



Integer exponents

When do you add, and when do you multiply?

- Today: two laws that are constantly swapped, and how to tell them apart.

First, what a power means

- $2^3 = 2 \times 2 \times 2 = 8$.
- Not 2×3 .

The exponent counts the factors. It is not another multiplier.

Multiplying: ADD the exponents

- $3^2 \times 3^3 = (3 \times 3)(3 \times 3 \times 3)$
- Five threes. So 3^5 .

Count the factors and the law writes itself.

Powering: **MULTIPLY** the exponents

- $(3^2)^3 = 3^2 \times 3^2 \times 3^2$
- Three lots of two threes. So 3^6 .

Same trick: write it out, then count.

Dividing: SUBTRACT

- $2^5 \div 2^2 = 2^3$.
- Two factors cancel from five.

Why $x^0 = 1$

- $7^2 \div 7^2 = 1$, obviously.
- But the law says $7^{2-2} = 7^0$.

So 7^0 must be 1. It is forced, not chosen.

Negative exponents are reciprocals

- $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$.
- NOT -4 .

The minus flips it. It does not make it negative.

Your turn

- Simplify: $5^2 \times 5^4$ $(2^3)^2$ 4^0 3^{-2}

For each: am I multiplying, powering, or dividing?