ARJUNA 2.0

FOR IIT/JEE 2024 CLASS 11TH

LET`S STUDY

Logarithm

Lecture-06

ASHISH AGARWAL

TABLE OF CONTENT

Recap :

★ log of a number any base alway has Two parts ① Integer part / Integral part

② Decimal part

❤ Integral part is called as chacteristic

❤ Decimal part is called as mantissa.

- Characteristic can be +ve, -ve or 0.

- Mantissa is never negative

mantissa $\in [0, 1)$

$2 < \log_2 5 < 3 \Rightarrow \log_2 5 = \underbrace{2}_{\text{Characteristic} = 2}.321920$ mantissa $= 0.32192\ldots$

$2^3 = 8 \quad , \quad 2^4 = 16$

$2^? = 9$

$\log_2 9 = 3 + f \quad f \in [0,1)$

$3 < \log_2 9 < 4$

$2^7 = 128$

$2^8 = 256$

$\log_3 19 = 2 + f \;,\quad f \in [0,1)$

$3^2 = 9 \qquad 3^3 = 27$

$2 < \log_3 19 < 3$

$\log_2 134 = 7 + f \;,\quad f \in [0,1)$

$\log_8 75 = 2 + f \;,\quad f \in [0,1)$

$\log_2 27$ > $\log_4 65$

$\parallel$ $\qquad$ $\parallel$

$4.\,-\,-\,-\,-$ $\qquad$ $3.\,-\,-\,-\,-$

$$\log_2 \frac{1}{10} = \log_2 10^{-1} = -\log_2 10$$

$$= -(3+f) = -3-f$$

$$= -3-f+1-1 = -3-1+1-f = -4+1-f$$

$$= -4+(1-f)$$

$$= -4+g \quad \text{let } 1-f = g$$

$$\begin{array}{r} 1.000 \\ .322 \\ \hline 0.678 \\ \hline \end{array}$$

Ex: $\log_2 \frac{1}{10}$

$= -(3.322)$

$= -(3 + .322)$

$= -3 - 0.322$

$= -3-1+1-0.322$

$= -4 + \underbrace{0.678}_{\text{Mantissa}}$

Popular Doubts

Calculate : $4^{5\log_{4\sqrt{2}}(3-\sqrt{6})-6\log_8(\sqrt{3}-\sqrt{2})}$

P

$\log_{a^y} m = \frac{1}{y}\log_a m$

(5) $P = 5\log_{4\sqrt{2}}(3-\sqrt{6}) - 6\log_8(\sqrt{3}-\sqrt{2})$

$2+\frac{1}{2} = \frac{5}{2}$

$2^{2+1/2} = 2^{5/2}$

$= 5\log_{2^2\cdot 2^{1/2}}(3-\sqrt{6}) - 6\cdot\log_{2^3}(\sqrt{3}-\sqrt{2})$

$= 5\log_{2^{5/2}}(3-\sqrt{6}) - 6\cdot\log_{2^3}(\sqrt{3}-\sqrt{2}) = \cancel{5}\times\frac{2}{\cancel{5}}\log(3-\sqrt{6}) - \frac{\overset{2}{\cancel{6}}}{\cancel{3}}\log(\sqrt{3}-\sqrt{2})$

3 rd step smaj main nahi aya

12 Same Doubts • 1 Reported

Mark Popular

$$= 5\log_{2^{5/2}}(3-\sqrt{6}) - 6\log_{2^3}(\sqrt{3}-\sqrt{2})$$

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

$$= \sqrt{3}(\sqrt{3}-\sqrt{2})$$

$$= 5\times\frac{1}{5/2}\times\log_2(3-\sqrt{6}) - 6\cdot\frac{1}{3}\log_2(\sqrt{3}-\sqrt{2})$$

$$= 5\times\frac{2}{5}\log_2(3-\sqrt{6}) - 2\log_2(\sqrt{3}-\sqrt{2})$$

$$= 2\log_2(3-\sqrt{6}) - 2\log_2(\sqrt{3}-\sqrt{2})$$

$$= 2\left(\log_2(3-\sqrt{6}) - \log_2(\sqrt{3}-\sqrt{2})\right)$$

$$= 2\log_2\left(\frac{3-\sqrt{6}}{\sqrt{3}-\sqrt{2}}\right) = 2\log_2\frac{\sqrt{3}\cancel{(\sqrt{3}-\sqrt{2})}}{\cancel{\sqrt{3}-\sqrt{2}}} = 2\log_2\sqrt{3} = \log_2(\sqrt{3})^2 = \log_2 3 = p.$$

$$4^p = 4^{\log_2 3}$$

$$= 3^{\log_2 4} = 3^2 = \underline{9}$$

$\log_5(5^{1/x}+125)=\log_5 6+1+\frac{1}{2x}$ then x is

$5^{\frac{1}{x}}+125 = 5^{\log_5^6 + 1 + \frac{1}{2x}} = 5^{\log_5^6}\cdot 5^1\, 5^{\frac{1}{2x}}$

