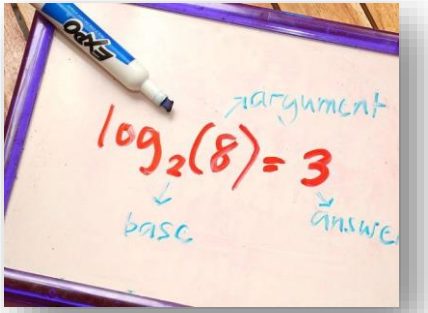
ACE QUANTS SERIES

KNOWVATION

PRACTICE QUESTIONS ON

LOGARITHMS

PART-1



CAT, XAT, IIFT, SNAP, NMAT,
Bank PO & other exams

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PROPERTIES OF LOGARITHMS

Basic

$$\log_a xy = \log_a x + \log_a y$$

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

$$\log_a x^n = n \log_a x$$

$$\log_a b = \frac{\log_c b}{\log_c a}$$

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

$$\log_a 1 = 0$$

$$\log_a a = 1$$

$$\log_a a^r = r$$

$$\log_a \frac{1}{b} = -\log_a b$$

$$\log_{\frac{1}{a}} b = -\log_a b$$

$$\log_a b \log_b c = \log_a c$$

$$\log_{a^m} a^n = \frac{n}{m}, m \neq 0$$

Q. Find the value of -

(i) $\log_{81} 27 = x$

$\log_{81} 27 = x$

$27 = 81^x$

$3^3 = (3^4)^x$

$3 = 4x$

$\boxed{x = \frac{3}{4}}$

(ii) $\log_{10} 100 = x$

$100 = 10^x$

$10^2 = 10^x$

$\boxed{x = 2}$

(iii) $\log_{1/3} 9\sqrt{3} = x$

$\left(\frac{1}{3}\right)^x = 9 \cdot \sqrt{3}$

$3^{-x} = 3^2 \cdot 3^{1/2}$

$= 3^{2+\frac{1}{2}}$

$3^{-x} = 3^{5/2}$

$\therefore \boxed{x = -5/2}$

Q. Find value of -

(i) $\log_5 \sqrt{5\sqrt{5\sqrt{5\ldots\infty}}} = ?$

$\log_5 y \Rightarrow \log_5 5$ $\{\log_a a = 1\}$

$\Rightarrow 1$

$\sqrt{5\sqrt{5\sqrt{5\ldots\infty}}} = y$

$\sqrt{5 \times y} = y$

Squaring -

$5y = y^2 \Rightarrow y^2 - 5y = 0$

$y(y-5) = 0$

$y \neq 0$ or $y = 5$

$y = 5$

Q- The value of $\left(\frac{1}{\log_3 60} + \frac{1}{\log_4 60} + \frac{1}{\log_5 60}\right)$ is -

(A) 1 (B) 0 (C) 5 (D) 60

$$\left(\frac{1}{\log_3 60} + \frac{1}{\log_4 60} + \frac{1}{\log_5 60}\right) \quad \left\{\because \log_n m = \frac{1}{\log_m n}\right\}$$

$$\Rightarrow \frac{1}{\left(\frac{1}{\log_{60} 3}\right)} + \frac{1}{\left(\frac{1}{\log_{60} 4}\right)} + \frac{1}{\left(\frac{1}{\log_{60} 5}\right)}$$

$$\Rightarrow \log_{60} 3 + \log_{60} 4 + \log_{60} 5 \qquad \{\log_a a = 1\}$$

$$\Rightarrow \log_{60} (3 \cdot 4 \cdot 5) \Rightarrow \log_{60} 60$$

$$\Rightarrow \underline{1}$$

Q. If $(\log \tan 5^\circ)(\log \tan 10^\circ)(\log \tan 15^\circ) \ldots\ldots (\log \tan 60^\circ) = x$. Then what is $x = ?$

(A) $\log(\sin 15^\circ)$

(B) 1

(C) 0

(D) $\log(\cos 60^\circ)$

$\log(\tan 45^\circ) \Rightarrow (\log 1)$

$\log 1 = 0$

$x = 0$

$\tan 45^\circ = 1$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$= \frac{\sin 45^\circ}{\cos 45^\circ} = \frac{1/\sqrt{2}}{1/\sqrt{2}} = 1$

Q- Find the value of x satisfying $\log_{10}(2^x + x - 41) = x(1 - \log_{10} 5)$.

(A) 21 (B) 61 (C) 41 (D) 81.

M-H

$\Rightarrow \log_{10}(2^x + x - 41) = x(1 - \log_{10} 5)$

$\log_{10} 10 = 1$

$= x(\log_{10} 10 - \log_{10} 5)$

$= x\left(\log_{10}\left(\frac{10}{5}\right)^2\right)$

$\log_{10}(2^x + x - 41) = x \cdot \log_{10} 2$

$\log_{10}(2^x + x - 41) = \log_{10}(2^x)$

$2^x + x - 41 = 2^x$

$x = 41$

Q- If $\log_{125} 729 = x$, then what is the value of $\log_{81} 5625$?

