LESSON 8.3

NAME ______________________ DATE ________

Challenge: Skills and Applications

For use with pages 463–469

In Exercises 1–3, find the value of *n* that makes the question true.

1. $\left(\frac{x^3}{x^5}\right)^n = x^{-6}$ **2.** $\frac{y^{4n-1}}{y^{2n}} = y^5$ **3.** $\left(\frac{y^{3n}}{y^{5n-4}}\right)^2 = y^{20}$

In Exercises 4–6, assuming the power of a power property $[(a^m)^n = a^{mn}]$ works for positive integers *m* and *n*, show that the property is true in each situation.

Example: m is a negative integer, n is a positive integer.

Solution: Let $m = -k$, where k is a positive integer. Then

$$(a^m)^n = (a^{-k})^n = \left(\frac{1}{a^k}\right)^n = \frac{1^n}{(a^k)^n} = \frac{1}{a^{kn}} = a^{-kn} = a^{mn}$$

4. m is a positive integer, n is a negative integer.

5. m is a negative integer, n is a negative integer.

6. m is a positive integer, n is zero.

In Exercises 7–9, use the following information.

The 17th-century French mathematician Pierre de Fermat proved a theorem about any prime number p and any integer a that is not divisible by p. You can discover this fact for $p = 5$ and $a = 2, 3, 4, 6,$ and 7 by calculating the values of $2^4, 3^4, 4^4, 6^4$, and 7^4.

7. What remainders do you get when you divide your answers by 5?

8. If $p = 7$, you can verify Fermat's theorem by calculating $2^6, 3^6, 4^6, 5^6$, and 6^6. What remainders do you get when you divide these numbers by 7?

9. Based on your answers from Exercises 7 and 8, state Fermat's theorem. Start your statement with, "If p is a prime number and a is not divisible by p..."