

## EXAMPLE 2 Apply properties of exponents

**BIOLOGY** A mammal's surface area  $S$  (in square centimeters) can be approximated by the model  $S = km^{2/3}$  where  $m$  is the mass (in grams) of the mammal and  $k$  is a constant. The values of  $k$  for some mammals are shown below. Approximate the surface area of a rabbit that has a mass of 3.4 kilograms ( $3.4 \times 10^3$  grams).

Mammal	Sheep	Rabbit	Horse	Human	Monkey	Bat
$k$	8.4	9.75	10.0	11.0	11.8	57.5

### Solution

$$\begin{aligned} S &= km^{2/3} && \text{Write model.} \\ &= 9.75(3.4 \times 10^3)^{2/3} && \text{Substitute 9.75 for } k \text{ and } 3.4 \times 10^3 \text{ for } m. \\ &= 9.75(3.4)^{2/3}(10^3)^{2/3} && \text{Power of a product property} \\ &\approx 9.75(2.26)(10^2) && \text{Power of a power property} \\ &\approx 2200 && \text{Simplify.} \end{aligned}$$

► The rabbit's surface area is about 2200 square centimeters.

## ✓ GUIDED PRACTICE for Examples 1 and 2

Simplify the expression.

1.  $(5^{1/3} \cdot 7^{1/4})^3$       2.  $2^{3/4} \cdot 2^{1/2}$       3.  $\frac{3}{3^{1/4}}$       4.  $\left(\frac{20^{1/2}}{5^{1/2}}\right)^3$

5. **BIOLOGY** Use the information in Example 2 to approximate the surface area of a sheep that has a mass of 95 kilograms ( $9.5 \times 10^4$  grams).

**PROPERTIES OF RADICALS** The third and sixth properties on page 420 can be expressed using radical notation when  $m = \frac{1}{n}$  for some integer  $n$  greater than 1.

### KEY CONCEPT

*For Your Notebook*

#### Properties of Radicals

Product property of radicals

$$\sqrt[n]{a \cdot b} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

Quotient property of radicals

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}, b \neq 0$$

## EXAMPLE 3 Use properties of radicals

Use the properties of radicals to simplify the expression.

a.  $\sqrt[3]{12} \cdot \sqrt[3]{18} = \sqrt[3]{12 \cdot 18} = \sqrt[3]{216} = 6$       **Product property**

b.  $\frac{\sqrt[4]{80}}{\sqrt[4]{5}} = \sqrt[4]{\frac{80}{5}} = \sqrt[4]{16} = 2$       **Quotient property**