

12-Nov-2024

Term 4 / Week 5

## Logarithms- Usage

• The "common" logarithms table which are used for calculations was published by Henry Briggs in 1617.

• Briggs table used a base of 10.

Hence,  $\log_{10} 1 = 0 \Rightarrow 10^0 = 1$

$\log_{10} 10 = 1 \Rightarrow 10^1 = 10$

Recall,

if  $y = a^x$  then  $x = \log_a(y)$

where "a" is the base (=10),

y - Given number & x - logarithm.

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\* Assuming an increment of 0.001, the table will have approx 10,000 values.

\* The above precision is adequate for most engineering design calculations in practice.

\* of course, higher precision requires more number of values! Briggs' table had a 14 digit precision.

\* Finally, the logarithm (x) values range from 0.0000 to 0.9999 for a 4 digit precision.

• Note that for a base value of 10 ;

\* range of given numbers from 1 to 10 is adequate, since values greater than 10 can be represented as below:

For ex:  $251.52 = 2.5152 \times 10^2$

$0.052 = 5.2 \times 10^{-2}$

etc.

\* of course, the number of (y) values in the table depends on the required precision. For a 4 digit precision the values range from 1.000 to 9.999

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• Even though anti-logarithm values [i.e., to find the number (y) for given  $\log_{10}(x)$ ], can be found from the logarithm table, however, in practice it is common to provide a separate anti-logarithm table.

• Let us now practice the use of logarithms & anti-logarithms, using the table provided to you.

Ex.1

Find the  $\log_{10}(2)$

While referring to the table, the value of "20" refers to "2.0".

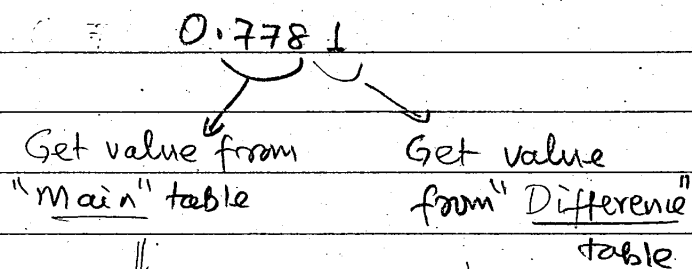
By convention, the decimal point is "assumed"!

$\therefore \log_{10}(2.0) = 0.3010$

NOTE: The value given in the table is "3010"; the decimal point is "assumed", since the range of logarithm is from 0 to 1.

Now, find the anti-logarithm of 0.7781

From the anti-log table:



5998

1

5999

5.999

Note that the table lists the value as "5998", we have to provide the decimal point !!

Note that, the 'y' values (given numbers) range from 1.0 to 10.0

& 'x' values (logarithms) range from 0.0 to 1.0

Ex.2

$\log_{10}(3.0) = 0.4771$

Ex.3

Calculate  $2 \times 3 (=6)$

$$\begin{aligned} \log_{10}(2) &= 0.3010 \\ + \log_{10}(3) &= 0.4771 \\ \hline &= 0.7781 \end{aligned}$$

Ex.4

Find  $\log_{10}(2.5)$

From the table look for "25"

$\therefore \log_{10}(2.5) = 0.3979$

Ex.5 Find  $\log_{10}(25.7)$

We have  $25.7 = 2.57 \times 10^1$

$$\begin{aligned} \therefore \log_{10}(25.7) &= \log_{10}(2.57) + \log_{10}(10^1) \\ &= \log_{10}(2.57) + 1.19(10) \\ &= 0.4099 + 1 \\ &= 1.4099 \end{aligned}$$

Mantissa

Ex.6 Find antilog of 1.4099

Find antilog of 0.4099 from table

= 2.569

Mantissa

then multiply by  $10^1$   
 $\therefore$  The answer is 25.69