Name _____ Date _____

Powers and Exponents

A **power** is a product of repeated factors. The **base** of a power is the common factor. The **exponent** of a power indicates the number of times the base is used as a factor.

base → $\left(\frac{2}{5}\right)^3 = \frac{2}{5} \cdot \frac{2}{5} \cdot \frac{2}{5}$ ← exponent

power

$\frac{2}{5}$ is used as factor 3 times

Example 1 **Write each product using exponents.**

a. $(-9) \cdot (-9) \cdot (-9) \cdot (-9) \cdot (-9)$

Because -9 is used as a factor 5 times, its exponent is 5.

▶ So, $(-9) \cdot (-9) \cdot (-9) \cdot (-9) \cdot (-9) = (-9)^5$.

b. $\pi \cdot \pi \cdot h \cdot h \cdot h$

Because π is used as a factor 2 times, its exponent is 2. Because h is used as a factor 3 times, its exponent is 3.

▶ So, $\pi \cdot \pi \cdot h \cdot h \cdot h = \pi^2 h^3$.

Example 2 **Evaluate each expression.**

a. $(-5)^4$

$(-5)^4 = (-5) \cdot (-5) \cdot (-5) \cdot (-5)$ Write as repeated multiplication.

$= 625$ Simplify.

b. -5^4

$-5^4 = -(5 \cdot 5 \cdot 5 \cdot 5)$ Write as repeated multiplication.

$= -625$ Simplify.

Practice

Check your answers at BigIdeasMath.com.

Write the product using exponents.

1. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$ 7^6

2. $\left(-\frac{1}{3}\right) \cdot \left(-\frac{1}{3}\right) \cdot \left(-\frac{1}{3}\right)$ $\left(-\frac{1}{3}\right)^3$

3. $x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y$ x^2y^5

4. $2.5 \cdot 2.5 \cdot b \cdot b \cdot b \cdot b$ 2.5^2b^4

5. $(-n) \cdot (-n) \cdot (-n) \cdot (-n)$ $(-n)^4$

6. $(-12) \cdot (-12) \cdot v \cdot v \cdot v$ $(-12)^2v^3$

Evaluate the expression.

7. 10^4 $10{,}000$

8. -15^2 -225

9. $\left(\frac{3}{4}\right)^3$ $\frac{27}{64}$

10. $\left(-\frac{1}{2}\right)^5$ $-\frac{1}{32}$

11. **VOLUME** Write an expression involving a power that represents the volume (in cubic centimeters) of the die shown. Then find the volume.

$\left(1\frac{3}{5}\right)^3$; 4.096 cm^3