$

77. A loss of 5 yards is represented by –5.
$(-5)(2)=-10$
The total loss is 10 yards.

78. A loss of \$50 is represented by –50.
$(-50)(4)=-200$
The total loss is \$200.

79. A debt of \$1024 is represented by –1024.
$-1024\div 4=-256$
Each payment is \$256.

80. A drop of 45 degrees is represented by –45.
$\dfrac{-45}{9}=-5$ or $-45\div 9=-5$
The average drop each hour is 5°F.

81. $(-7)^2=(-7)(-7)=49$

82. $-7^2=-(7\cdot 7)=-49$

83. $5-8+3=-3+3=0$

84. $-3+12+(-7)-10=9+(-7)-10=2-10=-8$

85. $-10+3\cdot(-2)=-10+(-6)=-16$

86. $5-10\cdot(-3)=5-(-30)=5+30=35$

87. $16\div(-2)\cdot 4=-8\cdot 4=-32$

88. $-20\div 5\cdot 2=-4\cdot 2=-8$

89. $16+(-3)\cdot 12\div 4=16+(-36)\div 4$
$=16+(-9)$
$=7$

90. $-12+10\div(-5)=-12+(-2)=-14$

91. $4^3-(8-3)^2=4^3-(5)^2=64-25=39$

92. $(-3)^3-90=-27-90=-117$

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93. $\dfrac{(-4)(-3)-(-2)(-1)}{-10+5}=\dfrac{12-2}{-5}=\dfrac{10}{-5}=-2$

94. $\dfrac{4(12-18)}{-10\div(-2-3)}=\dfrac{4(-6)}{-10\div(-5)}=\dfrac{-24}{2}=-12$

95. $\text{average}=\dfrac{-18+25+(-30)+7+0+(-2)}{6}$

$=\dfrac{-18}{6}$

$=-3$

96. $\text{average}=\dfrac{-45+(-40)+(-30)+(-25)}{4}$

$=\dfrac{-140}{4}$

$=-35$

97. $2x-y=2(-2)-1=-4-1=-5$

98. $y^2+x^2=1^2+(-2)^2=1+4=5$

99. $\dfrac{3x}{6}=\dfrac{3(-2)}{6}=\dfrac{-6}{6}=-1$

100. $\dfrac{5y-x}{-y}=\dfrac{5(1)-(-2)}{-1}=\dfrac{5+2}{-1}=\dfrac{7}{-1}=-7$

101. $2n-6=16$

$2(-5)-6\stackrel{?}{=}16$

$-10-6\stackrel{?}{=}16$

$-16=16$ False

Since $-16=16$ is false, -5 is not a solution of the equation.

102. $2(c-8)=-20$

$2(-2-8)\stackrel{?}{=}-20$

$2(-10)\stackrel{?}{=}-20$

$-20=-20$ True

Since $-20=-20$ is true, -2 is a solution of the equation.

103. $n-7=-20$

$n-7+7=-20+7$

$n=-13$

The solution is -13.

104. $-5=n+15$

$-5-15=n+15-15$

$-20=n$

The solution is -20.

105. $10x=-30$

$\dfrac{10x}{10}=\dfrac{-30}{10}$

$\dfrac{10}{10}\cdot x=\dfrac{-30}{10}$

$x=-3$

The solution is -3.

106. $-8x=72$

$\dfrac{-8x}{-8}=\dfrac{72}{-8}$

$\dfrac{-8}{-8}\cdot x=\dfrac{72}{-8}$

$x=-9$

The solution is -9.

107. $-20+7=y$

$-13=y$

The solution is -13.

108. $x-31=-62$

$x-31+31=-62+31$

$x=-31$

The solution is -31.

109. $\dfrac{n}{-4}=-11$

$-4\cdot\dfrac{n}{-4}=-4\cdot(-11)$

$\dfrac{-4}{-4}\cdot n=-4\cdot(-11)$

$n=44$

The solution is 44.

110. $\dfrac{x}{-2}=13$

$-2\cdot\dfrac{x}{-2}=-2\cdot 13$

$\dfrac{-2}{-2}\cdot x=-2\cdot 13$

$x=-26$

The solution is -26.

111. $n+12=-7$

$n+12-12=-7-12$

$n=-19$

The solution is -19.

