

UNIT-1-LOGARITHM

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7. If $\log_{2x} x = a$, $\log_{3x} 2x = b$ & $\log_{4x} 3x = c$,

Prove that $abc + 1 = 2bc$.

⇒

$$\text{L.H.S.} = abc + 1$$

$$= \left(\log_{2x} x \times \log_{3x} 2x \times \log_{4x} 3x \right) + 1$$

$$= \left(\frac{\log x}{\log 2x} \times \frac{\log 2x}{\log 3x} \times \frac{\log 3x}{\log 4x} \right) + 1$$

$$= \frac{\log x}{\log 4x} + 1$$

$$= \frac{\log x + \log 4x}{\log 4x}$$

$$= \frac{\log (x \times 4x)}{\log 4x}$$

$$= \frac{\log 4x^2}{\log 4x} \text{ — (A)}$$

From (A) & (B)

$$\text{L.H.S.} = \text{R.H.S.}$$

$$\text{R.H.S.} = 2bc$$

$$= 2 \times \log_{3x} 2x \times \log_{4x} 3x$$

$$= 2 \times \frac{\log 2x}{\log 3x} \times \frac{\log 3x}{\log 4x}$$

$$= \frac{2 \log 2x}{\log 4x}$$

$$= \frac{\log (2x)^2}{\log 4x}$$

$$= \frac{\log 4x^2}{\log 4x} \text{ — (B)}$$

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8. If $\log_{10} 2 = 0.30103$ & $\log_{10} 3 = 0.47712$,
Find Value of $\log_{10} 5$ and $\log_{10} 1.2$ Using
Without Logtable. (লগ টেবিল ছাড়া কৌশলিক উপায়ের ব্যবহার
করে উত্তর দেবেন।)

$$\begin{aligned} &\Rightarrow \log_{10} 5 \\ &= \log_{10} \left(\frac{10}{2} \right) \\ &= \log_{10} 10 - \log_{10} 2 \quad [\because \log \frac{a}{b} = \log a - \log b] \\ &= 1 - 0.30103 \quad [\because \log_a a = 1] \\ &= \boxed{0.69897} \text{ Ans.} \end{aligned}$$

$$\begin{aligned} &\Rightarrow \log_{10} 1.2 \\ &= \log_{10} \left(\frac{12}{10} \right) \\ &= \log_{10} 12 - \log_{10} 10 \\ &= \log_{10} (3 \times 2 \times 2) - 1 \\ &= \log_{10} 3 + \log_{10} 2 + \log_{10} 2 - 1 \\ &= 0.47712 + 0.30103 + 0.30103 - 1 \\ &= \boxed{0.07918} \text{ Ans.} \end{aligned}$$

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TOPIC: C

* Solve Equation (ନୀચେନା ସମୀକରଣ ଉଡ଼େଲୋ.)

1. $\log x + \log (x-5) = \log 6$

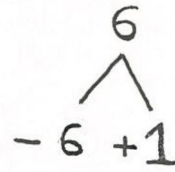
$$\therefore \log [x(x-5)] = \log 6$$

$$\therefore x(x-5) = 6 \quad [\because \text{Log is one-one Function}]$$

$$\therefore x^2 - 5x = 6$$

$$\therefore x^2 - 5x - 6 = 0$$

$$\therefore (x-6)(x+1) = 0$$



$$x-6 = 0 \quad \text{OR} \quad x+1 = 0$$

$$\therefore \boxed{x=6} \text{ Ans.} \quad \therefore \boxed{x=-1} \text{ Ans.}$$

2. $\log (x+3) + \log (x-3) = \log 27$

$$\therefore \log [(x+3)(x-3)] = \log 27$$

$$\therefore (x+3)(x-3) = 27 \quad [\because \text{Log is one-one Function}]$$

$$\therefore x^2 - 9 = 27$$

$$\therefore x^2 = 27 + 9$$

$$\therefore x^2 = 36 \Rightarrow \boxed{x = \pm 6} \text{ Ans.}$$

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3. $\log_2(x+5) + \log_2(x-2) = 3$

$$\therefore \log_2[(x+5)(x-2)] = 3$$

$$\therefore (x+5)(x-2) = 2^3 \quad [\because y = a^x \Rightarrow x = \log_a y]$$

$$\therefore x^2 - 2x + 5x - 10 = 8$$

$$\therefore x^2 + 3x - 10 - 8 = 0$$

$$\therefore x^2 + 3x - 18 = 0$$

$$\therefore (x+6)(x-3) = 0 \quad \begin{array}{c} 18 \\ \wedge \\ +6 \quad -3 \end{array}$$

$$x+6 = 0 \quad \text{OR} \quad x-3 = 0$$

$$\therefore \boxed{x = -6} \text{ Ans.} \quad \therefore \boxed{x = 3} \text{ Ans.}$$