$= 6\cdot 5\cdot 5^{1/2x}$

$5^{1/x}+125 = 5^{\log_5^6}\cdot 5^1\, 5^{\frac{1}{2x}}$

$5^{1/x}+125 = 6\cdot 5\cdot 5^{1/2x}$

let $5^{1/2x}=t \Rightarrow (5^{\frac{1}{2x}})^2=t^2 \Rightarrow 5^{1/x}=t^2$

$t^2+125=30t$

$t^2-30t+125=0$

$a^{m+n+p} = a^m\cdot a^n\cdot a^p$

$5^{\frac{1}{2x}}=t$

squaring

$(5^{\frac{1}{2x}})^2=t^2$

$5^{\frac{1}{\cancel{2}x}\cdot\cancel{2}}=t^2$

$5^{1/x}=t^2$

sir square karne se 1/4x² ho jaye naki 1/x iske liye 2 se multiply karna padega

6 Same Doubts • 0 Reported

Mark Popular

$5^{1/x} + 125 = 30 \cdot 5^{\frac{1}{2x}}$

$5^{\frac{1}{2x}} = t$

squaring

$\left(5^{1/2x}\right)^2 = t^2$

$5^{1/x} = t^2$

$\left(5^{\frac{1}{2x}}\right)^2 \neq 5^{\frac{1}{4x^2}}$

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

$(3^3)^2 \neq 3^9$

Common & Natural Logarithm

e = Napierian Const ≈ 2.718

★ $\log_{10}x$ is called Common Logarithm

★ $\log_e x$ is called Natural Logarithm

Characteristic of $\log_{10}x$

$\log_{10}1 = 0, \ \log_{10}10 = 1$

$1 \le x < 10 \Rightarrow 0 \le \log_{10}x < 1 \Rightarrow \log_{10}x = 0 + f \quad f \in [0,1)$

$10 \le x < 100 \Rightarrow 1 \le \log_{10}x < 2 \Rightarrow \log_{10}x = 1 + f \quad f \in [0,1).$

$100 \le x < 1000 \Rightarrow 2 \le \log_{10}x < 3 \Rightarrow \log_{10}x = 2 + f \quad f \in [0,1)$

b/w 10 & 100.

Ex: $\log_{10}80 = 1 + f$

b/w 1 & 100

$\log_{10}79.68 = 1 + f.$

$\log_{10}997.35 = 2 + f$

$\log_{10} 7285.67 = 3 + f$

$\log_{10} 3.65 = 0 + f$

Calhu

$\log(00765.32) = 2 + f$

Therefore if $x \geq 1$ the characteristic of $\log_{10} x$ is

No: of significant digits before decimal -1

i.e characteristic $=$ No: of significant digits -1.

Ex: find No: of digits in

(a) 2^{64}

given $\log_{10} 2 = 0.3010$

$\log_{10} 3 = 0.4771$

$\log_{10} 7 = 0.8451$

$2^7 = 128$

$\log_{10} 9876.4 = 3 + f$

let $x = 2^{64}$.

Taking log on both sides to base 10.

$$\log_{10} x = \log_{10} 2^{64} = 64 \cdot \log_{10} 2 = 64 \times 0.3010 = 19.264.$$

$$\log_{10} x = 19 + 0.264.$$

mantissa

characteristic

Q

Using log 2 = 0.3010 and log 3 = 0.4771 and log 7 = 0.8451

Find the number of digits 136048896.

(i) $(2.5)^{200}$ (ii) $3^{12} \times 2^{8}$ (iii) 5^{25}

KTK (D)

$x = 3^{12} \times 2^{8}$

Taking log on both sides to base 10.

$\log_{10} x = \log_{10}(3^{12} \times 2^{8})$

$= \log_{10} 3^{12} + \log_{10} 2^{8}$

$= 12\log_{10} 3 + 8\log_{10} 2 = 12 \times 0.4771 + 8 \times 0.3010 = 8.1332$

$= 8 + 0.1332$

let $x = 5^{25}$.

$\log_{10} x = \log_{10} 5^{25} = 25\log_{10} 5$.

$= 25 \log_{10}(10/2)$

$= 25(\log_{10} 10 - \log_{10} 2)$

$= 25(1 - 0.3010)$

$= 25 \times 0.6990 = 17.4725$.

