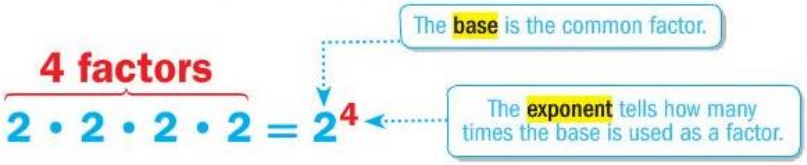
Name: _____ Date: _____

Chapter 1, Lesson 2: Powers and Exponents

Write and Evaluate Powers

A product of repeated factors can be expressed as a power, that is, using an exponent and a base.



Powers are read in a certain way.

Read and Write Powers

Power	Words	Factors
3^1	3 to the first power	3
3^2	3 to the second power or 3 squared	3 • 3
3^3	3 to the third power or 3 cubed	3 • 3 • 3
3^4	3 to the fourth power or 3 to the fourth	3 • 3 • 3 • 3
⋮	⋮	⋮
3^n	3 to the nth power or 3 to the nth	$\underbrace{3 \cdot 3 \cdot 3 \cdot \ldots \cdot 3}_{n \text{ factors}}$

$-2^4 = -16$

$(-2)^4 = 16$

$(-2)(-2)(-2)(-2)$

4 · 4

Examples

Tutor

Write each expression using exponents.

1. $(-2) \cdot (-2) \cdot (-2) \cdot 3 \cdot 3 \cdot 3 \cdot 3$

The base -2 is a factor 3 times, and the base 3 is a factor 4 times.

$(-2) \cdot (-2) \cdot (-2) \cdot 3 \cdot 3 \cdot 3 \cdot 3 = (-2)^3 \cdot 3^4$

$4 \cdot (-2) = -8$

$(-2)^3 = (-2)(-2)(-2)$

-2^3 = opposite of 2^3

2. $a \cdot b \cdot b \cdot a \cdot b$

Use the properties of operations to rewrite and group like bases together. The base a is a factor 2 times, and the base b is a factor 3 times.

$a \cdot b \cdot b \cdot a \cdot b = a \cdot a \cdot b \cdot b \cdot b$

$= a^2 \cdot b^3$

Got It? Do these problems to find out.

a. $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$ **b.** $4 \cdot 4 \cdot 4 \cdot 5 \cdot 5$ **c.** $m \cdot m \cdot n \cdot n \cdot m$

Show your work.

a. $\frac{1}{2}^4$

b. $4^3 \cdot 5^2$

c. $m^3 \cdot n^2$

Example

Tutor

3. Evaluate $\left(-\frac{2}{3}\right)^4$.

$\left(-\frac{2}{3}\right)^4 = \left(-\frac{2}{3}\right) \cdot \left(-\frac{2}{3}\right) \cdot \left(-\frac{2}{3}\right) \cdot \left(-\frac{2}{3}\right)$ Write the power as a product.

$= \frac{16}{81}$ Multiply.

Got It? Do these problems to find out.

d. 4^4 64 **e.** $(-2)^6$ 64 **f.** $\left(\frac{1}{5}\right)^3$ $\frac{1}{125}$

Evaluate
Remember that to evaluate an expression means to find its value.

Show your work.

d. 256

e. 64

f. $\frac{1}{125}$

Example

Real World

Tutor

4. **The deck of a skateboard has an area of about $2^5 \cdot 7$ square inches. What is the area of the skateboard deck?**

$2^5 \cdot 7 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 7$ Write the power as a product.

$= (2 \cdot 2 \cdot 2 \cdot 2 \cdot 2) \cdot 7$ Associative Property

$= 32 \cdot 7$ or 224 Multiply.

The area of the skateboard deck is about 224 square inches.

Got It? Do this problem to find out.

200 · 21
8 · 3 · 25 · 7

g. A school basketball court has an area of $2^3 \cdot 3 \cdot 5^2 \cdot 7$ square feet. What is the area of a school basketball court?

g. 4200 ft²

Examples

Tutor

Evaluate each expression if $a = 3$ and $b = 5$.

5. $a^2 + b^4$

$a^2 + b^4 = 3^2 + 5^4$ Replace a with 3 and b with 5.

$= (3 \cdot 3) + (5 \cdot 5 \cdot 5 \cdot 5)$ Write the powers as products.

h. 17

i. 125

j. 715

Got It? Do these problems to find out.

Evaluate each expression if $c = -4$ and $d = 9$.

h. $c^3 + d^2$ **i.** $(c + d)^3$ **j.** $d^3 - (c^2 - 2)$

Show your work.

$(-4)^3 + 9^2$
$-64 + 18$

$(-4+9)^3$
$(5)^3$

$729 - ((9)^2 - 2)$
$729 - 14$
715

Guided Practice

Check