LOGARITHMS

If x , a and m are any three numbers connected by the relation: $m=a^x$ $(a>0, a\neq1)$, 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 $\log_5 \frac{1}{125}$

Solution:

$=\log_5 5^{-3}$

$=-3 \log_5 5$

$=-3$

3. Find the value of Log$\sqrt{8}$/log8

Solution:

log$\sqrt{8}$ / log8

log 8 ^ 1/2 / log 8

= 1/2 log 8 / log 8

= 1/2 .

We used the formula, loga^b = bloga

4. FIND THE VALUE OF X

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

SOLUTION:

$10^4 = 20X$

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

5. FIND THE VALUE OF X

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

$\log[(x+3)(x-3)]=\log 72.$

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

$$= \frac{1}{log_{xy}(xyz)} + \frac{1}{log_{yz}(xyz)} + \frac{1}{log_{zx}(xyz)}$$

$$= log_{xyz}(xy) + log_{xyz}(yz) + log_{xyz}(zx)$$

$$= log_{xyz}\left(x^2y^2z^2\right)$$

$$= 2$$

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

$= log_a a + log_{a^{\frac{1}{2}}} a + log_{a^{\frac{1}{3}}} a + \ldots\ldots\ldots + log_{a^{\frac{1}{20}}} a$, a>1

$=1+\frac{1}{\frac{1}{2}}+\frac{1}{\frac{1}{3}}+\cdots\frac{1}{\frac{1}{20}}$

$=1+2+3+\ldots\ldots+20=\frac{20\times 21}{2}=210.$

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 x 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

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 x 4) - log 10

= log 7 + 2 log 2 - log 10

= 0.8451 + 2 x 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