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No: of digit in

$3^{12} \times 2^{8} = 9$

$\log_{10} x = 17 + 0.425$

No: of digit in $5^{25} = \underline{18}$

if $\frac{1}{10} \le x < 1 \Rightarrow -1 \le \log_{10} x < 0 \Rightarrow \log_{10} x = -1 + f.$ $\quad f \in [0,1)$

$\downarrow$

$0.1 < x < 1$

$\frac{1}{100} \le x < \frac{1}{10} \Rightarrow -2 \le \log_{10} x < -1 \Rightarrow \log_{10} x = -2 + f$ $\quad f \in [0,1)$

$\downarrow$

$.01 \le x < 0.1$

$\frac{1}{1000} \le x < \frac{1}{100} \Rightarrow -3 \le \log_{10} x < -2 \Rightarrow \log_{10} x = -3 + f.$

$\downarrow$

$.001 \le x < .01$

Ex: $\log(0.003) = -3 + f$

$\log(0.0567) = -2 + f$

$\log_{10}(0.00005678) = -5 + f$

$\log_{10}(0.573) = -1 + f.$

If $0 < x < 1$

then chalceristic of $\log_{10} x$ is given by

Characteristic = $-$(No: of zeros immediately after decimal before significant digit starts + 1)

Callu

$\log(0.0057000) = -3 + f$

$\log(0.0005076) = -4 + f$

Ex: find no: of zeros immediately after decimal before significant digit starts in

ⓐ 2^{-100} given $\log_{10} 2 = 0.3010$

$x = 2^{-100}$

Take log to base 10.

$\log_{10} x = \log_{10} 2^{-100}$

$= -100 \log_{10} 2$

$= -100(0.3010) = -30.10$

$$\log_{10} x = -30.10$$

$$= -30 - 0.10$$

$$= -30 - 1 + 1 - 0.10$$

$$= -31 + 0.90$$

mantissa

Characteristic

No: of zero immediately after decimal before significant starts = 30.

Q Find the number of zeroes after decimal before a significant figures start in

(i) $\left(\frac{9}{8}\right)^{-100}$

(KTK - 2)

(ii) $(0.35)^{12}$

(iii) $\frac{1}{2^{40}}$

(KTK - 1)

$x = (0.35)^{12}$

$\log_{10} x = 12 \log_{10}(.35)$

$= 12 \log_{10} \frac{\cancel{35}\ 7}{\cancel{100}\ 20} = 12 \log_{10} \frac{7}{20}$

$= 12(\log_{10} 7 - \log_{10} 20)$

$= 12(\log_{10} 7 - (\log_{10} 2 + \log_{10} 10)) = 12 - (\log_{10} 7 - (\log_{10} 2 + 1))$

$= 12(\log_{10} 7 - \log_{10} 2 - 1) = 12(0.8451 - .3010 - 1) = -5.4078$

$\log_{10} x = -5.4078 = -5 - 0.4078 = -5 - 1 + 1 - 0.4078.$

$= -6 + 0.5922.$

Characteristic

No: of zero after decimal before significant digit

In $(0.35)^{12} = 5.$

$\downarrow$

$.0000033792$

Q

Let $\log_3 N = \alpha_1 + \beta_1$, $\log_5 N = \alpha_2 + \beta_2$ and $\log_7 N = \alpha_3 + \beta_3$ where $\alpha_1, \alpha_2, \alpha_3$ are integers and $\beta_1, \beta_2, \beta_3 \in [0, 1)$.

$\alpha_1, \alpha_2, \alpha_3 \in I$ (i) Find the number of integral values of N if $\alpha_1 = 4$ and $\alpha_2 = 2$.

$\beta_1, \beta_2, \beta_3 \in [0,1)$ (ii) Find the largest integral values of N if $\alpha_1 = 5$ and $\alpha_2 = 3$ and $\alpha_3 = 2$.