(A) $\frac{4+x}{2x}$ (B) $\frac{6+x}{2x}$ (C) $\frac{6+2x}{3x}$ (D) $\frac{4+2x}{3x}$

$\Rightarrow x = \log_{125} 729$

$x = \log_{5^3} (3^6)$

$x = 2\frac{6}{3} \log_5 3$

$x = 2 \log_5 3$

$\log_5 3 = \frac{x}{2}$ — (i)

$\log_5 3 = \frac{1}{\log_3 5}$

$\log_{81} 5625$

$\log_{3^4} (5^4 \cdot 9)$

$\Rightarrow \frac{1}{4} \log_3 (5^4 \cdot 9)$

$\Rightarrow \frac{1}{4} \log_3 5^4 + \frac{1}{4} \log_3 3^2$

$\Rightarrow \frac{1}{4} \cdot 4 \log_3 5 + \frac{1}{4} \times 2$

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

$\Rightarrow \frac{4+x}{2x}$

$\log a \cdot b = \log a + \log b$

3	729
3	243
3	81
3	27
3	9
3	3

5	5625
5	1125
5	225
5	45
9	9

Q- If $\log_2 x + \log_4 x = \log_{0.25} \sqrt{6}$ where $x > 0$, then $x = ?$

(A) $3^{-1/6}$ (B) $6^{-1/6}$ (C) $6^{-1/2}$ (D) $3^{-1/2}$

$\Rightarrow \log_4 x + \log_4 x = \log_{0.25} \sqrt{6}$

$\Rightarrow \log_2 x + \log_{2^2} x = \log_{(0.5)^{1/2}} \sqrt{6}$ $\quad 0.5 = \frac{1}{2} = (2)^{-1}$

$\Rightarrow \log_2 x + \frac{1}{2}\log_2 x = \frac{1}{2}\log_{0.5} \sqrt{6}$

$\Rightarrow \log_2 x + \log_2 x^{1/2} = \frac{1}{2}\log_{2^{-1}} \sqrt{6} \Rightarrow -\frac{1}{2}\log_2 6^{1/2}$

$\Rightarrow \log_2 (6^{-1/4}) = \log_2 (x^{3/2}) \Rightarrow -\frac{1}{2}\times\frac{1}{2}\log_2 6$

$6^{-1/4} = x^{3/2} \Rightarrow -\frac{1}{4}\log_2 6 = \log_2 x + \log_2 x^{1/2}$

$x = 6^{-\frac{1}{4}\times\frac{2}{3}} \Rightarrow -\frac{1}{4}\log_2 6 = \log_2 (x \cdot x^{1/2})$

$\Rightarrow x = 6^{-1/6} \Rightarrow -\frac{1}{4}\log_2 6 = \log_2 x^{3/2}$

Q- If $a = \sqrt{b} = \sqrt[3]{c} = \sqrt[4]{d} = \sqrt[5]{e}$, then find value of $\log_a(abcde)$?

15

$\Rightarrow a = \sqrt{b} = c^{1/3} = d^{1/4} = e^{1/5} = k$

$b^{1/2}$

$b^{1/2} = k$

$b = k^2$

$a = k$

$b = k^2$

$c = k^3$

$d = k^4$

$c = k^5$

$\log_a(a \cdot b \cdot c \cdot d \cdot e)$

$\log_k (k \cdot k^2 \cdot k^3 \cdot k^4 \cdot k^5)$

$\Rightarrow \log_k k^{15}$

$\Rightarrow 15 \log_k k$

$= 15$

Q- If $49^{\{\log_7 \frac{1}{3} + 2\log_x \sqrt{3}\}} = \frac{1}{3}$, then find x.

(A) $\frac{1}{49}$ (B) $\frac{1}{7}$ (C) 49 (D) 7

$\log a^{n}$

$\Rightarrow \log_7 \frac{1}{3} + \log_x 3 = \log_7 \frac{1}{\sqrt{3}}$

$\log_x 3 = \log_7 \left(\frac{1}{\sqrt{3}}\right) - \log_7 \left(\frac{1}{3}\right)$

$= \log_7 \left(\frac{\frac{1}{\sqrt{3}}}{\frac{1}{3}}\right)$

$= \log_7 (\sqrt{3})^{3/\cancel{2}}$

$\log_x 3 = \log_7 \sqrt{3}$

$\Rightarrow \frac{1}{\log_3 x} = \frac{1}{\log_{\sqrt{3}} 7}$

$3^{1/2}$

$\Rightarrow \log_{\sqrt{3}} 7 = \log_3 x$

$\Rightarrow 2\log_3 7 = \log_3 x$

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

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

$x = 7^2 = 49$

Thanks a lot for watching!!

PART-2 is coming soon.

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