4. If $\log_2 x = 2$ and $\log_x y = 2$, Find y .

$$\Rightarrow \text{Here } \log_2 x = 2$$

$$\therefore 2^2 = x$$

$$\therefore \boxed{x = 4}$$

$$\text{Also, } \log_x y = 2$$

$$\therefore x^2 = y$$

$$\therefore y = x^2$$

$$\therefore y = (4)^2$$

$$\therefore \boxed{y = 16} \text{ Ans.}$$

$$\therefore \frac{4 \log 5 \times \log x}{2 \log 5} = \log 1024$$

$$\therefore 2 \log x = \log 1024$$

$$\therefore \log x^2 = \log 1024$$

$$\therefore x^2 = 1024 \quad [\because \text{Log is one-one Function}]$$

$$\therefore \boxed{x = 32} \text{ Ans.}$$

7. $\frac{\log x \times \log 16}{\log 32} = \log 256$, Find x .

$$\Rightarrow \frac{\log x \times \log 16}{\log 32} = \log 256$$

$$\therefore \frac{\log x \times \log 2^4}{\log 2^5} = \log 256$$

$$\therefore \frac{\log x \times 4 \log 2}{5 \log 2} = \log 256$$

$$\therefore \frac{4}{5} \log x = \log 256$$

$$\therefore \log x^{4/5} = \log 256$$

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5. $\frac{4 \log 3 \times \log x}{\log 9} = \log 27$, Find x .

$\Rightarrow \frac{4 \log 3 \times \log x}{\log 9} = \log 27$

$\therefore \frac{4 \log 3 \times \log x}{\log 3^2} = \log 27$

$\therefore \frac{4 \log 3 \times \log x}{2 \log 3} = \log 27$

$\therefore 2 \log x = \log 27$

$\therefore \log x^2 = \log 27$

$\therefore x^2 = 27$ [\because Log is one - one

$\therefore x^2 = 9 \times 3$

Function]

$\therefore \boxed{x = 3\sqrt{3}}$ Ans.

6. $\frac{4 \log 5 \times \log x}{\log 25} = \log 1024$, Find x .

$\Rightarrow \frac{4 \log 5 \times \log x}{\log 25} = \log 1024$

$\therefore \frac{4 \log 5 \times \log x}{\log 5^2} = \log 1024$

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$$\therefore x^{4/5} = 256 \quad [\because \text{Log is one - one Function}]$$

$$\therefore x^{4/5} = 2^8$$

$$\therefore x = 2^{\frac{8 \times 5}{4}}$$

$$\therefore x = 2^{10}$$

$$\therefore \boxed{x = 1024} \text{ Ans.}$$

8. $\frac{\log a}{\log 8} = \frac{\log 256}{\log 64}$, Find a.

$$\Rightarrow \frac{\log a}{\log 8} = \frac{\log 256}{\log 64}$$

$$\therefore \frac{\log a}{\log 8} = \frac{\log 2^8}{\log 2^6}$$

$$\therefore \frac{\log a}{\log 8} = \frac{8 \log 2}{6 \log 2}$$

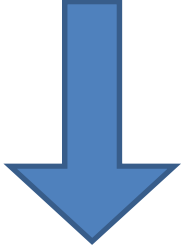
$$\therefore \log a = \frac{4}{3} \log 8$$

$$\therefore \log a = \log 8^{4/3}$$

$$\therefore a = 8^{4/3} \quad [\because \text{Log is one - one Function}]$$

$$\therefore a = 2^{3 \times 4/3} \Rightarrow \therefore a = 2^4 \Rightarrow \therefore \boxed{a = 16} \text{ Ans.}$$

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