$\log_3 N = \alpha_1 + \beta_1$

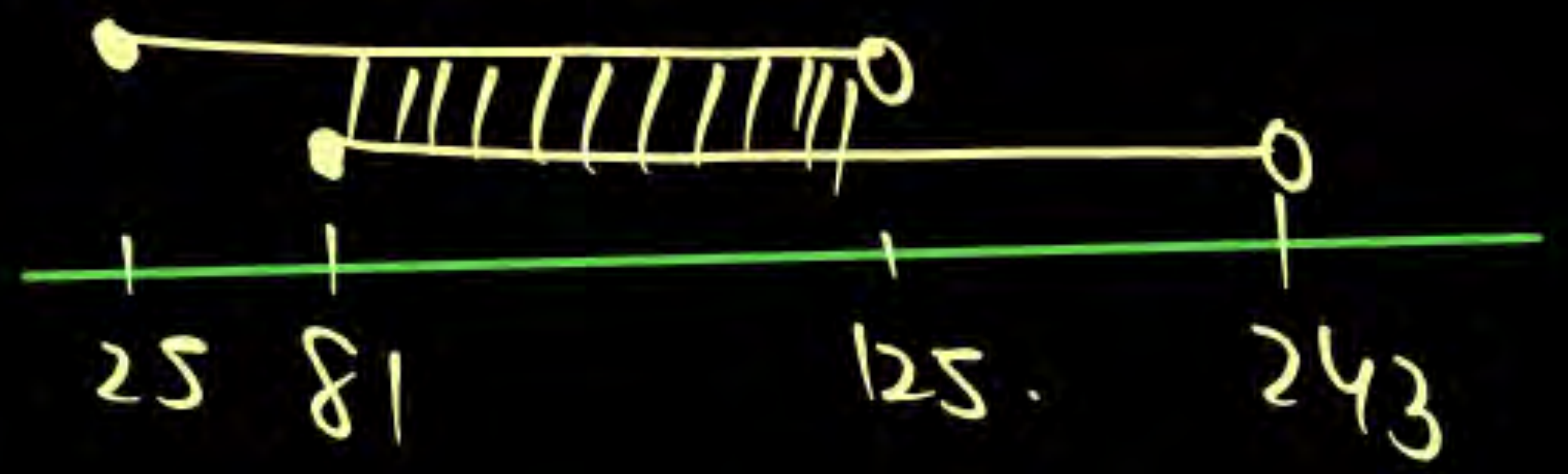
$\log_5 N = \alpha_2 + \beta_2$

$\log_7 N = \alpha_3 + \beta_3$

(i) $\alpha_1 = 4,\ \alpha_2 = 2$

$4 \le \log_3 N = 4 + \beta_1 < 5 \Rightarrow \quad 3^4 \le N < 3^5 \Rightarrow 81 \le N < 243$

$2 \le \log_5 N = 2 + \beta_2 < 3 \quad 5^2 \le N < 5^3 \Rightarrow 25 \le N < 125$



$\Rightarrow N \in [81, 125)$

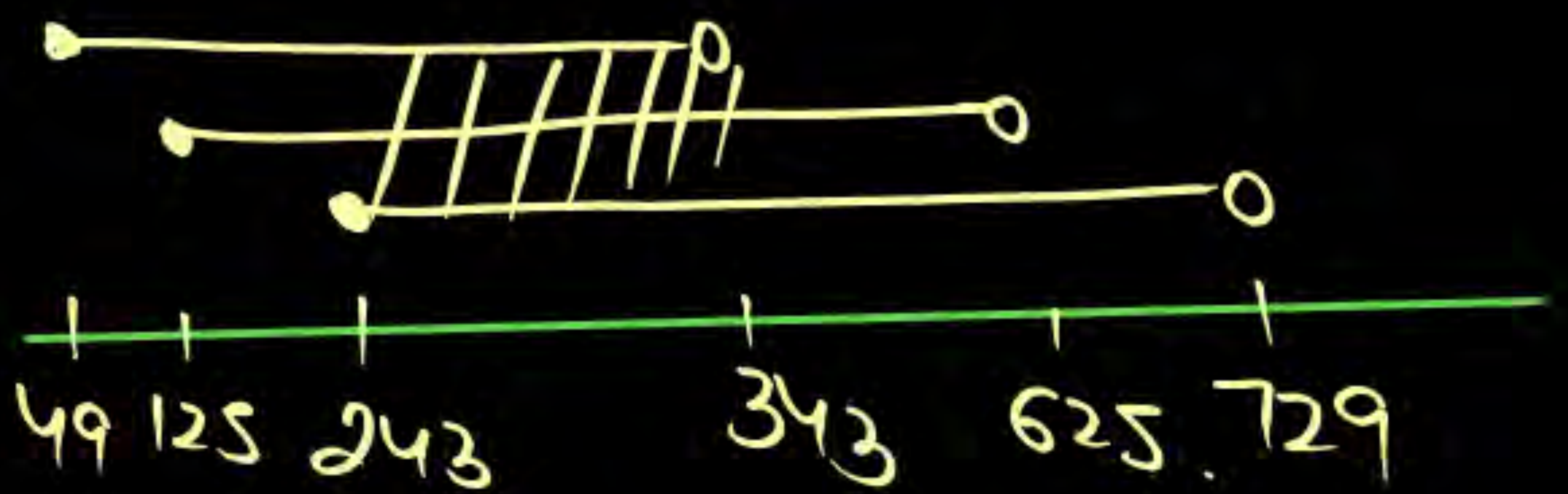
$\Downarrow$

44 integral values

$5 \le \log_3 N = 5+\beta_1 < 6 \Rightarrow 3^5 \le N < 3^6 \Rightarrow 243 \le N < 729$

$3 \le \log_5 N = 3+\beta_2 < 4 \Rightarrow 5^3 \le N < 5^4 \Rightarrow 125 \le N < 625$

$2 \le \log_7 N = 2+\beta_3 < 3 \qquad 7^2 \le N < 7^3 \Rightarrow 49 \le N < 343$



$N \in [243, 343)$ largest possible integer value $= \underline{342}$.