112. $n-40=-2$

$n-40+40=-2+40$

$n=38$

The solution is 38.

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113. $-36 = -6x$

$$\frac{-36}{-6} = \frac{-6x}{-6}$$

$$\frac{-36}{-6} = \frac{-6}{-6} \cdot x$$

$$6 = x$$

The solution is 6.

114. $-40 = 8y$

$$\frac{-40}{8} = \frac{8y}{8}$$

$$\frac{-40}{8} = \frac{8}{8} \cdot y$$

$$-5 = y$$

The solution is –5.

115. $-6 + (-9) = -15$

116. $-16 - 3 = -16 + (-3) = -19$

117. $-4(-12) = 48$

118. $\frac{84}{-4} = -21$

119. $-76 - (-97) = -76 + 97 = 21$

120. $-9 + 4 = -5$

121. $-18 - 9 = -27$

The temperature on Friday was –27°C.

122. $-11 + 17 = 6$

The temperature at noon on Tuesday was 6°C.

123. $12{,}923 - (-195) = 12{,}923 + 195 = 13{,}118$

The difference in elevations is 13,118 feet.

124. $-32 + 23 = -9$

His financial situation can be represented by –9 or –$9.

125. $(3-7)^2 \div (6-4)^3 = (-4)^2 \div (2)^3 = 16 \div 8 = 2$

126.
$$\begin{aligned} 3(4+2) + (-6) - 3^2 &= 3(6) + (-6) - 3^2 \\ &= 3(6) + (-6) - 9 \\ &= 18 + (-6) - 9 \\ &= 12 - 9 \\ &= 3 \end{aligned}$$

127. $2 - 4 \cdot 3 + 5 = 2 - 12 + 5 = -10 + 5 = -5$

128. $4 - 6 \cdot 5 + 1 = 4 - 30 + 1 = -26 + 1 = -25$

129. $$\frac{-|-14| - 6}{7 + 2(-3)} = \frac{-14 - 6}{7 + (-6)} = \frac{-20}{1} = -20$$

130.
$$\begin{aligned} 5(7-6)^3 - 4(2-3)^2 + 2^4 &= 5(1)^3 - 4(-1)^2 + 2^4 \\ &= 5(1) - 4(1) + 16 \\ &= 5 - 4 + 16 \\ &= 1 + 16 \\ &= 17 \end{aligned}$$

131.
$$n - 9 = -30$$

$$n - 9 + 9 = -30 + 9$$

$$n = -21$$

The solution is –21.

132.
$$n + 18 = 1$$

$$n + 18 - 18 = 1 - 18$$

$$n = -17$$

The solution is –17.

133.
$$-4x = -48$$

$$\frac{-4x}{-4} = \frac{-48}{-4}$$

$$\frac{-4}{-4} \cdot x = \frac{-48}{-4}$$

$$x = 12$$

The solution is 12.

134.
$$9x = -81$$

$$\frac{9x}{9} = \frac{-81}{9}$$

$$\frac{9}{9} \cdot x = \frac{-81}{9}$$

$$x = -9$$

The solution is –9.

135.
$$\frac{n}{-2} = 100$$

$$-2 \cdot \frac{n}{-2} = -2 \cdot 100$$

$$\frac{-2}{-2} \cdot n = -2 \cdot 100$$

$$n = -200$$

The solution is –200.

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136. $\dfrac{y}{-1} = -3$

$-1 \cdot \dfrac{y}{-1} = -1(-3)$

$\dfrac{-1}{-1} \cdot y = -1 \cdot (-3)$

$y = 3$

The solution is 3.

Chapter 2 Getting Ready For the Test

1. The opposite of –2 is –(–2) = 2; A.

2. The absolute value of –2 is |–2| = 2 because –2 is 2 units from 0 on a number line; A.

3. The absolute value of 2 is |2| = 2 because 2 is 2 units from 0 on a number line; A.

4. The opposite of 2 is –2; B.

5. For xy, the operation is multiplication; C.

6. For –12(+3), the operation is multiplication; C.

7. For –12 + 3, the operation is addition; A.

8. For $\dfrac{-12}{+3}$, the operation is division; D.

9. For 4 + 6 · 2, the operation of multiplication is performed first, since multiplication and division are performed before addition and subtraction; C.

