Exponents and Radicals Rules

Complete reference for exponent laws and radical operations. Master these rules for algebra success.

Exponent Rules

Product and Quotient

Product Rule: $x^a * x^b = x^{(a+b)}$

Quotient Rule: $x^a / x^b = x^{(a-b)}$

Power Rule: $(x^a)^b = x^{(ab)}$

Power of Product: $(xy)^a = x^a y^a$

Power of Quotient: $(x/y)^a = x^a / y^a$

Special Exponents

Zero Exponent: $x^0 = 1$ (x `0)

Negative Exponent: $x^{(-n)} = 1/x^n$

Negative in Denom: $1/x^{(-n)} = x^n$

Rational Exponent: $x^{(1/n)} = $ n-th root of x

General Rational: $x^{(m/n)} = $ n-th root of x^m

Radical Rules

Basic Radical Operations

Product: (ab) = a * b

Quotient: (a/b) = a / b

Simplify: $(a^2 b)$ = ab

Like radicals: ac + bc = (a+b)c

Unlike radicals: Cannot combine 2 + 3

Rationalizing Denominators

Single term: 1/a = a / a (multiply by a/a)

Binomial: 1/(a + b): multiply by (a - b)/(a - b)

Why: No radicals in the denominator (standard form)

Simplifying Radicals

Step-by-Step Process

1. Factor the number under the radical into prime factors
2. Pair up factors (for square roots, find pairs; for cube roots, find triples)
3. Move each pair outside the radical as a single factor
4. Multiply remaining factors inside the radical

Example: 72 = (36 * 2) = 36 * 2 = 62

Key pattern: exponent rules and radical rules are the same thing. A radical is just a fractional exponent. Convert between forms to make problems easier.