

EPS20: Earthquakes in your backyard

Logarithm Primer

Some of the homework assignments call for some use of the Log function. Below is a primer to help you learn to use the Log function if you aren't familiar with it.

The logarithm (Log) function is the answer to the following question:

If $A^b = c$ then what is b ?

The answer is that $b = \text{Log}_A(c)$ which we say "Log base A of c". For example:

If $2^b = 4$ then what is b ? In other words, 2 to what power equals 4?

We know that $2^2 = 4$, so $b = \text{Log}_2(4) = 2$, or "the Log base 2 of 4 is 2".

Likewise, $\text{Log}_2(8) = 3$, because 2 to the 3rd power equals $2 \times 2 \times 2$ equals 8.

A Log can have any base, but the most common base is 10. In fact Log_{10} is called the "common Log" and most often the subscript 10 is omitted, so it's just "Log". All the work we will do in this class is in common Log, and can be done on your calculator using the "Log" button. An example with common Logs:

If $10^b = 1000$ then what is b ?

We know that $10^3 = 1000$, so $\text{Log}(1000) = 3$. Note that the base of 10 is assumed.

By convention $10^0 = 1$, and $10^{-1} = 0.1$, $10^{-2} = 0.01$, etc. The variable b does not have to be an integer. For example, $10^{0.5} \approx 3.16$, $10^{1.5} \approx 31.6$, etc. You aren't expected to be able to do that in your head, but you can use a calculator to figure it out. Here are a few examples to summarize:

Power notation	Log notation
$10^{-3} = 0.001$	$\text{Log}(0.001) = -3$
$10^0 = 1$	$\text{Log}(1) = 0$
$10^{0.5} \approx 3.16$	$\text{Log}(3.16) \approx 0.5$
$10^1 = 10$	$\text{Log}(10) = 1$
$10^2 = 100$	$\text{Log}(100) = 2$

You should now be familiar enough with Logs to be able to use them in the context of this class.