Exponents and Monomials – Quick Reference

4^2	This expression is read as "4 to the second power" OR "4 squared".
$4^2 = 4 \cdot 4$	It means that we multiply 4 by itself 2 times.
$4^2 = 16$	$4 \cdot 4 = 16$

Tip!

Whenever you have a **negative base** and the **exponent** is **even**, your answer will always be **positive!**

Whenever you have a **negative base** and the **exponent** is **odd**, your answer will always be **negative!**

$(-3)^3$	This expression is read as -3 to the third power.
$(-3)^3 = -3 \cdot -3 \cdot -3$	It means that we multiply -3 by itself 3 times.
$(-3)^3 = -27$	$-3 \cdot -3 \cdot -3 = -27$ $9 \cdot (-3) = -27$

LAWS of EXPONENTS

Multiplying Powers with the Same Base

Property: When multiplying powers with the same base, **add the exponents.**

$y^3 \cdot y^4 = \mathbf{y^7}$ Since the bases are the same (y), you can add the exponents: 3+4 = 7.

Power of a Power Property

Property: To find the power of a power, **multiply the exponents.**

$(a^3)^5 = \mathbf{a^{15}}$ Multiply the exponents.

Power of a Product Property

Property: To find the power of a product, **find the power of each factor and multiply.**

Think of it as distributing the exponent to each factor!

$(2xy)^3 = 2^3x^3y^3 = \mathbf{8\,x^3y^3}$ ($8\,x^3y^3$)

$2^3 = 8$. x^3y^3 cannot be combined because the bases are not the same.

Power of Quotient Property

Property: To find the power of a quotient, **raise the numerator to the power, and the denominator to the power. Then divide.**

$$\left(\frac{2}{3}\right)^2 = \frac{2^2}{3^2} = \frac{4}{9}$$

Zero Exponents

Any number (except 0) to the zero power is equal to 1.

$4^0 = 1$ $10^0 = 1$ $22^0 = 1$ $y^0 = 1$

The Rule for Negative Exponents:

The expression a^{-n} is the reciprocal of a^n

$3x^{-2} = \frac{3}{x^2}$

**In this problem, only the x contains the negative exponent, so we only take the reciprocal of x^2.

Multiplying Monomials Example

$(3x^2y^3z)^2\,(-3xy^4z)$	Original Problem
$(3x^2y^3z)^2\,(-3xy^4z)$ $(9x^4y^6z^2)\,(-3xy^4z)$	The first monomial is raised to the second power. Every constant and variable must be raised to the second power. **The second monomial is not raised to a power, so leave it as is!
$(9x^4y^6z^2)\,(-3xy^4z) = -27$	Multiply your coefficients.
$(9x^4y^6z^2)\,(-3xy^4z) = -27x^5y^{10}z^3$	Multiply the variables with like bases. (Add the exponents.)
$(3x^2y^3z)^2\,(-3xy^4z) = \mathbf{-27x^5y^{10}z^3}$	Final Answer.

Simplifying Monomials Example

$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$		Original Problem
$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$	$\frac{18x^4y^5}{\square}$	Step 1: Multiply the numerators. Add the exponents of like bases.
$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$	$\frac{18x^4y^5}{3xy^4}$	Step 2: Multiply the denominators. **There are no like bases, so we can't add the exponents.
$\frac{18x^4y^5}{3xy^4} =$	$\frac{6}{\square}$	Step 3: Divide the coefficients, if possible.
$\frac{18x^4y^5}{3xy^4} =$	$\frac{6x^3y}{\square}$	Step 4: Subtract the exponents of like bases. $\frac{x^4}{x} = x^3$ and $\frac{y^5}{y^4} = y$
$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$	$6x^3y$	Final Answer!

Scientific notation must always be written with the same components as the following model:

1.5876×10^6

- 1.5876: A number in the ones' place.
- decimal: As many numbers as necessary after the decimal
- $\times 10^?$: (Any positive or negative exponent.)