8.1 Apply Exponent Properties Involving Products

Before	You evaluated exponential expressions.
Now	You will use properties of exponents involving products.
Why?	So you can evaluate agricultural data, as in Example 5.

Key Vocabulary
- **order of magnitude**
- **power,** *p. 3*
- **exponent,** *p. 3*
- **base,** *p. 3*

Notice what happens when you multiply two powers that have the same base.

$$a^2 \cdot a^3 = \underbrace{(a \cdot a)}_{\text{2 factors}} \cdot \underbrace{(a \cdot a \cdot a)}_{\text{3 factors}} = a^5 = a^{2+3}$$

5 factors

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

KEY CONCEPT *For Your Notebook*

Product of Powers Property

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

Words To multiply powers having the same base, add the exponents.

Algebra $a^m \cdot a^n = a^{m+n}$ **Example** $5^6 \cdot 5^3 = 5^{6+3} = 5^9$

EXAMPLE 1 Use the product of powers property

SIMPLIFY EXPRESSIONS

When simplifying powers with numerical bases only, write your answers using exponents, as in parts (a), (b), and (c).

a. $7^3 \cdot 7^5 = 7^{3+5} = 7^8$

b. $9 \cdot 9^8 \cdot 9^2 = 9^1 \cdot 9^8 \cdot 9^2$
$= 9^{1+8+2}$
$= 9^{11}$

c. $(-5)(-5)^6 = (-5)^1 \cdot (-5)^6$
$= (-5)^{1+6}$
$= (-5)^7$

d. $x^4 \cdot x^3 = x^{4+3} = x^7$

✓ **GUIDED PRACTICE** for Example 1

Simplify the expression.

1. $3^2 \cdot 3^7$ **2.** $5 \cdot 5^9$ **3.** $(-7)^2(-7)$ **4.** $x^2 \cdot x^6 \cdot x$