

**Challenge: Skills and Applications**

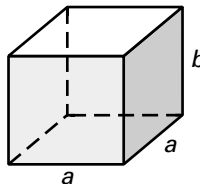
For use with pages 450–455

**In Exercises 1–6, simplify if possible. Write your answer as a power.**

1.  $k^n \cdot k^3$
2.  $x^{4n+5} \cdot x^{2n-3}$
3.  $(y^{7m})^3$
4.  $(k^{4m})^{3n}$
5.  $(x^3y^m)^{2n}$
6.  $(x^{4m}y^{6m})^{9n} \cdot x^7$

**In Exercises 7–8, use the box shown.**

7. Write an expression that gives the volume of the box in terms of  $a$  and  $b$ .
8. Suppose  $a$  is halved and  $b$  is multiplied by 8. By what factor is the volume of the box multiplied?

**In Exercises 9–16, for each pair of nonnegative numbers  $a$  and  $b$  and each positive integer  $n$ , calculate the value of  $a^n + b^n$  and the value of  $(a + b)^n$ .**

9.  $a = 3, b = 4, n = 2$
10.  $a = 2, b = 5, n = 3$
11.  $a = 4, b = 0, n = 4$
12.  $a = 1, b = 1, n = 7$
13.  $a = 6, b = 2, n = 1$
14.  $a = 3, b = 3, n = 3$
15.  $a = 0, b = 10, n = 5$
16.  $a = 9, b = 2, n = 1$
17. Based on your answers from Exercises 9–16, under what conditions, if any, on  $a$ ,  $b$ , and/or  $n$ , is it true that  $a^n + b^n = (a + b)^n$ ?
18. A test has 8 true-false and 12 multiple choice questions. Each multiple choice question has 4 possible answers. Write an exponential expression for the number of different ways it is possible to answer the 20 questions.
19. Use the fact that  $4 = 2^2$  to write the expression from Exercise 18 as a power of 2.