Logarithm

$a^b = N$

$\log_a N = b$

$\log_a 1 = b$

$1 = a^b \rightarrow 0$, $a \rightarrow$ anything

1. $\log_a a = 1$

2. $\log_a 1 = 0$

3. $\log_a (mn) = \log_a m + \log_a n$

4. $\log_a (m/n) = \log_a m - \log_a n$

$\log_a (m \times n^{-1}) \rightarrow \log_a m + \log_a n^{-1} = \log_a m - \log_a n$

5. $\log_a m^p = p \log_a m$

6. $\log_{a^q} m^p = \frac{p}{q} \log_a m$

7. $\log_a b = \frac{1}{\log_b a}$

$\rightarrow \log_a b = \frac{\log_x b}{\log_x a} = \frac{\log_e b}{\log_e a}$

$\log_b a = \frac{\log a}{\log b}$

8. $e^x = e^{\log_e a^x} = a^{\log_e e^x}$

$N = a^{\log_a N}$

eg: $5 = 16^{\log_{16} 5} = 100^{\log_{100} 5}$

$a^x = e^{\log_e a^x}$

$a^x = a^x$

$2 = 5^{\log_5 2}$

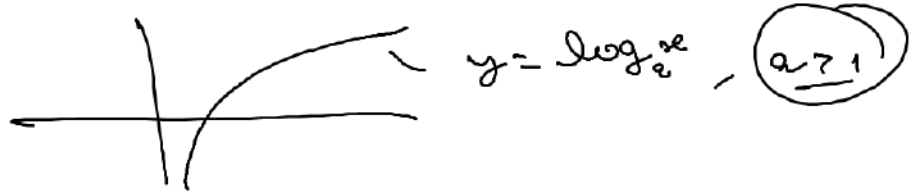
$16 = 18^{\log_{18} 16}$

$16 = 18^{\log_{18} 16}$

$a>1$ | $0<a<1$

Q: (i) $\log_a x > \log_a y$, $a>1$

