

EXPONENT LAWS

Exponent Law	Law Description	General Case	Example
Product Law	If the bases are the same and multiplied, keep the base the same and add the exponents.	$a^m \times a^n = a^{m+n}$	$4^3 \times 4^2 = (4 \times 4 \times 4)(4 \times 4)$ $= 4 \times 4 \times 4 \times 4 \times 4$ $= 4^5$
Quotient Law	If the bases are the same and divided, keep the base the same and subtract the exponents.	$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$	$\frac{3^6}{3^4} = \frac{3 \times 3 \times 3 \times 3 \times 3 \times 3}{3 \times 3 \times 3 \times 3}$ $= 3 \times 3$ $= 3^2$
Power of a Power	If you have a power with a further exponent outside, keep the base the same and multiply the exponents.	$(a^m)^n = a^{m \times n}$	$(7^2)^4 = (7 \times 7)(7 \times 7)(7 \times 7)(7 \times 7)$ $= 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$ $= 7^8$
Power of a Product	Same rule as above, just be careful to apply the exponent to all parts in the bracket.	$(ab)^m = a^m b^m$	$(2 \times 5)^3 = (2 \times 5)(2 \times 5)(2 \times 5)$ $= 2 \times 2 \times 2 \times 5 \times 5 \times 5$ $= 2^3 \times 5^3$
Power of a Quotient	Same rule as above, just be careful to apply the exponent to all parts in the bracket.	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$	$\left(\frac{3}{8}\right)^4 = \left(\frac{3}{8}\right)\left(\frac{3}{8}\right)\left(\frac{3}{8}\right)\left(\frac{3}{8}\right)$ $= \frac{3 \times 3 \times 3 \times 3}{8 \times 8 \times 8 \times 8}$ $= \frac{3^4}{8^4}$
Zero Exponent	Any power with an exponent of 0, has a value of 1.	$a^0 = 1$	$\frac{2^3}{2^3} = 2^{3-3}$ $= 2^0$ But $\frac{2^3}{2^3} = 1$, so $2^0 = 1$.
Negative Exponents	If you have a base with a negative exponent, write the reciprocal of the base with a positive exponent.	$a^{-m} = \frac{1}{a^m}, a \neq 0$	$2^{-3} = \frac{2^{-2}}{2}$ $= \frac{1}{2 \times 2} \div 2$ $= \frac{1}{2 \times 2 \times 2}$ $= \frac{1}{2^3}$