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LOGARITHM

{Logarithm} ← ये Nya chapter 17 Apr Shuru ho gya tha.

John Napier (1700)

NCERT से ज्यादा पढ़ाते हैं।

36 is 6^2

$N(36)$

↓ Exponential form

$6^2 = 36$

Antilog form.

↓ log form.

$\log_6 36 = 2$

Antilog of $\frac{3}{4}$ to Base 16

$= (16)^{3/4} = (2^4)^{\frac{3}{4}} = 2^3 = 8$

$\log_3 9 = 2$

$\log_2 8 = 3$

$2^3 = 8$

Exp.

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Q1 $\log_{\sin 30^\circ} \operatorname{Cos} 60^\circ$

$\left(\frac{1}{2}\right)^1 = \frac{1}{2}$ $\quad \log_{\frac{1}{2}} \frac{1}{2} = 1$

Q2 $\log_{\operatorname{Sec} 60^\circ} \operatorname{Cos} 60^\circ$

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

$\left(\frac{1}{2}\right)$, 2 ka Kitni deg par ata hai?

Q3 $\log_{.125} 8$

$\log_{\frac{1}{8}} 8 = -1$

Q4 $\log_{\pi} \operatorname{Cot} 45^\circ$

$\log \pi^1 = 0$

Q5 $\log_{10} \operatorname{Sec} 0^\circ$

$\log_{10} 1 = 0$

Q6 $\log_{10} \operatorname{Cos} 120^\circ$

$\log_{10} \left(-\frac{1}{2}\right) = \text{ND}$ (−ve)

* $\log_a N$ Defined

1) Base = $a > 0$
2) Base = $a \neq 1$
3) $N > 0$

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Q7 $\log_{10}(\sin^2 x + \cos^2 x)$

$\log_{10} 1 = 0$

Q8 $\log_2(\log_3 81)$

$\log_2(4)$ ← $3^4 = 81$

$= 2$

Q9 $\log_3 \log_4(\log_2 16)$ → $2^4 = 16$

$\log_3 \log_4(4)$

$\log_3 1 = 0$

Q10 $\log_{\frac{3}{4}}(1.\overline{3})$

8th

$x = 1.33333\ldots\infty$

$10x = 13.33333\ldots\infty$

$-x = -1.33333\ldots\infty$

$9x = 12$

$x = \frac{12}{9} = \frac{4}{3}$

$\log_{\frac{3}{4}} \frac{4}{3} = -1$

$\left(\frac{3}{4}\right)^{-1} = \frac{4}{3}$

Q11 $\log_{(\sqrt{2}-1)}(3-2\sqrt{2}) = \log_{\sqrt{2}-1}(\sqrt{2}-1)^2$

$(\sqrt{2}-1)^2 = (\sqrt{2})^2 + 1^2 - 2\times 1\times\sqrt{2}$

$= 2+1-2\sqrt{2}$

$= 3-2\sqrt{2}$

$= 2$

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Q12 $\log_{5\sqrt{5}} 125$

$(5\sqrt{5})^2 = 5^2 \times \sqrt{5}^2$

$= 25 \times 5$

$= 125$

$\log_{5\sqrt{5}} (5\sqrt{5})^2$

$= 2$

Q14 $\log \tan 1^\circ \cdot \log \tan 2^\circ \log \tan 3^\circ \cdots \log \tan 45^\circ \cdots \log \tan 89^\circ$

$\log 1 = 0$

$=$ 

Q13 $\log \sin 1^\circ \cdot \log \sin 2^\circ \cdot \log \sin 3^\circ \cdot \log \sin 4^\circ \cdots \log \sin 90^\circ \cdots \log \sin 179^\circ =$ 

