



4. The shipping cost for an order at an online store is  $\frac{1}{10}$  the cost of the items you order. What is an expression for the total cost of a given order? What are the total costs for orders of \$43, \$79, \$95, and \$103?



## Lesson Check

### Do you know HOW?

What is the simplified form of each expression?

1.  $5^2$                       2.  $2^3$                       3.  $\left(\frac{3}{4}\right)^2$

Evaluate each expression for  $x = 3$  and  $y = 4$ .

4.  $x^2 + 2(x + y)$   
 5.  $(xy)^3$   
 6.  $4x^2 - 3xy$

### Do you UNDERSTAND? MATHEMATICAL PRACTICES

7. **Vocabulary** Identify the exponent and the base in  $4^3$ .  
 8. **Error Analysis** A student simplifies an expression as shown below. Find the error and simplify the expression correctly.

$$\begin{aligned}
 23 - 8 \cdot 2 + 3^2 &= 23 - 8 \cdot 2 + 9 \\
 &= 15 \cdot 2 + 9 \\
 &= 30 + 9 \\
 &= 39 \quad \times
 \end{aligned}$$



## Practice and Problem-Solving Exercises



### A Practice

Simplify each expression.

- |                                  |                                  |                              |                                      |
|----------------------------------|----------------------------------|------------------------------|--------------------------------------|
| 9. $3^5$                         | 10. $4^3$                        | 11. $2^4$                    | 12. $10^8$                           |
| 13. $\left(\frac{2}{3}\right)^3$ | 14. $\left(\frac{1}{2}\right)^4$ | 15. $(0.4)^6$                | 16. $7^4$                            |
| 17. $20 - 2 \cdot 3^2$           | 18. $6 + 4 \div 2 + 3$           | 19. $(6^2 - 3^3) \div 2$     | 20. $5 \cdot 2^2 \div 2 + 8$         |
| 21. $80 - (4 - 1)^3$             | 22. $52 + 8^2 - 3(4 - 2)^3$      | 23. $\frac{6^4 \div 3^2}{9}$ | 24. $\frac{2 \cdot 7 + 4}{9 \div 3}$ |

See Problems 1 and 2.

Evaluate each expression for  $s = 4$  and  $t = 8$ .

- |                           |                            |                             |
|---------------------------|----------------------------|-----------------------------|
| 25. $(s + t)^3$           | 26. $s^4 + t^2 + s \div 2$ | 27. $(st)^2 \div (st^2)$    |
| 28. $3st^2 \div (st) + 6$ | 29. $(t - s)^5$            | 30. $(2s)^2t$               |
| 31. $2st^2 - s^2$         | 32. $2s^2 - t^3 \div 16$   | 33. $\frac{(3s)^3t + t}{s}$ |

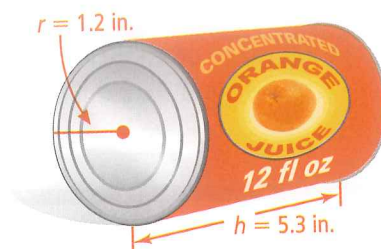
See Problem 3.

34. Write an expression for the amount of change you will get when you pay for a purchase  $p$  with a \$20 bill. Make a table to find the amounts of change you will get for purchases of \$11.59, \$17.50, \$19.00, and \$20.00.
35. An object's momentum is defined as the product of its mass  $m$  and velocity  $v$ . Write an expression for the momentum of an object. Make a table to find the momentums of a vehicle with a mass of 1000 kg moving at a velocity of 15 m/s, 20 m/s, and 25 m/s.

See Problem 4.

**B Apply**

36. **Geometry** The expression  $\pi r^2 h$  represents the volume of a cylinder with radius  $r$  and height  $h$ .
- What is the volume, to the nearest tenth of a cubic inch, of the juice can at the right? Use 3.14 for  $\pi$ .
  - Reasoning** About how many cubic inches, to the nearest tenth of a cubic inch, does a fluid ounce of juice fill?



Simplify each expression.

37.  $2[(8 - 4)^5 \div 8]$       38.  $3[(4 - 2)^5 - 20]$       39.  $10 - (2^3 + 4) \div 3 - 1$   
 40.  $\frac{22 + 1^3 + (3^4 - 7^2)}{2^3}$       41.  $3[42 - 2(10^2 - 9^2)]$       42.  $\frac{2[8 + (67 - 2^6)^3]}{9}$

43. **Think About a Plan** The snack bar at your school has added sushi to its menu. The ingredients for one roll include sushi rice, seaweed sheets, cucumbers, cream cheese, and 3 oz of smoked salmon. One roll can be cut into 8 servings. Write an expression for the amount of salmon needed to make  $s$  servings of sushi. How much salmon is needed to make 16 servings? 24 servings? 80 servings? 100 servings?
- What operations are needed in your calculations?
  - Use a table to help you organize your results. What will you use for the column headings in your table?