$x>y$



(ii) $\log_a x < \log_a y$, $0<a<1$

$x<y$

$\log(m/n) = \log m - \log n$

Q. $\log 2x - \log 4 = \log 6$, $x = ?$

$\rightarrow \log\left(\frac{2x}{4}\right) = \log 6$

$\frac{x}{2} = 6 \Rightarrow x = 12$

Q. $\log \frac{\sqrt[3]{a^2}}{c^3 b^4}$ (Exp. in terms of $\log a$, $\log b$, $\log c$)

$\rightarrow \frac{2}{3}\log a - 3\log c - 4\log b$

Q. $\log_4 9 \cdot \log_x 2 = 1$, $x = ?$ → 3

$2\log_2 3 \times \log_x 2 = 1$

$\log_2 3 \times \frac{\log 2}{\log x} = 1$

$\log_x 3 = 1$

$3 = x$

$x = 3$

$\log a$, $b = e$, $e = 2.7182$

Q. Integral part of $\log_2 10000$ → 13

$\log_2 2^{13.x}$

$2^{10} = 1024$

$2^9 = 512$

$2^{11} = 2048$

$2^{12} = 4096$

$2^{13} = 8192$

$2^{14} = 16384$

Q. $\log_2 1 \; \log_2 2 \; \log_2 4 \; \log_2 16 \; \log_2 (65536) = ?$

0

2^{16}

$3^4 = 81$, $3^5 = 243$

$\log_b a \times \log_c b = \log_c a$