10. For 4 + 6 ÷ 2, the operation of division is performed first, since multiplication and division are performed before addition and subtraction; D.

11. $-3x = 6$

$\dfrac{-3x}{-3} = \dfrac{6}{-3}$

$x = -2$

Choice B is correct.

12. $x - 2 = -4$

$x - 2 + 2 = -4 + 2$

$x = -2$

Choice B is correct.

13. $\dfrac{x}{-3} = 6$

$-3\left(\dfrac{x}{-3}\right) = -3(6)$

$x = -18$

Choice D is correct.

14. $x + 2 = 4$

$x + 2 - 2 = 4 - 2$

$x = 2$

Choice A is correct.

Chapter 2 Test

1. –5 + 8 = 3

2. 18 – 24 = 18 + (–24) = –6

3. 5 · (–20) = –100

4. –16 ÷ (–4) = 4

5. –18 + (–12) = –30

6. –7 – (–19) = –7 + 19 = 12

7. –5 · (–13) = 65

8. $\dfrac{-25}{-5} = 5$

9. |–25| + (–13) = 25 + (–13) = 12

10. 14 – |–20| = 14 – 20 = 14 + (–20) = –6

11. |5| · |–10| = 5 · 10 = 50

12. $\dfrac{|-10|}{-|-5|} = \dfrac{10}{-5} = -2$

13. –8 + 9 ÷ (–3) = –8 + (–3) = –11

14. $-7 + (-32) - 12 + 5 = -7 + (-32) + (-12) + 5$
$= -39 + (-12) + 5$
$= -51 + 5$
$= -46$

15. $(-5)^3 - 24 \div (-3) = -125 - 24 \div (-3)$
$= -125 - (-8)$
$= -125 + 8$
$= -117$

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16. $(5-9)^2 \cdot (8-2)^3 = (-4)^2 \cdot (6)^3 = 16 \cdot 216 = 3456$

17. $-(-7)^2 \div 7 \cdot (-4) = -49 \div 7 \cdot (-4) = -7 \cdot (-4) = 28$

18. $3-(8-2)^3 = 3-6^3$
$= 3-216$
$= 3+(-216)$
$= -213$

19. $\frac{4}{2} - \frac{8^2}{16} = \frac{4}{2} - \frac{64}{16} = 2-4 = 2+(-4) = -2$

20. $\frac{-3(-2)+12}{-1(-4-5)} = \frac{6+12}{-1(-9)} = \frac{18}{9} = 2$

21. $\frac{|25-30|^2}{2(-6)+7} = \frac{|-5|^2}{-12+7} = \frac{(5)^2}{-5} = \frac{25}{-5} = -5$

22. $5(-8)-[6-(2-4)]+(12-16)^2$
$= 5(-8)-[6-(-2)]+(12-16)^2$
$= 5(-8)-(6+2)+(-4)^2$
$= 5(-8)-8+(-4)^2$
$= 5(-8)-8+16$
$= -40-8+16$
$= -48+16$
$= -32$

23. $7x+3y-4z = 7(0)+3(-3)-4(2)$
$= 0+(-9)-8$
$= -9-8$
$= -17$

24. $10-y^2 = 10-(-3)^2 = 10-9 = 1$

25. $\frac{3z}{2y} = \frac{3(2)}{2(-3)} = \frac{6}{-6} = -1$

26. A descent of 22 feet is represented by –22.
$4(-22) = -88$
Tui is 88 feet below sea level.

27. $129+(-79)+(-40)+35 = 50+(-40)+35$
$= 10+35$
$= 45$
Their new balance can be represented by 45 or \$45.

28. Subtract the elevation of the Romanche Gap from the elevation of Mount Washington.
$6288 - (-25{,}354) = 6288 + 25{,}354 = 31{,}642$
The difference in elevations is 31,642 feet.

29. Subtract the depth of the lake from the elevation of the surface.
$1495 - 5315 = 1495 + (-5315) = -3820$
The deepest point of the lake is 3820 feet below sea level.

30. $\text{average} = \frac{-12+(-13)+0+9}{4} = \frac{-16}{4} = -4$

31. a. The product of a number and 17 is $17 \cdot x$ or $17x$.

b. A number subtracted from 20 is $20 - x$.

