DAY 19

# MCA CET 2025

## MATHS

# LOGARITHM

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# Logarithm

$$a^b = c$$

$$\log_a c = b$$

$a$ ← base

true if $\begin{cases} c > 0 \\ a > 0 \\ a \neq 1 \end{cases}$

# Algebra of Logarithm

1. $\log_a m + \log_a n = \log_a (m \times n)$

2. $\log_a m - \log_a n = \log_a \left(\frac{m}{n}\right)$

3. $\log_a (m^n) = n \log_a m$

# Algebra of Logarithm

4. $\log_a m = \dfrac{\log_b m}{\log_b a}$ $\quad a, b > 0,\ a, b \neq 1$

$= \dfrac{1}{\dfrac{\log_b a}{\log_b m}} = \dfrac{1}{\log_m a}$

# Algebra of Logarithm

5. $a^{\log_c b} = b^{\log_c a}$

6. $\log_{b^c} a = \frac{1}{c} \log_b a$

# Natural and Common Log

1. Common log (Brigg's log)

base = 10

e.g. $\log_{10} 100$

# Natural and Common Log

## 2. Natural log (Napier's log)

base = 'e' = 2.71

e.g. $\log_e x = \ln x$

↑ representation for natural log.

# Antilog

$\log a = b$

$\Updownarrow$ interchangeable.

$\therefore \quad a = \text{antilog } b$

# Characteristic & Mantissa

log 3.257 ← Mantissa

Mantissa can never be -ve and always be less than `1`

characteristic can be +ve, -ve or 0

# How to find characteristic?

## Case I :

The characteristic of the log of a number greater than 1

$\log 3.257$

$n = 1 \Rightarrow$ characteristic $= n - 1$

$= 1 - 1$

$= 0$

# How to find characteristic?

## Case II :

(-ve)

The characteristic of the log of a number smaller than 1

log 0.0152

$n = 1$

characteristic

$= -(n+1)$

$= -(1+1) = -2$

$= \bar{2}$

# Bar Notation in Log

$\bar{2}.176$

$-2 + 0.176$

$\bar{3}.0176$

$= -3 + 0.0176$

What is the value of $\log_{10}(0.0001)$?

(a) $\frac{1}{4}$ (b) $-\frac{1}{4}$

(c) $-4$ (d) 4

NOTE: $\log_{10} 10 = 1$

$\log_e e = 1$

$\log_a m^n = n \log_a m$

$\log_{10} 0.0001 = \log_{10} \frac{1}{10000} = \log_{10} \frac{1}{10^4}$

$= \log_{10} 10^{-4} = -4 \log_{10} 10 = -4 \times 1 = -4$

Find the logarithm of 1728 to the base $2\sqrt{3}$.

(a) 3.124 (b) 3.1732

(c) 6 (d) 5

$\log_{2\sqrt{3}} 1728 = 6$

$2^6 \times 3^3$

$(\sqrt{3}^2)^3 = (\sqrt{3})^6$

$(2\sqrt{3})^6 = 1728$

| | |
|---|---|
| 2 | 1728 |
| 2 | 864 |
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

What is the value of

$$\frac{1}{2}\log_{10} 25 - 2\log_{10} 3 + \log_{10} 18?$$

(a) 2 (b) 3

(c) 1 (d) 0

$= \log \sqrt{25} - \log 3^2 + \log 18$

$= \log 5 - \log 9 + \log 18$

$= \log \frac{5}{9} \times 18 2 = \frac{\log 10}{\log 10} = 1$

What is the value of $[\log_{10}(5\log_{10}100)]^2$ ?

(a) 4 (b) 3

(c) 2 (d) 1

$$[\log_{10} 5\times 2]^2$$

$$=[\log_{10} 10^1]^2$$

The value of $\log_y x \cdot \log_z y \cdot \log_x z$ is

(a) $\log xyz$ (b) $xyz$

(c) 1 (d) 0

$$\frac{\log x}{\log y} \times \frac{\log y}{\log z} \times \frac{\log z}{\log x} = 1$$

The value of $\frac{1}{\log_{xy}(xyz)} + \frac{1}{\log_{yz}(xyz)} + \frac{1}{\log_{zx}(xyz)}$ is

(a) $xyz$ (b) 2

(c) 0 (d) 1

$\log_{xyz} xy + \log_{xyz} yz + \log_{xyz} zx$

$= \log_{xyz} xy \times yz \times zx$ $= x^2y^2z^2$

$= \log_{xyz} (xyz)^2$

The value of $\log_{(0.01)}(1000)$ is

(a) $\frac{1}{3}$ (b) $-\frac{1}{3}$ (c) $\frac{3}{2}$ (d) $-\frac{3}{2}$

$\log_{10^{-2}} 10^{3}$

$= \frac{3}{-2} \log_{10} 10$ → 1

$= -\frac{3}{2}$

The characteristic in $\log 6.7482 \times 10^{-5}$ is

(a) 6 (b) $-4$

(c) 5 (d) $-5$

The value of $10^{\log_{10} m + 2\log_{10} n + 3\log_{10} p}$ is

(a) $m^2np^3$

(b) $mn^2p^3$

(c) $m^3np^2$

(d) None of these

$a^{\log_n m} = m \log_n a$

$10^{[\log_{10} m + \log_{10} n^2 + \log_{10} p^3]}$

$10^{[\log_{10} mn^2p^3]} = mn^2p^3 \log_{10} 10$

The number of zeros that are between the decimal point and the first significant figure in $(0.5)^{100}$,

if $\log(0.5) = \bar{1}.6990$ is

~~(a)~~ 30 (b) 20 (c) 10 (d) 40

$\log x = \log 0.5^{100}$

$\log x = 100 \log 0.5$

$= 100 \times (\bar{1}.6990)$

$= 100 \times (-1 + 0.6990)$

$= -100 + 69.90$

$= -100 + 69 + 0.90$

$-31 + 0.90$

$= \bar{31}.90$

$= 30$

$n+1$

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