$\log_a a$

2, 4, 8, 16, 32, 64

Q. $\frac{1}{\log_2 a} + \frac{1}{\log_3 a} + \frac{1}{\log_4 a} + \dots + \frac{1}{\log_{100} a} = ?$

$\log_a 2 + \log_a 3 + \log_a 4 + \dots + \log_a 100$

$\log_b a = \frac{1}{\log_a b}$

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

base ≥ same

$\log_a (1.2.3.4.5 \dots 100)$

$\log_a 100!$

Factorial

$m! = 1.2.3.4 \dots m$

$3! = 1 \times 2 \times 3$

$4! = 1 \times 2 \times 3 \times 4$

$5! = 1 \times 2 \times 3 \times 4 \times 5$

$\frac{a^m}{a^n} = a^{m-n}$

Q. $\log_q p = 3$, $\log_q 8p = 4$, $p = ?$

$p = q^3$

$= 8 \times 8 \times 8$

$= 512$

$8p = q^4$

$8q^3 = q^4$

$q = 8$

$\log_{8p} p = \frac{3}{4}$

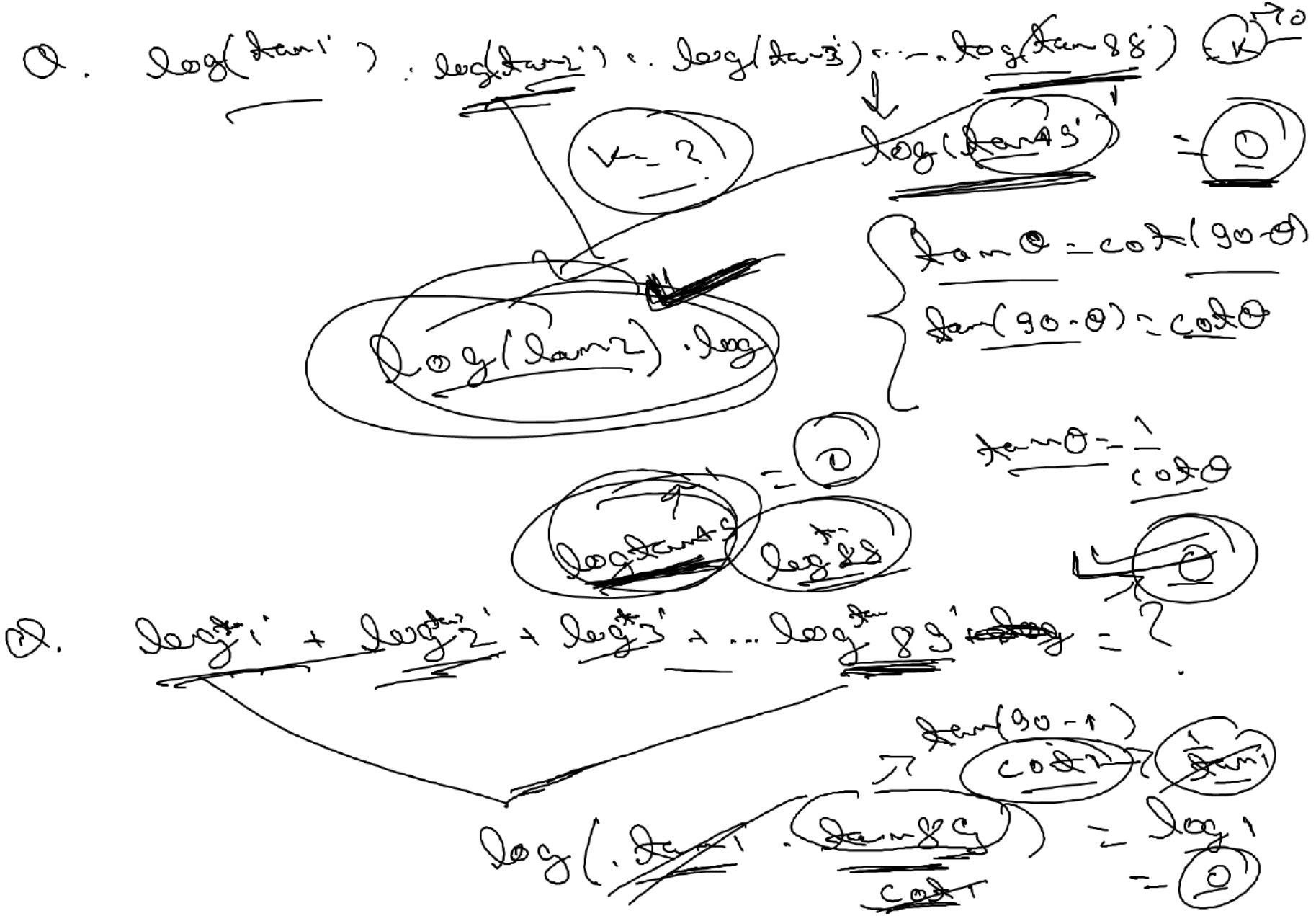
$p = (8p)^{3/4}$

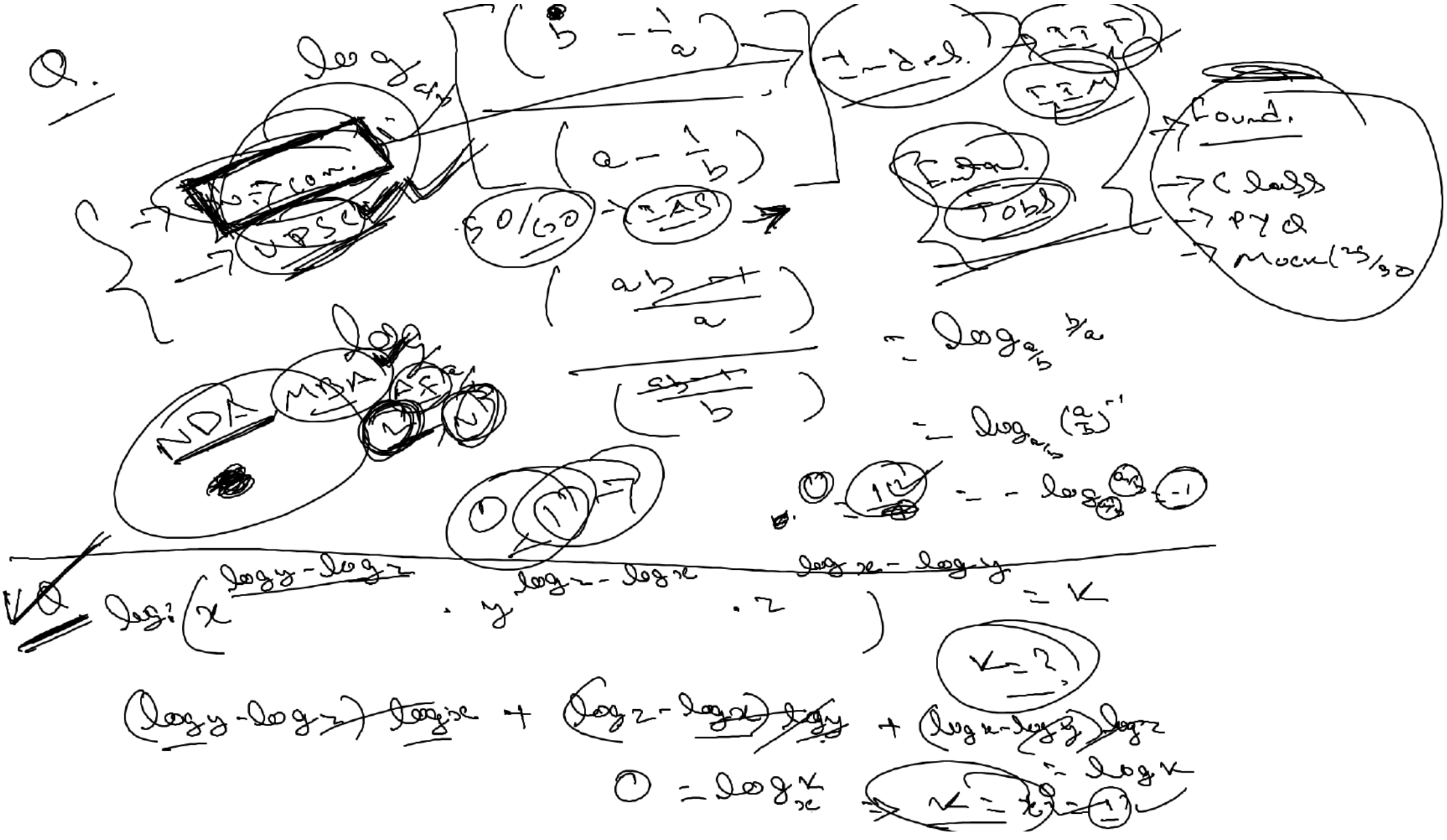
$p = 8^{3/4} \times p^{3/4}$

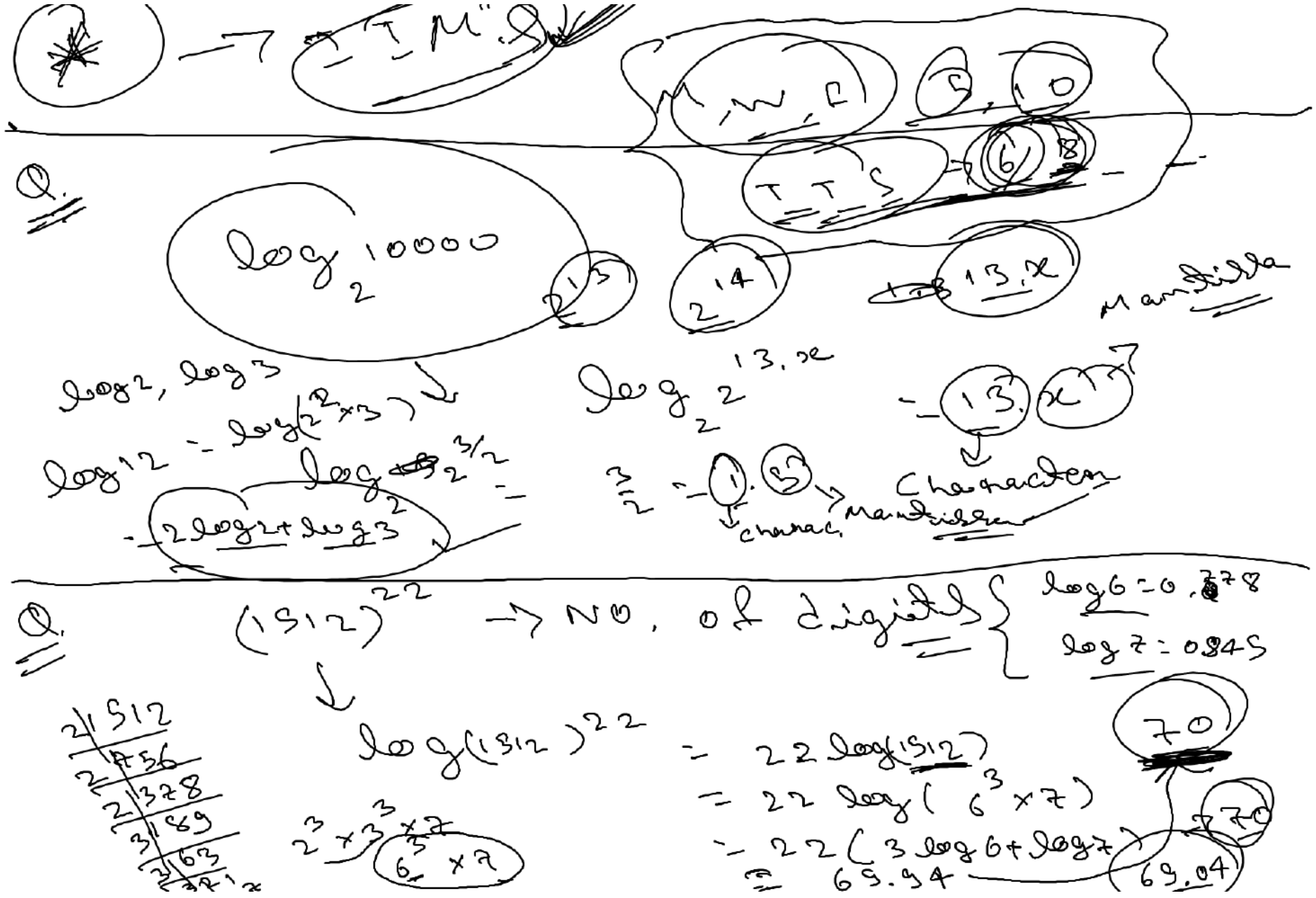
