

# Multiplying Exponents

# What is an exponent?

An **exponent** shows us how many times we multiply a number together. We also call this a **power**.

For example:  $4^3 = 4 \cdot 4 \cdot 4$

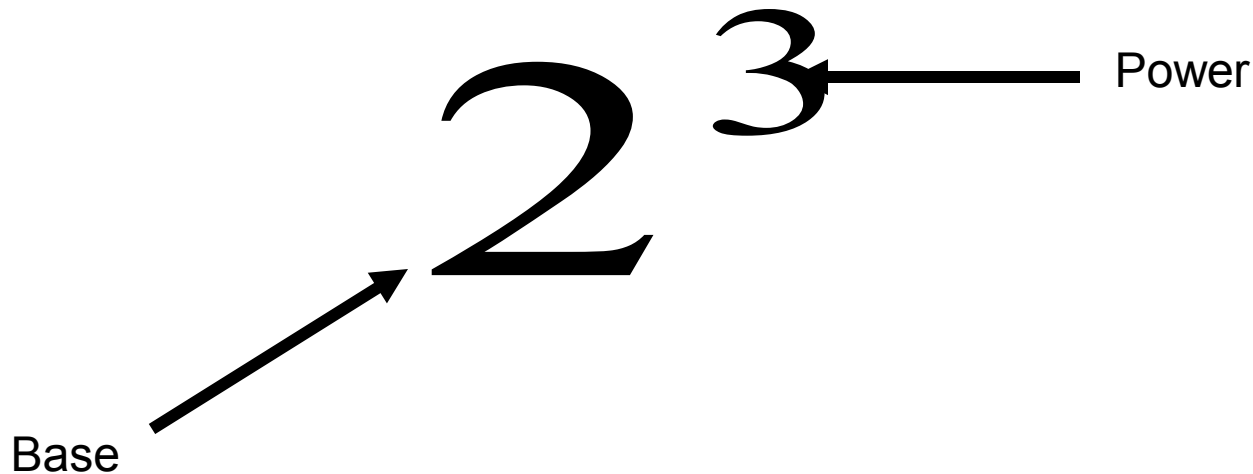
$$x^4 = x \cdot x \cdot x \cdot x$$

Do not confuse this with  $4x$ .

# Exponents

In the expression  $2^3$ , the 2 is called the **base**.

The 3 is called the **power or exponent**.



# Exponents

$2^1$	2 to the first power	2
$2^2$	2 to the second power	$(2)(2) = 4$
$2^3$	2 to the third power	$(2)(2)(2) = 8$
$2^4$	2 to the fourth power	$(2)(2)(2)(2) = 16$
$2^5$	2 to the fifth power	$(2)(2)(2)(2)(2) = 32$

Write as a power:

$$(2)(2)(2)(2)(2) = \square$$

$$(3)(3)(3) = \square$$

$$(5)(5)(5)(5) = \square$$

$$(6)(6) = \square$$

# On your own

Write as a power:

$$4 \times 4 \times 4 =$$

$$3 \cdot 3 \cdot 3 \cdot 3 =$$

$$9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 =$$

$$(6)(6)(6) =$$

# Evaluating Powers

Evaluate  $x^2$  for  $x=-5$

$$\begin{aligned}x^2 &= (x)(x) \\ &= (-5)(-5) = 25\end{aligned}$$

Evaluate  $x^3$  for  $x=4$

$$\begin{aligned}x^3 &= (x)(x)(x) \\ &= (4)(4)(4) \\ &= 64\end{aligned}$$

# On your own

Evaluate  $y^3$  for  $y=2$

Evaluate  $y^2$  for  $y=-2$

# Evaluating Powers

$$(2a)^3 \text{ for } a=2$$

$$\begin{aligned}(2a)^3 &= (2a)(2a)(2a) \\ &= (2 \times 2)(2 \times 2)(2 \times 2) \\ &= (4)(4)(4) = 64\end{aligned}$$

$$2a^3 \text{ for } a=2$$

$$2(2)^3 = 2(8) = 16$$

# On your own

Evaluate  $-3n^2$  for  $n=3$

Evaluate  $(-3n)^2$  for  $n=3$

# Multiplying Exponents

If I have Powers with  
the **same base**, I can  
multiply them.

For Example:

$$3^2 \cdot 3^3 = (3 \cdot 3)(3 \cdot 3 \cdot 3) = 3^5$$

$$a^2 \cdot a^3 = (a \cdot a)(a \cdot a \cdot a) = a^5$$

# Multiplying Exponents with same Base

To multiply numbers or variables with the same base, simply **add** the exponents

Ex:

$$3^2 \cdot 3^3 = 3^{2+3} = 3^5$$

$$a^m \cdot a^n = a^{m+n}$$

Write each expression with a single exponent

$$4^2 \cdot 4^3 = 4^{2+3} = 4^5$$

$$(-3)^2 \cdot (-3)^4 = (-3)^6$$

$$n^5 \cdot n^3 \cdot n^2 = n^{5+3+2} = n^{10}$$

# On your own

Write each expression with a single exponent

$$3^4 \cdot 3^2$$

$$8^4 \cdot 8^7$$

$$a^3 \cdot a^4$$