Simplify : $7^{\log_3 5} + 3^{\log_5 7} - 5^{\log_3 7} - 7^{\log_5 3}$

A) $\log_{10}100$

B) $\log_{10}10$

C) ~~$\log_{10}1$~~ $= 0.$

D) ~~$\log_2 8 - \log_3 27$~~

$3 - 3 = 0.$

$\cancel{5^{\log_3 7}} + \cancel{7^{\log_5 3}} - \cancel{5^{\log_3 7}} - \cancel{7^{\log_5 3}} = 0.$

If $(4)^{\log_9 3} + (9)^{\log_2 4} = (10)^{\log_x 83}$, then x is equal to :

(A) 2

(B) 10

(C) 3

(D) 30

$4^{\frac{1}{2}} + 9^2 = 10^{\log_x 83}$

$2 + 81 = 10^{\log_x 83}$

$\underline{10}^{\log_{\underline{x}} 83} = 83.$

$x = 10$

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Let $P = \dfrac{5}{\dfrac{1}{\log_2 x}+\dfrac{1}{\log_3 x}+\dfrac{1}{\log_4 x}+\dfrac{1}{\log_5 x}}$ and $(120)^P = 32$, then the value of x be

(A) 1

(B) 2

(C) 3

(D) 4

$$P = \frac{5}{\log_x 2 + \log_x 3 + \log_x 4 + \log_x 5}.$$

$$= \frac{5}{\log_x (2\times3\times4\times5)} = \frac{5}{\log_x 120}.$$

$$P = 5\log_{120} x$$

$$(120)^P = (120)^{5\log_{120} x}$$

$$= x^{5\log_{120} 120} = x^5 = 32 \Rightarrow x^5 = 2^5 \Rightarrow x = 2.$$

Mathematical Gyaan

Sum of first n Natural Numbers :

$\overbrace{1+2+3}^{3\text{ no: s}} = 6 = \frac{3\times 4}{2}$

$\underbrace{1+2+3+4}_{4\text{ no: s}} = 10 = \frac{4\times 5}{2}$

$1+2+3+\text{——}+n = \frac{n(n+1)}{2}$

$1+2+3+\text{——}+100$

$= \frac{100\times 101}{2} = 50\times 101$

$= \underline{5050}$

Q.find the value of n if $\log_2 4+\log_2 4^2+\log_2 4^3+......+\log_2 4^n = 20$

$\log_2 4 + \log_2 4^2 + \log_2 4^3 \text{——} + \log_2 4^n = 20$

$\log_2 4 + 2\log_2 4 + 3\log_2 4 + \text{——} + n\log_2 4 = 20$

$(\log_2 4)[1+2+3+\text{——}+n] = 20$

$\cancel{2} \times \frac{n(n+1)}{\cancel{2}} = 20 \Rightarrow n(n+1) = 20 \Rightarrow n^2+n-20=0$

$(n+5)(n-4)=0 \Rightarrow n = 4, \cancel{-5}$

Today's KTK & Home Challenge

Home Challenge-9

Passage

Let A be the sum of the roots of

$$\frac{1}{5-4\log_4 x}+\frac{4}{1+\log_4 x}=3,$$

B be the product of m and n, where $2^m = 3$ and $3^n = 4$, and C be the sum of the integral roots of

$$\log_{3x}\left(\frac{3}{x}\right)+(\log_3 x)^2=1.$$

1. The value of $A + B$ is
   (a) 10 (b) 6 (c) 8 (d) 4
2. The value of $B + C$ is
   (a) 6 (b) 2 (c) 4 (d) 8
3. The value of $(A + C \div B)$ is
   (a) 5 (b) 8 (c) 7 (d) 4

(KTK2) Solve for x: $7^{\log_2 x} = 98 - x^{\log_2 7}$.

(KTK3) Solve for x: $4^{\log_3 x} = 32 - x^{\log_3 4}$.

(KTK4) If α and β be the solutions of

$|x-2|^{\log_2(x^3) - 3\log_x 4} = (x-2)^3$,

find the value of $(\alpha + 2\beta + 3)$.

Solution to Previous KTKs & Home Challenge

Q Simplify: $\dfrac{81^{\frac{1}{\log_5 9}}+3^{\frac{3}{\log_{\sqrt{6}} 3}}}{409}\cdot\left((\sqrt{7})^{\frac{2}{\log_{25} 7}}-(125)^{\log_{25} 6}\right)$

(KTK1)

KTK01

Q. $\dfrac{81^{\frac{1}{\log_5 9}} + 3^{\frac{3}{\log_{\sqrt6} 3}}}{409} \cdot \left((\sqrt7)^{\frac{2}{\log_{25}7}} - (125)^{\log_{25}6}\right)$