0 ka multiply hoga | $\log 1$

10

0

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Q. $\log_{2-\sqrt{3}} (2+\sqrt{3})$

$$\frac{1}{2-\sqrt{3}} = \frac{1}{(2-\sqrt{3})} \times \frac{2+\sqrt{3}}{(2+\sqrt{3})} = \frac{2+\sqrt{3}}{2^2-\sqrt{3}^2} = \frac{2+\sqrt{3}}{4-3} = 2+\sqrt{3}$$

$$\log_{2-\sqrt{3}}^{\frac{1}{(2-\sqrt{3})}} = -1$$

Q16 $\log_7 \sqrt{7\sqrt{7\sqrt{7}}}$

$$\log_7 (7)^{\frac{7}{8}} = \frac{7}{8}$$

$$\sqrt{7\sqrt{7\sqrt{7}}} = 7^{\frac{1}{2}} \cdot 7^{\frac{1}{4}} \left(7^{\frac{1}{2}}\right)^{\frac{1}{2}} = 7^{\frac{1}{2}} \cdot 7^{\frac{1}{4}} \cdot 7^{\frac{1}{8}}$$

$$= (7)^{\frac{1}{2}+\frac{1}{4}+\frac{1}{8}} = (7)^{\frac{4+2+1}{8}} = 7^{\frac{7}{8}}$$

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Q17 $\log_{15}\sqrt{15\sqrt{15\sqrt{15\sqrt{15}}}}$

$\log_{15}(15)^{\frac{2^4-1}{2^4}}$

$\log_{15}(15)^{\frac{16-1}{16}}$

$\log_{15}(15)^{\frac{15}{16}} = \log_{15}(15) = \frac{15}{16}$.

$\sqrt{7\sqrt{7\sqrt{7}}} = (7)^{\frac{2^3-1}{2^3}} = (7)^{\frac{8-1}{8}} = 7^{\frac{7}{8}}$

$\sqrt{7\sqrt{7\sqrt{7\sqrt{7}}}} = (7)^{\frac{2^4-1}{2^4}} = (7)^{\frac{15}{16}}$.

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Q_{18} Find a if $\log_2 a = 4$?

a, 2 Ki 4 degree hai

$a = 2^4 \Rightarrow a = 16$.

M2

$\log_2 a = 4$

$a = 2^4 = 16$

Q_{19} $\log_3 (a^2+1) = 1$ find a?

$a^2+1 = 3^1$

$a^2+1 = 3$

$a^2 = 2$

$a = \pm\sqrt{2}$ ($\sqrt{2}$, $-\sqrt{2}$)

Check → A) $\log_3 (\sqrt{2}^2+1) = \log_3 (2+1) = \log_3 3 = 1$

B) $\log_3 ((-\sqrt{2})^2+1) = \log_3 (2+1) = 1$.

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Future Problem.

1) Kb Kaunsi Prob Lgi Pta hi nahi chlta

Practice more than 50 Qs then ask.

2) Kitne Qs Karen?

Dont do all type of Qs. do only Sheet

3) Sheet K Sare Qs नहीं बनते?

50% Qs of sheet is enough but Work hard to make more Qs.

4) Book Batao?

Do this books!

(5) Sheet Kb?

Sheet is already Uploaded.

(6) NCERT ho jayegi

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3 Important Theorems

Th 1) $\log_a M + \log_a N = \log_a MN$ · $a>0, a\neq 1$, $M, N>0$

$$\log_a M + \log_a N + \log_a T = \log_a (MNT)$$

Th 2) $\log_a M - \log_a N = \log_a \frac{M}{N}$ $a>0, a\neq 1$, $M, N>0$

Th 3) $\log_a M^x = x \log_a M$ $a>0, a\neq 1, M>0$

ध्यान दीजिए

$\log_a (M+N) \neq \log_a M + \log_a N$

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Q_{20} $\log_a 2 + \log_a 3 + \log_a 4 = ?$

$\log_a (2 \times 3 \times 4) = \log_a 24$

Q_{21} $\log_a 2 - \log_4 3 = ?$

$\log_a \frac{2}{3}$

Q_{22} $\log_a 2 + \log_a 3 - \log_a 4$

$= \log_a \frac{2 \times 3}{4_2} = \log_a 3/2$

Q_{23} $\log_2 2^3 = ?$

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

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Q24 Prove $\log_a N^\alpha = \alpha \log_a N$

$N^4 = \underbrace{N \cdot N \cdot N \cdot N}_{\text{4 times}}$

$\log_a (\underbrace{N \cdot N \cdot N \cdot N \cdots N}_{\alpha \text{ times}})$

$\log A + \log B = \log AB$

Ulta Use Kra

$= \underbrace{\log N + \log N + \log N + \log N \cdots \log N}_{\alpha \text{ times}}$

$= \alpha \cdot \log_a N$ RHS

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Q25 $\log_2 3^4 = 4 \log_2 3$ P.T.

