POWER OF A POWER Notice what happens when you raise a power to a power.

$$(a^2)^3 = a^2 \cdot a^2 \cdot a^2 = (a \cdot a) \cdot (a \cdot a) \cdot (a \cdot a) = a^6 = a^{2 \cdot 3}$$

The example above suggests the following property of exponents, known as the power of a power property.

KEY CONCEPT *For Your Notebook*

Power of a Power Property

Let a be a real number, and let m and n be positive integers.

Words To find a power of a power, multiply exponents.

Algebra $(a^m)^n = a^{mn}$

Example $(3^4)^2 = 3^{4 \cdot 2} = 3^8$

EXAMPLE 2 Use the power of a power property

AVOID ERRORS
In part (d), notice that you can write $[(y + 2)^6]^2$ as $(y + 2)^{12}$, but you cannot write $(y + 2)^{12}$ as $y^{12} + 2^{12}$.

a. $(2^5)^3 = 2^{5 \cdot 3}$
$= 2^{15}$

b. $[(-6)^2]^5 = (-6)^{2 \cdot 5}$
$= (-6)^{10}$

c. $(x^2)^4 = x^{2 \cdot 4}$
$= x^8$

d. $[(y + 2)^6]^2 = (y + 2)^{6 \cdot 2}$
$= (y + 2)^{12}$

GUIDED PRACTICE for Example 2

Simplify the expression.

5. $(4^2)^7$ **6.** $[(-2)^4]^5$ **7.** $(n^3)^6$ **8.** $[(m + 1)^5]^4$

POWER OF A PRODUCT Notice what happens when you raise a product to a power.

$$(ab)^3 = (ab) \cdot (ab) \cdot (ab) = (a \cdot a \cdot a) \cdot (b \cdot b \cdot b) = a^3b^3$$

The example above suggests the following property of exponents, known as the power of a product property.

KEY CONCEPT *For Your Notebook*

Power of a Product Property

Let a and b be real numbers, and let m be a positive integer.

Words To find a power of a product, find the power of each factor and multiply.

Algebra $(ab)^m = a^m b^m$

Example $(23 \cdot 17)^5 = 23^5 \cdot 17^5$