$\Rightarrow \dfrac{81^{\log_9 5} + 3^{3\log_3 \sqrt6}}{409} \cdot \left((\sqrt7)^{2\log_7 25} - (125)^{\log_{25}6}\right)$

$\Rightarrow \dfrac{5^{\log_9 81} + \sqrt6^{3\log_3 3}}{409} \cdot \left(25^{2\log_7 \sqrt7} - 6^{\log_{25}125}\right)$

$\Rightarrow \dfrac{5^{\log_9 9^2} + \sqrt6^{3}}{409} \cdot \left(25^{\cancel{2}\times\frac{1}{\cancel{2}}} - 6^{\log_{5^2}5^3}\right)$

$\Rightarrow \dfrac{5^2 + \sqrt6^{3}}{409} \cdot \left(25 - 6^{\frac{3}{2}}\right)$

→ SAKSHI

from U.P (Agra

$= \dfrac{(25+6\sqrt6)\cdot(25-6\sqrt6)}{409}$

$= \dfrac{(25)^2-(6\sqrt6)^2}{409}$

$= \dfrac{625-216}{409} = \dfrac{409}{409} = \underline{\underline{1}}$ Answer

Tuljesh Salvi (M.P.)

KTK - 01

Simplify $\dfrac{81^{\frac{1}{\log_5 9}} + 3^{\frac{3}{\log_{\sqrt{6}} 3}}}{409} \cdot \left((\sqrt{7})^{\frac{2}{\log_{25} 7}} - (125)^{\log_{25} 6} \right)$

$\Rightarrow \dfrac{81^{\log_9 5} + 3^{3\log_3 \sqrt{6}}}{409} \cdot \left(\sqrt{7}^{\,2\log_7 25} - (125)^{\log_{25} 6} \right)$

$((\sqrt{7})^2)^{\log_7 25}$

$\Rightarrow \dfrac{5^{\log_9 81} + 27^{\log_3 \sqrt{6}}}{409} \cdot \left(7^{\log_7 25} - (125)^{\log_{25} 6} \right)$

$\Rightarrow \dfrac{5^{\log_9 81} + \sqrt{6}^{\log_3 27}}{409} \cdot \left(25^{\log_7 7} - 6^{\log_{25} 125} \right)$

$\Rightarrow \dfrac{5^2 + \sqrt{6}^3}{409} \cdot \left(25 - 6^{3/2} \right)$

$\Rightarrow \dfrac{(25 + 6\sqrt{6})(25 - 6\sqrt{6})}{409}$

$\Rightarrow$ Now, $\dfrac{25^2 - 6\sqrt{6}^2}{409}$

$\Rightarrow \dfrac{625 - 216}{409} \Rightarrow \dfrac{409}{409} = 1$

ANS : 1

Solve for x:

(KTK2) $\log_4(x-1) = \log_2(x-3)$

(KTK3) $\log_4(x-2) = \log_2(x-2)$

(KTK4) $\log_9(x-1) = \log_3(x-1)$

(KTK5) $\log_2 x + \log_2(x+3) = 1/4$

(KTK6) $\log_4(x^2+x) - \log_4(x+1) = 2$

KTK2

$$\log_4(x-1) = \log_2(x-3)$$

$$\Rightarrow \log_{2^2}(x-1) = \log_2(x-3) \Rightarrow \frac{1}{2}\log_2(x-1) = \log_2(x-3)$$

$$\Rightarrow 2^{-1}\log_2(x-1) = \log_2(x-3) \Rightarrow \cancel{\log_2}(x-1)^{1/2} = \cancel{\log_2}(x-3)$$

$$\Rightarrow (x-1)^{1/2} = (x-3)$$

On squaring both side we get

$$(x-1) = (x-3)^2 \Rightarrow x-1 = x^2+9-6x$$

$$\Rightarrow x^2-7x+10 = 0$$

$$\Rightarrow (x-5)(x-2) = 0$$

$$\Rightarrow \boxed{x=5}, \boxed{x=2}$$

$x=2$ is rejected because if we put $x=2$ in $\log_2(x-3)$ then the log is not define

Vaibhav Panchal from Samawali (Dist - Shamli)

KTK - 2

ANAND MANI TIWARI
GORAKHPUR (U.P.)

Q. Solve for x :-

(i) $\log_4(x-1) = \log_2(x-3)$

Sol: $\log_{2^2}(x-1) = \log_2(x-3)$

$$\frac{1}{2}\log_2(x-1) = \log_2(x-3)$$

$$\log_2(x-1) = 2\log_2(x-3)$$

$$\cancel{\log_2}(x-1) = \cancel{\log_2}(x-3)^2$$

$$(x-1) = (x^2-6x+9)$$

$$x^2-6x+9-x+1 = 0$$

$$x^2-7x+10 = 0$$

$$x^2-5x-2x+10 = 0$$

$$x(x-5)-2(x-5) = 0$$

$$(x-2)(x-5) = 0$$

$$x = 2 \text{ or } \boxed{x=5}$$

(Rejected as $(x-3)$ cannot be a negative number).

