8.2 Apply Exponent Properties Involving Quotients

TEKS A.11.A

Before You used properties of exponents involving products.

Now You will use properties of exponents involving quotients.

Why? So you can compare magnitudes of earthquakes, as in Ex. 53.

Key Vocabulary
- **power,** *p. 3*
- **exponent,** *p. 3*
- **base,** *p. 3*

Notice what happens when you divide powers with the same base.

$$\frac{a^5}{a^3} = \frac{a \cdot a \cdot a \cdot a \cdot a}{a \cdot a \cdot a} = a \cdot a = a^2 = a^{5-3}$$

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

KEY CONCEPT *For Your Notebook*

Quotient of Powers Property

Let a be a nonzero real number, and let m and n be positive integers such that $m > n$.

Words To divide powers having the same base, subtract exponents.

Algebra $\frac{a^m}{a^n} = a^{m-n}, a \neq 0$ **Example** $\frac{4^7}{4^2} = 4^{7-2} = 4^5$

EXAMPLE 1 Use the quotient 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. $\frac{8^{10}}{8^4} = 8^{10-4} = 8^6$

b. $\frac{(-3)^9}{(-3)^3} = (-3)^{9-3} = (-3)^6$

c. $\frac{5^4 \cdot 5^8}{5^7} = \frac{5^{12}}{5^7} = 5^{12-7} = 5^5$

d. $\frac{1}{x^4} \cdot x^6 = \frac{x^6}{x^4} = x^{6-4} = x^2$

GUIDED PRACTICE for Example 1

Simplify the expression.

1. $\frac{6^{11}}{6^5}$ **2.** $\frac{(-4)^9}{(-4)^2}$ **3.** $\frac{9^4 \cdot 9^3}{9^2}$ **4.** $\frac{1}{y^5} \cdot y^8$