

Property	Explanation	Examples
Product of Powers	$a^m \cdot a^n = a^{m+n}$ Multiply numbers, add exponents with the same base	$b^2 \cdot b^5 = b^7$ $(5x^2)(9x^3) = 45x^5$ $5 \cdot x \cdot x \cdot 9 \cdot x \cdot x \cdot x$
Power of a Power	$(a^m)^n = a^{m \cdot n}$ When an exponent is raised to a power, multiply exponents.	$(d^5)^3 = d^{5 \cdot 3} = d^{15}$ $(x^2y^4)^3 = x^{2 \cdot 3} y^{4 \cdot 3}$ $x^6 y^{12}$
Power of a Product	$(ab)^m = a^m b^m$ When an exponent is outside the parentheses, everything inside is raised to that power.	$(xyz)^3 = x^3 y^3 z^3$ $(5bc)^3 = 5^3 b^3 c^3$ $125b^3c^3$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}$ Subtract exponents (top - bottom)	$\frac{a^{10}b^9}{a^2b^4} = \frac{a^{10-2}b^{9-4}}{1} = a^8b^5$ $\frac{12x^7y^8}{6x^6y^3} = 2xy^5$
Power of a Quotient	$\left(\frac{a}{b}\right)^m = \frac{(a)^m}{(b)^m}$ When an exponent is outside parentheses of a fraction, raise both the numerator and denominator to the power	$\left(\frac{2a^3b^5}{3b^2}\right)^3 = \frac{(2a^3b^5)^3}{(3)^3}$ <i>*after top and bottom are raised, follow quotient of powers rule</i> $\frac{8a^9b^{15}}{27}$
Zero Exponent	$a^0 = 1$ Any number (except zero) raised to the zero power ALWAYS = 1	$a^0b^3 = 1 \cdot b^3 = b^3$ $(25c^3d^7)^0 = 1$
Negative Exponent	$a^{-n} = \frac{1}{a^n}$ $\frac{1}{a^{-n}} = a^n$ Negative numerator moves to denominator. Negative denominator moves to numerator.	$\frac{4a^{-3}b^6}{16a^2b^{-2}} = \frac{1b^8}{4a^5}$ $\frac{x^4y^0}{x^{-2}} = x^6 \cdot 1 = x^6$