

What is an exponent

The base a is raised to the power of n is equal to the multiplication of a , n times:

$$a^n = a \times a \times \dots \times a$$

n times

a is the base and n is the exponent.

Examples

$$3^1 = 3$$

$$3^2 = 3 \times 3 = 9$$

$$3^3 = 3 \times 3 \times 3 = 27$$

$$3^4 = 3 \times 3 \times 3 \times 3 = 81$$

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$$

Exponents rules and properties

Rule name	Rule	Example
Product rules	$a^n \cdot a^m = a^{n+m}$	$2^3 \cdot 2^4 = 2^{3+4} = 128$
	$a^n \cdot b^n = (a \cdot b)^n$	$3^2 \cdot 4^2 = (3 \cdot 4)^2 = 144$
Quotient rules	$a^n / a^m = a^{n-m}$	$2^5 / 2^3 = 2^{5-3} = 4$
	$a^n / b^n = (a / b)^n$	$4^3 / 2^3 = (4/2)^3 = 8$
Power rules	$(b^n)^m = b^{n \cdot m}$	$(2^3)^2 = 2^{3 \cdot 2} = 64$
	$b^{n^m} = b^{(n^m)}$	$2^{3^2} = 2^{(3^2)} = 512$
Negative exponents	$b^{-n} = 1 / b^n$	$2^{-3} = 1/2^3 = 0.125$
Zero rules	$b^0 = 1$	$5^0 = 1$
	$0^n = 0$, for $n > 0$	$0^5 = 0$
One rules	$b^1 = b$	$5^1 = 5$
	$1^n = 1$	$1^5 = 1$

Exponents product rules

Product rule with same base

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

Example:

$$2^3 \cdot 2^4 = 2^{3+4} = 2^7 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 128$$

Product rule with same exponent

$$a^n \cdot b^n = (a \cdot b)^n$$

Example:

$$3^2 \cdot 4^2 = (3 \cdot 4)^2 = 12^2 = 12 \cdot 12 = 144$$

See: [Multiplying exponents](#)

Exponents quotient rules

Quotient rule with same base

$$a^n / a^m = a^{n-m}$$

Example:

$$2^5 / 2^3 = 2^{5-3} = 2^2 = 2 \cdot 2 = 4$$

Quotient rule with same exponent

$$a^n / b^n = (a / b)^n$$

Example:

$$4^3 / 2^3 = (4/2)^3 = 2^3 = 2 \cdot 2 \cdot 2 = 8$$

Exponents power rules

Power rule I

$$(a^n)^m = a^{n \cdot m}$$

Example:

$$(2^3)^2 = 2^{3 \cdot 2} = 2^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$$

Negative exponents rule

$$b^{-n} = 1 / b^n$$

Example:

$$2^{-3} = 1/2^3 = 1/(2 \cdot 2 \cdot 2) = 1/8 = 0.125$$