$(p)^{1/4} = (8^{3/4})$

$p^{1-3/4} = 8^{3/4}$

$p = 8^3$


Q. log(tan1°) + log(tan2°) + log(tan3°) ... + log(tan88°)
K = ?
log(tan45°) = 0
log(tan2°) log
tanθ = cot(90-θ)
tan(90-θ) = cotθ
log tan45° = 0
log 45°
tanθ = 1/cotθ
Q. log* 1° + log* 2° + log* 3° + ... log* 89°
log(. tan1° . tan89°)
cot1°
tan(90-1)
= log 1
= 0




Q.
$\log_2 10000$
13
14
13.2
$\log 2, \log 3$
$\log 12 = \log(2^2 \times 3)$
$= 2\log 2 + \log 3$
$\log_2 2^{13.2}$
$= 13.2$
Characteristic
Mantissa
Q.
$(512)^{22}$ → No. of digits
$\log 6 = 0.778$
$\log 7 = 0.845$
$\log(512)^{22} = 22 \log(512)$
$= 22 \log(6^3 \times 7)$
$= 22(3\log 6 + \log 7)$
$= 69.94$
70
69.04
$2^3 \times 3^3 \times 7$
$6^3 \times 7$

Q. 2^5

$\log(2^5) = 5 \log 2$

$= 5 \times 0.3081$

$= 1.505$

$+1$

2 digits

Q. $2^{10} \rightarrow 1024$

$10 \log 2$

10×0.301

$= 3.01$

$+1 = 4$ digits