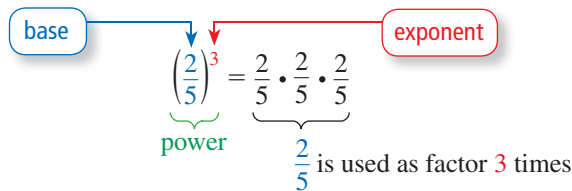


Powers and Exponents

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.



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. $(-5)^4$

$$\begin{aligned} (-5)^4 &= (-5) \cdot (-5) \cdot (-5) \cdot (-5) \\ &= 625 \end{aligned}$$

Write as repeated multiplication.

Simplify.

b. -5^4

$$\begin{aligned} -5^4 &= -(5 \cdot 5 \cdot 5 \cdot 5) \\ &= -625 \end{aligned}$$

Write as repeated multiplication.

Simplify.

Practice

Check your answers at BigIdeasMath.com.

Write the product using exponents.

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

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

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

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

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

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

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