32. $-9n = -45$
$\frac{-9n}{-9} = \frac{-45}{-9}$
$\frac{-9}{-9} \cdot n = \frac{-45}{-9}$
$n = 5$
The solution is 5.

33. $\frac{n}{-7} = 4$
$-7 \cdot \frac{n}{-7} = -7 \cdot 4$
$\frac{-7}{-7} \cdot n = -7 \cdot 4$
$n = -28$
The solution is –28.

34. $x-16 = -36$
$x-16+16 = -36+16$
$x = -20$
The solution is –20.

35. $-20+8+8 = x$
$-12+8 = x$
$-4 = x$
The solution is –4.

Cumulative Review Chapters 1–2

1. The place value of 3 in 396,418 is hundred-thousands.

2. The place value of 3 in 4308 is hundreds.

3. The place value of 3 in 93,192 is thousands.

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4. The place value of 3 is 693,298 is thousands.

5. The place value of 3 in 534,275,866 is ten-millions.

6. The place value of 3 in 267,301,818 is hundred-thousands.

7. a. $-7 < 7$ since -7 is to the left of 7 on a number line.

b. $0 > -4$ since 0 is to the right of -4 on a number line.

c. $-9 > -11$ since -9 is to the right of -11 on a number line.

8. a. $12 > -4$ since 12 is to the right of -4 on a number line.

b. $-13 > -31$ since -13 is to the right of -31 on a number line.

c. $-82 < 79$ since -82 is to the left of 79 on a number line.

9. $13+2+7+8+9 = (13+7)+(2+8)+9$
$= 20+10+9$
$= 39$

10. $11+3+9+16 = (11+9)+(3+16) = 20+19 = 39$

11.
$$\begin{array}{r} 7826 \\ -\ 505 \\ \hline 7321 \end{array}$$
Check:
$$\begin{array}{r} 7321 \\ +\ 505 \\ \hline 7826 \end{array}$$

12.
$$\begin{array}{r} 3285 \\ -\ 272 \\ \hline 3013 \end{array}$$
Check:
$$\begin{array}{r} 3013 \\ +\ 272 \\ \hline 3285 \end{array}$$

13. Subtract 7257 from the radius of Jupiter.
$$\begin{array}{r} 43,441 \\ -\ 7\,257 \\ \hline 36,184 \end{array}$$
The radius of Saturn is 36,184 miles.

14. Subtract the cost of the camera from the amount in her account.
$$\begin{array}{r} 762 \\ -\ 237 \\ \hline 525 \end{array}$$
She will have \$525 left in her account after buying the camera.

15. To round 568 to the nearest ten, observe that the digit in the ones place is 8. Since this digit is at least 5, we add 1 to the digit in the tens place. The number 568 rounded to the nearest ten is 570.

16. To round 568 to the nearest hundred, observe that the digit in the tens place is 6. Since this digit is at least 5, we add 1 to the digit in the hundreds place. The number 568 rounded to the nearest hundred is 600.

17.
$$\begin{array}{rcr} 4725 & \text{rounds to} & 4700 \\ -\ 2879 & \text{rounds to} & -\ 2900 \\ \hline & & 1800 \end{array}$$

18.
$$\begin{array}{rcr} 8394 & \text{rounds to} & 8000 \\ -\ 2913 & \text{rounds to} & -\ 3000 \\ \hline & & 5000 \end{array}$$

19. a. $5(6+5) = 5 \cdot 6 + 5 \cdot 5$

b. $20(4+7) = 20 \cdot 4 + 20 \cdot 7$

c. $2(7+9) = 2 \cdot 7 + 2 \cdot 9$

20. a. $5(2+12) = 5 \cdot 2 + 5 \cdot 12$

b. $9(3+6) = 9 \cdot 3 + 9 \cdot 6$

c. $4(8+1) = 4 \cdot 8 + 4 \cdot 1$

21.
$$\begin{array}{r} 631 \\ \times\ 125 \\ \hline 3\ 155 \\ 12\ 620 \\ 63\ 100 \\ \hline 78,875 \end{array}$$

22.
$$\begin{array}{r} 299 \\ \times\ 104 \\ \hline 1\ 196 \\ 29\ 900 \\ \hline 31,096 \end{array}$$

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