LOGARITHM
S

If x , a and m are any three numbers connected by the relation: $m=a^x$ $(a>0, a\neq 1)$, then,

“x” is defined as the logarithm of “m” to the base “a” and is written as:

$\log_a m=x$

Logarithm means power of base $m= a^x$

Important properties:

$\log_a a = 1$

$\log_a (m^n) = n. \log_a m$

$\log_a 1 = 0$

$\log_a (m \times n) = \log_a m + \log_a n$

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

$x = \log_a (a^x)$

$$\log_{a^b} m^x = \frac{x}{b} \log_n m.$$

$\log_b a \times \log_c b = (\log_c a)$..... Chain rule

$\log_a m = (\log_b m) / (\log_b a)$ .... Change of base theorem

$\log_a m = 1 / (\log_m a)$

$\log_a b * \log_b a = 1$

1.The value of $\log_{343} 7$

Solution:

$\log_{7^3} 7^1 = 1/3 \log_7 7 = 1/3.$

2.Find $\log_5 {}^{1/125}$

Solution:

$=\log_5 5^{-3}$

$=-3 \log_5 5$

$=-3$

3. Find the value of $\log\sqrt{8}/\log 8$

Solution:

$\log\sqrt{8} / \log 8$

$\log 8^{1/2} / \log 8$

$= 1/2 \log 8 / \log 8$

$= 1/2$.

We used the formula, $\log a^b = b \log a$

4. FIND THE VALUE OF X

$\mathrm{Log}_{10}\, 20X = 4$

SOLUTION:

$10^4 = 20X$

$X = \frac{10^4}{20} = 500$

5. FIND THE VALUE OF X

$\log(x+3)+\log(x-3)=\log72$

$\log[(x+3)(x-3)]=\log72.$

apply the exponential function on both sides of the equation :

$(x+3)(x-3)=72$

$x^2-9=72$

$x^2=81,$

$X=+9,-9$

-9 NOT APPLICABLE SO +9

Find the value of

= [illegible] + [illegible] + [illegible]

= [illegible] + [illegible] + [illegible]

= [illegible]

=2

7. FIND THE VAULE OF X :

$\log_{27}8.\log_x 3=1$

SOLUTION:

$\log_{3^3}2^3.\log_x 3=1$

$=\frac{3}{3}\log_3 2.\log_x 3=1$

$= \log_3 2.\log_x 3=1$ hint($\log_a b * \log_b a = 1$)

$X = 2$

8. FIND THE VALUE OF

$\frac{1}{2}\log(11+4\sqrt{7})=\log(2+x)$

$\log(11+4\sqrt{7})=\log(2+x)^2$

$11+4\sqrt{7}= (2+x)^2$

$11+4\sqrt{7}=4+4x+x^2$

$7+4\sqrt{7}=x^2+4x$

Comparing both the side,

$X=\sqrt{7}$.

Find the value of

= [illegible] + [illegible] + [illegible] +.........+ [illegible] ,a>1

=1+ [illegible] + [illegible] + ⋯ [illegible]

$=1+2+3+\ldots\ldots+20=$ [illegible] $=210.$

10. FIND THE VALUE OF

$$log_2 log_2 log_3 log_3 27^3$$

Solution

$$= log_2\ log_2 log_3 (3 log_3 3^3)$$

$$= log_2\ log_2 log_3 9$$

$$= log_2\ log_2 2$$

$$= log_2\ 1 = 0$$

11. The value of $\log_2 3 \times \log_3 2 \times \log_3 4 \times \log_4 3$ is ?

1. 1
2. 2
3. 3
4. 4

SOLUTION:

hint($\log_a b * \log_b a = 1$)

$= \log_2 3 \times \log_3 2 \times \log_3 4 \times \log_4 3$

$= (\log 3 / \log 2) \times (\log 2 / \log 3) \times (\log 4 / \log 3) \times (\log 3 / \log 4)$

$= 1$

12.If $\log 2 = 0.3010$, then the number of digits in 2^{64} is ?

SOLUTION

Required answer = $[64 \log_{10} 2]$

$= [\ 64 \times 0.3010\ ]$

$= 19.264$

$= 19 + 1$

$= 20$

13. Given that $\log_{10} 2 = 0.3010$, then $\log_2 10$ is equal to ?

1. **0.3010**
2. **0.6990**
3. **1000 / 301**
4. **699 / 301**

SOLUTION

$\log_2 10 = \log 10 / \log 2$

$= 1 / \log 2$

$= 1.0000 / 0.3010$

$= 1000 / 301$

14. The value of log 9/8 - log 27/32 + log3/4 is ?

SOLUTION:

Given Exp. = log [{(9/8) / (27/32)} x 3/4)]

= log [(9/8) x (3/4) x (32/27)]

= log 1

= 0

16.If $\log_{10}2 = 0.3010$ and $\log_{10}7 = 0.8451$, then find the value of $\log_{10} 2.8$?

1. 0.4471
2. 1.4471
3. 2.4471
4. 14.471

SOLUTION:

$\log_{10}2.8 = \log_{10}(28/10)$

$= \log 28 - \log 10$

$= \log (7 \times 4) - \log 10$

$= \log 7 + 2 \log 2 - \log 10$

$= 0.8451 + 2 \times 0.3010 - 1$

$= 0.8451 + 0.6020 - 1$

$= 0.4471$

17.If $a^x = b$, $b^y = c$, $c^z = a$, then the value of xyz is ?

SOLUTION

$\because\ a^x = b$

$\Rightarrow \log_a b = x$

$\because\ b^y = c$

$\Rightarrow \log_b c = y$

$\because\ c^z = a$

$\Rightarrow \log_c a = z$

$\therefore$ xyz

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

$= 1$

18. If $\log_x 4 = 0.4$ then the value of x is ?

SOLUTION:

$\log_x 4 = \log 4 / \log x = 2/5$

$\Rightarrow 2\log 2 / \log x = 2/5$

$\Rightarrow \log x = 5\log 2 = \log 2^5$

$\Rightarrow \log x = \log 32$

=32

Thank You