Exponent Rules Cheat Sheet

Multiply or divide powers

Same base, multiply	$a^m a^n = a^{m+n}$
Same base, divide	$a^m/a^n = a^{m-n}$
Power of a power	$(a^m)^n = a^{mn}$
Power of a product	$(ab)^n = a^n b^n$

For these integer-exponent rules, assume nonzero bases. Add exponents only in a same-base product.

Zero, negative & special bases

Zero exponent, nonzero base	$a^0 = 1$
Negative exponent, nonzero base	$a^{-n} = 1/a^n$
Power of a quotient	$(a/b)^n = a^n/b^n$
Base zero, n > 0	$0^n = 0$

The quotient assumes nonzero a and b for integer n. A negative exponent does not make a positive base negative.

Fractional powers & roots

Square root	$a^{1/2} = \sqrt{(a)}$
General positive base	$a^{m/n} = (a^{1/n})^m$
Example	$27^{2/3} = 3^2 = 9$
Square root of a square	$\sqrt{(x^2)} = \lvert x \rvert$

For the general rule use a > 0 and positive integer n. An even real root cannot have a negative radicand.

Solve an exponential equation

Rewrite using one base	$9^x = 27 \Rightarrow 3^{2x} = 3^3$
Match exponents	$2x = 3;\ x = 3/2$
If bases do not match	$2^x = 5 \Rightarrow x = \ln(5)/\ln(2)$

Use a positive base other than 1 and a positive right-hand side.

Read the negative sign

Square a negative base	$(-5)^2 = 25$
Negate a square	$-5^2 = -25$
Subtract a negative	$7 - (-2) = 7 + 2 = 9$

Parentheses tell you when the minus sign belongs to the base.

Powers and scientific notation

Same-base product	$a^m \times a^n = a^{m+n}$
Same-base quotient	$a^m / a^n = a^{m-n}$
Negative exponent	$a^{-n} = 1/a^n$
Scientific notation	$72{,}000 = 7.2 \times 10^4$

Here a is nonzero and m and n are integers.