KTK:- 3

ANAND MANI TIWAR
GORAKHPUR (U.P.)

Q. Solve for x :-

(i) $\log_4(x-2) = \log_2(x-2)$

Sol: $\log_{2^2}(x-2) = \log_2(x-2)$

$\frac{1}{2}\log_2(x-2) = \log_2(x-2)$

$\log_2(x-2) = 2\log_2(x-2)$

$\cancel{\log_2}(x-2) = \cancel{\log_2}(x-2)^2$

$(x-2) = (x^2-4x+4)$

$x^2-4x+4-x+2 = 0$

$x^2-5x+6 = 0$

$x^2-3x-2x+6=0$

$x(x-3)-2(x-3)=0$

$(x-2)(x-3)=0$

$\boxed{x=2,\ x=3} \Rightarrow x=2$ rejected b'coz $x-2$ becomes 0

$x=3$ Ans

KT4

$\Rightarrow \log_9(x-1) = \log_3(x-1)$

$\Rightarrow (x-1) = 9^{\log_3(x-1)}$

$\Rightarrow (x-1) = (x-1)^{\log_3 9}$

$\Rightarrow (x-1) = (x-1)^{\log_3 3^2}$

$\Rightarrow (x-1) = (x-1)^{2\log_3 3}$

$\Rightarrow (x-1) = (x-1)^2$

$\Rightarrow x-1 = x^2-2x+1$

$\Rightarrow x^2-3x+2=0$

$(x-2)(x-1)=0$

$x=2$ or $x=1$ X

Rejected

$\therefore x=2$ Ans

Dipanshu U.P

KTK-5

MAANU RAW

Q) $\log_2(x) + \log_2(x+3) = \frac{1}{4}$

$\log_2(x(x+3)) = \frac{1}{4}$

$\log_2(x^2+3x) = \frac{1}{4}$

$x^2+3x = (2)^{\frac{1}{4}}$

$x^2+3x = \sqrt[4]{2}$

$x^2+3x-\sqrt[4]{2}$

$-3 \pm \sqrt{(3)^2-4(1)(-\sqrt[4]{2})}$

$-3 \pm \sqrt{9-4\sqrt[4]{2}}$

$x = -3+\sqrt{9-4\sqrt[4]{2}}$ ✓

$x = -3-\cancel{\sqrt{9-4\sqrt[4]{2}}}$ (rejected)

Vaibhav Panchal Sarnawali (Dis - Shamli)

KTK 6 $\log_4(x^2+x) - \log_4(x+1) = 2$

We can write it as $\log_4\left(\frac{x^2+x}{x+1}\right) = 2$ $\quad \because \left(\log_a m - \log_a n = \log_a\left(\frac{m}{n}\right)\right)$

$\Rightarrow 4^2 = \frac{x^2+x}{x+1} \Rightarrow 16(x+1) = x^2+x$

$\Rightarrow 16x+16 = x^2+x \Rightarrow x^2-15x-16 = 0$

$\Rightarrow x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} \Rightarrow x = \frac{15 \pm \sqrt{(-15)^2-4(1)(-16}}{2}$

$\Rightarrow x = \frac{15 \pm \sqrt{225+64}}{2} \Rightarrow x = \frac{15 \pm \sqrt{289}}{2}$

$\Rightarrow x = \frac{15 \pm 17}{2} \Rightarrow \boxed{x = 16}, \boxed{x = -1}$ X

$x = -1$ is rejected by if we put $x = -1$ in $\log_4(x+1)$ then its value is not define

Hence $x = 16$ is final answer

Correction in KTK sent by Students

Solve the following equations :

(i) $\log_{x-1} 3 = 2$ (KTK 1)

(ii) $\log_4 (2 \log_3 (1 + \log_2 (1 + 3\log_3 x))) = \frac{1}{2}$ (KTK 2)

(iii) $\log_3(1 + \log_3(2^x - 7)) = 1$ (KTK 3)

(iv) $\log_3(3^x - 8) = 2 - x$ (KTK 4)

Practical Book ACTIVITY SHEET

Vaibhav Panchal from U.P

KTK 2

$$\log_4 [2\log_3(1+\log_2(1+3\log_3 x))] = \frac{1}{2}$$

we can write it as $(4)^{\frac{1}{2}} = [2\log_3(1+\log_2(1+3\log_3 x))]$

$\Rightarrow \quad 2 = \log_3 [1+\log_2(1+3\log_3 x)]^2$

$\Rightarrow$ we can write it as $[1+\log_2(1+3\log_3 x)]^2 = 3^2 = 9$

$\Rightarrow \quad 1+\log_2(1+3\log_3 x) = \sqrt{9} = 3$

$\Rightarrow \quad \log_2(1+3\log_3 x) = 3-1 = 2$

$\Rightarrow$ we can write it as $1+3\log_3 x = 2^2$

$\Rightarrow \quad 3\log_3 x = 3 \quad \Rightarrow \log_3 x^3 = 3$

$\Rightarrow$ we can write it as $(3)^3 = x^3$

$\Rightarrow \boxed{x=3}$ Ans.

