

Exponent Rules

Zero Exponents

Any base raised to an exponent of 0 has a value of 1.

$$a^0 = 1 \quad 100^0 = 1 \quad 5xyz^0 = 5xy \quad (5xyz)^0 = 1$$

Negative Exponents

A base raised to a negative exponent has the same value as the reciprocal of the base to the positive of the exponent.

$$a^{-4} = \left(\frac{1}{a}\right)^4 = \frac{1}{a^4} \quad 10^{-4} = \left(\frac{1}{10}\right)^4 = \frac{1}{10^4} \quad \left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2 = \frac{3^2}{2^2} = \frac{9}{4}$$

The Product Rule for Exponents (Multiplying Like Bases With Exponents)

When you multiply like bases you add your exponents.

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

$$2^3 \cdot 2^5 = 2^{3+5} = 2^8$$

$$w^2 \cdot w^3 = w^5$$

Quotient Rule for Exponents (Dividing Like Bases With Exponents)

When you divide like bases you subtract their exponents.

$$a^m \div a^n = a^{m-n}$$

$$7^5 \div 7^2 = 7^{5-2} = 7^3$$

$$2^2 \div 2^5 = 2^{2-5} = 2^{-3} = \frac{1}{2^3} = \frac{1}{8}$$

Power of a Power Rule for Exponents (Base Raised to Two Exponents)

When you raise a base to two exponents, you multiply those exponents together.

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

$$(a^5)^2 = a^{5 \times 2} = a^{10}$$

$$(2^2)^{-3} = 2^{2 \times -3} = 2^{-6} = \frac{1}{2^6} = \frac{1}{64}$$