$a^x = m = x \log_a m$ → Base to base rahega... power alag rahega...

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Formula sheet

Logarithm

- $x = \log_a m$ (x is equal to Logarithm of m to base a)
- $a^0 = 1 \quad \therefore 0 = \log_a 1$ $\quad \log 1 = 0$
  i.e. Logarithm of 1 to any base is always zero.
- $a^1 = a \quad \therefore 1 = \log_a a$ same then answer is 1
  i.e. Logarithm of any number to same base is 1.
- We have $a^x = m$ and $x = \log_a m$
  Exponential form ← $\therefore a^{\log_a m} = m$ → Logarithm form
- Types of Logarithm:
  1. Common Logarithm → Base 10. ex. $\log_{10} x$.
  2. Natural Logarithm → Base e ex. $\log_e x = \ln x$.
- Laws of Logarithm:

1. Law of product:

$$\log_a mn = \log_a m + \log_a n$$

corollary:

i) $\log_a (mnp) = \log_a m + \log_a n + \log_a p$

ii) $\log_a (xyz....) = \log_a x + \log_a y + \log_a z .....$

2. Law of quotient:

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

corollary:

$$\log_a\left(\frac{mn}{pq}\right) = (\log_a m + \log_a n) - (\log_a p + \log_a q)$$

3. Law of exponent: Log power utar sakte hai?? !!

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

$$\log_a\left(\frac{x^p y^q}{z^r w^s}\right) = p\log_a x + q\log_a y - r\log_a z - s\log_a w$$

- Change of base:

$$\log_a m = \frac{\log_b m}{\log_b a} \quad \text{i.e.} \quad \frac{\log m}{\log a}.$$

corollary:

$$\log_a b = \frac{1}{\log_b a} \quad \text{OR} \quad (\log_b a)(\log_a b) = 1.$$