Logarithms

A logarithm is the opposite of an exponential.

$\log_{10}1000 = 3$. If 1000 were written as 10^x, $x = 3$. Easy enough for 1000, but a bit harder to work out for, say, 469. Have a guess, then use your calculator to find it, correct to 4 significant figures:

$\log_{10}469$ = ___________ (the $\log_{10}$ button may be labeled just **log**)

Other common logarithms:

$\log_2$ – useful for computing, where memory and capacity increase by factors of 2. $\log_2 256 = 8$, $\log_2 64 = 6$. Also in sound, where volume is measured in decibels, with 7db being twice as loud as 6db, which is twice as loud as 5db, etc.

$\log_e$ – aka the Natural Log – where e = 2.71828182845904…
Often written as **Ln** (including on your calculator)

$\log_a b = c$ is equivalent to saying **$a^c = b$**
a is the base, c is the exponent

Learn this!

Laws of indices along with their related log rules:

$a^b \times a^c = a^{b+c}$	$(a^n)^m = a^{nm}$	$a^b / a^c = a^{b-c}$
$\log(xy) = \log(x) + \log(y)$	$\log(x^n) = n\log(x)$	$\log(x/y) = \log(x) - \log(y)$
$a^{-b} = 1/a^b$	$a^0 = 1$	$a^1 = a$
$-\log(x) = \log(1/x)$	$0 = \log(1)$	$1 = \log_a(a)$

Note: The logarithm always has a base. If it isn't written, you assume it is the same base all through the question (it doesn't matter what it is, as long as it's the same). If you are asked to evaluate, for instance, **log(12)**, it usually means **$\log_{10}12$**. If it is the natural log, it will either say **$\log_e 12$** or **ln12**.

Remember: *logarithms and exponentials are opposite functions. So to solve exponential equations, first* ***rearrange****, then* ***take logs*** *of both sides.*

$\ln(e^x) = x$ *and* $e^{\ln(x)} = x$

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