Vaishnavi Gupta ... Dehat

KTK $\Rightarrow$ 2

(ii) $\log_4(2\log_3(1+\log_2(1+3\log_3 x)) = \frac{1}{2}$

Solve :- $2\log_3(1+\log_2(1+\log_3 x)) = 4^{\frac{1}{2}}$

$\Rightarrow \cancel{2}\log_3(1+\log_2(1+\log_3 x)) = \cancel{2}$

$\Rightarrow \log_3(1+\log_2(1+\log_3 x)) = 1$

$\Rightarrow 1+\log_2(1+\log_3 x) = 3^1$

$\Rightarrow \log_2(1+\log_3 x) = 3-1$

$\Rightarrow \log_2(1+\log_3 x) = 2$

$\Rightarrow 1+\log_3 x = 2^2$

$\Rightarrow \log_3 x = 4-1$

$\Rightarrow \log_3 x = 3$

$\Rightarrow 3^3 = x$

$\Rightarrow x = 27$ Ans:-

(iii) $\log_3(1+\log_3(2^x-7))=1$

Ans:-

$1+\log_3(2^x-7)=3^1$

$\log_3(2^x-7)=3-1$

$\Rightarrow \log_3(2^x-7)=2$

$\Rightarrow 2^x-7=3^2$

$\Rightarrow 2^x-7=9$

$\Rightarrow 2^x=9+7$

$\Rightarrow 2^x=16$

$\Rightarrow 2^x=2^4$

$\Rightarrow x=4$ Ans:-

(iv) $\log_3(3^x-8)=2-x$

Solve:

$\log_3(3^x-8)=2-x$

$\Rightarrow 3^x-8=3^{2-x}$

$\Rightarrow 3^x-8=3^2\cdot 3^{-x}$

$\Rightarrow 3^x-8=3^2\times\frac{1}{3^x}$

Let $3^x=t$

$\Rightarrow t-8=3^2\times\frac{1}{t}$

$\Rightarrow \frac{t-8}{1}=\frac{9}{t}$

$\Rightarrow t^2-8t=9$

$\Rightarrow t^2-8t-9=0$

$\Rightarrow (t-9)(t+1)=0$

$\Rightarrow t=9,\ t=-1$ ✗ rejected

$3^x=t$

$3^x=9$

$3^x=3^2$

$x=2$

$3^x=-1$ (reject)

b'coz 3^x can never be -ve

PW Maharathi

Because Practice makes a Maharathi

You have a TEST !!!

Rewards for Students who attempt all the tests regularly on Sunday/ Monday!

- Top 3 Students in each month will receive a Gift Voucher worth Rs 500.
- Top 20 Students in each month will receive a Gift Voucher worth Rs 200.
- Lucky 20 students in each month will be selected on a random basis who will receive a Gift Voucher worth Rs 100 for attending regular tests.

MEGA MAHARATHI (FEBRUARY-2023)

- Top 5 Students will receive a Gift Voucher worth Rs 1000
- Lucky 100 Students in September 2022 will be given a Gift Voucher worth Rs 500 under MEGA MAHARATHI.

** Eligibility and Rules are covered in the next slide.

MAHARATHI MONTHS

- SEPTEMBER 2022
- NOVEMBER 2022
- JANUARY 2023
- FEBRUARY 2023

MEGA MAHARATHI MONTHS

- FEBRUARY 2023

DO’s AND DON'Ts TO BECOME A PW MAHARATHI:-

1). You have to attempt all the test (except short tests)occurring between the last Maharathi and till the next one to be eligible for Maharathi at all.

2). Maharathi will be announced only in the batch for the month if more than one test has occurred in that last month. For eg- If only one test occurred in June then that test would be considered in July’s Month Maharathi Results.

3). The combined performance of all the tests would ensure your selection in the toppers prizes.

4). The selection of **Lucky students** will be done using our Random Selection Algorithm and not on the basis of marks, names and past maharathi results, you just have to be eligible by attempting all tests and yes, if you have been selected once it can happen again :D

5). You are eligible in MEGA MAHARATHI if you have given more than 9 TESTS out of the 13 TESTS occurring throughout the batch i.e May-Aug and not on marks or any other factor.

6). All the tests need to be attempted on Day of test (Sunday) or the next day (Monday).

7). You will have to attempt all tests genuinely and completely to be eligible for any scheme. We will use our Fraud check algorithms before identifying the award winners.

THANK-YOU