

## Properties of Logarithms

The key thing to remember is that...*"The Log is an exponent"*...and it relates to exponential functions in the following way;

$$\log_{base} result = exponent \Leftrightarrow base^{exponent} = result$$

$$\log_2 8 = 3 \Leftrightarrow 2^3 = 8$$

Below; b = any number >0

$\log_b 1 = 0$	$\log_b b = 1$
$\log_{a^b} M = y = \frac{1}{b} \log_a M$	$\log_b b^n = n \log_b b = n$
$\log_b M * N = \log_b M + \log_b N$	$\log_b \frac{M}{N} = \log_b M - \log_b N$
$\log_b N^r = r * \log_b N$	If M=N then $\log_b M = \log_b N$
If $\log_b M = \log_b N$ then $M = N$	Change of base (log base 10) $\log_b M = \frac{\log_{10} M}{\log_{10} b}$
$-\log_{\frac{a}{b}} M = y$ $\log_{\frac{a}{b}} M^{-1} = y$ or $\log_{\frac{a}{b}} M = -y$ $(\frac{a}{b})^y = M^{-1}$ or $(\frac{a}{b})^{-y} = M$ $(\frac{a}{b})^y = \frac{1}{M}$ or $(\frac{b}{a})^y = M$	Change of base (natural log or log base e )  $\log_b M = \frac{\ln M}{\ln b}$

Common Logs are base 10 and are usually written without base notation

$$\log_{10} result = \log result$$

And natural logs with base = e = 2.71828

$$\log_e result = \ln result$$

The key thing to remember is *"The Log is an Exponent"*