↳ $\log_2 3^4 = \log_2 (3 \times 3 \times 3 \times 3)$

$= \log_2 3 + \log_2 3 + \log_2 3 + \log_2 3$

$= 4 \cdot \log_2 3 = RHS$

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Q26 $\log_4(x^2-1)=0$ find x?

$\log_4(x^2-1)=0$

$x^2-1=4^0$

$x^2-1=1$

$x^2=2$

$x=\pm\sqrt{2}$

Q27 $\log_4(x+1)+\log_4(x-1)=0$ find x?

log Eqn Kaise Kare Answer check

Prob.

$\log_4(x^2-1)=0$ | $x=\sqrt{2}$

$x=\sqrt{2}, -\sqrt{2}$ (✓, ✗)

Check $\sqrt{2}$: $\log_4(\sqrt{2}+1)+\log_4(\sqrt{2}-1)=0$ (⊕, ⊕)

$1.41-1=.41$

$-\sqrt{2}$: $\log_4(-\sqrt{2}+1)+\log_4(-\sqrt{2}-1)$ (-ve)

$-1.41+1=-.41$

Not Possible.

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Q28 $\log_2(1+x)+\log_2(x+3)=3$ find x?

$\log_2(1+x)(x+3)=3$

$x=1$

$\log_2(1+1)+\log_2(1+3)$

MSttt.

$x^2+4x+3=2^3$

$x^2+4x-5=0$

$(x+5)(x-1)=0$

$x=-5$ or $x=1$ ✓

$x=-5$ ✗

$x=-1$

$x=-5$

$\log_2(-5+1)+\ldots$

$\log_2(-4)$

-ve

Rotoise.

Q29 $\log_2(4-x)=4-\log_2(-2-x)$ find x?

$x=-4$ Ans

$\log_2(4-x)+\log_2(-2-x)=4$

$\log_2(4-x)(-2-x)=4$

$\Rightarrow x^2+2x-4x-8=2^4$

$x^2-2x-24=0$

$\Rightarrow (x-6)(x+4)=0$

$\Rightarrow x=6$ ⊗

$\log_2(4-6)$

-ve

$x=-4$ ✓

$\log_2(4+4)+\log_2(-2+4)$

⊕ ⊕

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Q30 $\log_{10}\left(\frac{ab+\sqrt{(ab)^2-4(a+b)}}{2}\right)+\log_{10}\left(\frac{ab-\sqrt{(ab)^2-4(a+b)}}{2}\right)=\log_{10}(a+b)$ [T/F]

LHS log add ho rahe hain.

$$\log_{10}\left\{\left(\frac{ab+\sqrt{(ab)^2-4(a+b)}}{2}\right)\left(\frac{ab-\sqrt{(ab)^2-4(a+b)}}{2}\right)\right\}$$

(A + B) (A − B)

$$\log_{10}\left\{\frac{(ab)^2-\left(\sqrt{(ab)^2-4(a+b)}\right)^2}{4}\right\}$$

$$\log_{10}\left\{\frac{(ab)^2-(ab)^2+4(a+b)}{4}\right\}=\log_{10}(a+b)=RHS$$

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** Imp.

(A) $\log_e x = \boxed{\ln x}$ → log Natural x

e → Napier (offilient

(B) $\log_{10} x$ = Common log.

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Fundamental Identity

Fundamental Identity of log is

$$a^{\log_a N} = N$$

$a > 0$
$a \neq 1$
$N > 0$

Agr log Ka Base & log Ji is pr hetha hai vo Base Same ho they remove each other

$2^{\log 3^2}$
$= \log 3^2$

Q $2^{\log_2 9}$
$= 9$

Q $3^{\log_3 5} = 5$

Q $\left(\frac{1}{2}\right)^{\log_2 5}$
$2^{-1 \times \log_2 5}$
$2^{\log_2 5^{-1}} = 5^{-1} = \frac{1}{5}$

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Q_{31} $\log_2\left(\frac{1}{\log_7 .125}\right) = ?$

$\log_2\left(\frac{1000}{125}\right) = \log_2 8$

$= \log_2 2^3 = 3 \times 1 = 3.$