

Exponent Properties

1. Product of like bases: $a^m a^n = a^{m+n}$

To multiply powers with the same base, add the exponents and keep the common base.

Example: $2^7 \cdot 2^8 = 2^{7+8} = 2^{15}$

2. Quotient of like bases: $\frac{a^m}{a^n} = a^{m-n}$

To divide powers with the same base, subtract the exponents and keep the common base.

Example: $\frac{2^7}{2^4} = 2^{7-4} = 2^3$

To raise a power to a power, keep the base and multiply the exponents.

Example: $(2^7)^8 = 2^{7 \cdot 8} = 2^{56}$

4. Product to a power: $(ab)^m = a^m b^m$

To raise a product to a power, raise each factor to the power.

Example: $(2^3 \cdot 3^4)^7 = 2^{3 \cdot 7} \cdot 3^{4 \cdot 7} = 2^{21} \cdot 3^{28}$

To raise a quotient to a power, raise the numerator and the denominator to the power.

Example: $\left(\frac{2^3 \cdot 3^7}{5^6 \cdot 9^5}\right)^8 = \frac{2^{3 \cdot 8} \cdot 3^{7 \cdot 8}}{5^{6 \cdot 8} \cdot 9^{5 \cdot 8}}$

6. Zero Exponent: $a^0 = 1$

Examples: $5^0 = 1$, $10^0 = 1$, $(-3)^0 = 1$, $\frac{1}{2^0} = 1$, $\frac{1}{(-4)^0} = 1$

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7. Negative exponent:

Unhappy (negative) exponents: $a^{-n} = \frac{1}{a^n}$

Example: $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

Example: $\frac{1}{3^{-4}} = 3^4 = 81$

Example: $\frac{5^{-6}}{7^{-6}} = \frac{1}{7^6} \cdot 5^6 = \frac{5^6}{7^6}$