44. **Salary** You earn \$10 for each hour you work at a canoe rental shop. Write an expression for your salary for working the number of hours  $h$ . Make a table to find how much you earn for working 10 h, 20 h, 30 h, and 40 h.

Evaluate each expression for the given values of the variables.

45.  $3(s - t)^2$ ;  $s = 4, t = 1$       46.  $2x - y^2$ ;  $x = 7, y = 3.5$   
 47.  $3m^2 - n$ ;  $m = 2, n = 6$       48.  $(2a + 2b)^2$ ;  $a = 3, b = 4$   
 49.  $2p^2 + (2q)^2$ ;  $p = 4, q = 3$       50.  $(4c - d + 0.2)^2 - 10c$ ;  $c = 3.1, d = 4.6$   
 51.  $\frac{3g + 6}{h}$ ;  $g = 5, h = 7$       52.  $\frac{2w + 3v}{v^2}$ ;  $v = 6, w = 1$

53. **Writing** Consider the expression  $(1 + 5)^2 - (18 \div 3)$ . Can you perform the operations in different orders and still get the correct answer? Explain.

54. A student wrote the expressions shown and claimed they were equal for all values of  $x$  and  $y$ .

$$\begin{aligned} (x + y)^2 \\ x^2 + y^2 \end{aligned}$$

- Evaluate each expression for  $x = 1$  and  $y = 0$ .
- Evaluate each expression for  $x = 1$  and  $y = 2$ .
- Open-Ended** Choose another pair of values for  $x$  and  $y$ . Evaluate each expression for those values.
- Writing** Is the student's claim correct? Justify your answer.

55. Find the value of  $14 + 5 \cdot 3 - 3^2$ . Then change two operation signs so that the value of the expression is 8.



**C Challenge** Use grouping symbols to make each equation true.

56.  $9 + 3 - 2 + 4 = 6$

57.  $16 - 4 \div 2 + 3 = 9$

58.  $4^2 - 5 \cdot 2 + 1 = 1$

59.  $3 \cdot 4 + 5 - 6 + 7 = 28$

- C 60. a. Geometry** A cone has a slant height  $\ell$  of 11 cm and a radius  $r$  of 3 cm. Use the expression  $\pi r(\ell + r)$  to find the surface area of the cone. Use 3.14 for  $\pi$ . Round to the nearest tenth of a square centimeter.
- b. Reasoning** Does the surface area of the cone double if the radius doubles? If the slant height doubles? Explain.

## Standardized Test Prep

**SAT/ACT**

61. What is the simplified form of  $4 + 10 \div 4 + 6$ ?
- (A) 1.4                      (B) 9.5                      (C) 12.5                      (D) 24
62. What is the value of  $(2a)^2b - 2c^2$  for  $a = 2$ ,  $b = 4$ , and  $c = 3$ ?
- (F) 14                      (G) 28                      (H) 32                      (I) 46
63. A shirt is on sale for \$25 at the local department store. The sales tax equals  $\frac{1}{25}$  of the shirt's price. What is the total cost of the shirt including sales tax?
- (A) \$17                      (B) \$26                      (C) \$27                      (D) \$33
64. You can find the distance in feet that an object falls in  $t$  seconds using the expression  $16t^2$ . If you drop a ball from a tall building, how far does the ball fall in 3 s?
- (F) 16 ft                      (G) 48 ft                      (H) 96 ft                      (I) 144 ft

## Mixed Review

Write an algebraic expression for each word phrase.

See Lesson 1-1.

65. 4 more than  $p$

66. 5 minus the product of  $y$  and 3

67. the quotient of  $m$  and 10

68. 3 times the difference of 7 and  $d$

Tell whether each number is *prime* or *composite*.

See p. 798.

69. 17

70. 33

71. 43

72. 91

**Get Ready!** To prepare for Lesson 1-3, do Exercises 73–80.

Write each fraction as a decimal and each decimal as a fraction.

See p. 802.

73.  $\frac{3}{5}$

74.  $\frac{7}{8}$

75.  $\frac{2}{3}$

76.  $\frac{4}{7}$

77. 0.07

78. 0.07

79. 4.25

80. 0.425