IB HL MATH
LOGARITHM QUESTION BANK by Rakesh Jha

Topic: Algebra

Logarithm question bank

1. Rewrite the following questions in log form

   $(i)\,4^{\frac{3}{2}}=8\;(ii)\left(2\sqrt{2}\right)^{\frac{-2}{3}}=\frac{1}{2}$

2. Rewrite in the exponential form;

   $(i)\log_2 32=5\;(ii)\log_{100}(0.1)=\frac{-1}{2}$

3. Find the value of

   $(i)\,2^{2-\log_2 5}\;(ii)\,3^{\frac{-1}{2}\log_3 9}\;(iii)\,10^{\log_{10} m+\log_{10} n}$

4. Compute without using GDC

   $(i)\log_6(216\sqrt{6})\;(ii)\log_9 27-\log_{27} 9$

   $(iii)\log\tan 40\times\log\tan 41\times-----\times\log\tan 50$

5. Compute

   $\log_6 16$ *if* $\log_{12} 27=a$

6. Find the least integer n such that $7^n>10^5$ given that $\log_{10} 343=2.5353$

7. Determine b if

   $(i)\log_{\sqrt{8}} b=\frac{10}{3}\;(ii)\ln 2\times\log_b 625=\log_{10} 16\times\ln 10$

8. Prove that $\log_2 3$ is an irrational number.

9. If $\log_3 2,\log_3(2^x-5),\log_3\left(2^x-\frac{7}{2}\right)$ are in AP then find the value of x.

10. Solve for x and y;

    $(3x)^{\log 3}=(4y)^{\log 4}\;\&\;4^{\log x}=3^{\log y}$

11. Given that $\log_l x,\log_m x\;\&\log_n x$ are in AP $x\neq 1$, prove that $n^2=(\ln)^{\log_l m}$.

12. Find the sum of $a\left(x^2+\frac{1}{x^2}\right)-\frac{a^2}{2}\left(x^4+\frac{1}{x^4}\right)+\frac{a^3}{3}\left(x^6+\frac{1}{x^6}\right)$ and determine the value of a and x for which it is valid.

13.

Show that $\frac{1}{\log_2 n}+\frac{1}{\log_3 n}+-----+\frac{1}{\log_{43} n}=\frac{1}{\log_{43!} n}$

14.

If

$\frac{\log a}{b-c}=\frac{\log b}{c-a}=\frac{\log c}{a-b}$, prove that $a^a.b^b.c^c=1$

15.

Prove that

$(i)\frac{\log_a n}{\log_{ab} n}=1+\log_a b$

(ii) *If* $a^2+b^2=7ab$ *then* $\log\left(\frac{a+b}{3}\right)=\frac{1}{2}[\log a+\log b]$

16.

If $a^2+4b^2=12ab$ then find the value of $\log(a+2b)$.

17.

Solve for x: $\log x+\log(1+x)=0$

18.

Find the sum of series

$\log_4 2-\log_8 2+\log_{16} 2----$

19.

Find the value of x if, $7^{\log_7(x^2-4x+5)}=x-1$

20.

Find the value of $(0.2)^{\log_{\sqrt{5}}\left(\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+-----\infty\right)}$

21.

Solve the following equations for x:

$(a)\ 2^{x^2} : 2^{2x} = 8:1$

$(b)\ 3^{2x} - 3^{x+1} - 3^{x-1} + 1 = 0$

$(c)\ a^{2x}(a^2+1) = (a^{3x} + a^x)a$

$(d)\ 3^x . 8^{\frac{x}{x+2}} = 6$

$(e)\ 4^x + 6^x = 9^x$

$(f)\ 2^{2x+2} - 6^x - 2 \times 3^{2x+2} = 0$

$(g)\ 16^{\sin^2 x} + 16^{\cos^2 x} = 10,\ 0 \le x \le 360$

$(h)\ \log_{10} \log_{10} \log_{10} x = 0$

$(i)\ \log_x (3x^2 + 10x) = 3$

$(j)\ \log_{10}(98 + \sqrt{x^3 - x^2 - 12x + 36}) = 2$

$(k)\ 4^{\log_9 3} + 9^{\log_2 4} = 10^{\log_x 83}$

$(l)\ 2^x = 1024$

$(m)\ \log\left(\frac{1}{2^x + x - 1}\right) = x(\log_{10} 5 - 1)$

22.

Solve for x:

$\log_{10}(x^2 - x - 6) - x = \log_{10}(x+2) - 4$

23.

Solve for x: $\log_x 5 + \log_5 x = \frac{5}{2}$

24.

If x and y are real the solve the following;

$(a) 3.x^{2y-1} = 4 \;\&\; x^{y+1} = 6$

$(b) 3^x.5^y = 75 \;\&\; 3^y.5^x = 45$

$(c) \log_y x + \log_x y = 2 \;\&\; x^2 + y = 12$

25.

Solve for x and y:

$2^{x+y} = 6^y \;\&\; 3^x = 3 \times 2^{y+1}$

26.

Show that the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has no real roots.

27.

Solve for x:

$(a) \left(5+2\sqrt{6}\right)^{x^2-3} + \left(5-2\sqrt{6}\right)^{x^2-3} = 10$

$(b) \left(\sqrt{3}+\sqrt{2}\right)^x + \left(\sqrt{3}-\sqrt{2}\right)^x = 10$

28.

Solve for x:

$$2\cos^2\left(\frac{x^2+x}{2}\right) = 2^x + 2^{-x}$$

29.

Solve for x and y: $\log_2 xy = 5 \;\&\; \log_{\frac{1}{2}}\left(\frac{x}{y}\right) = 1$

30.

Solve for x:

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$$x^{\frac{2}{3}\left((\log_2 x)^2+\log_2 x-\frac{5}{4}\right)}=\sqrt{2}$$

IB EXAM QUESTION:

1. Solve the following system of equations.

$$\log_{x+1} y = 2$$
$$\log_{y+1} x = \frac{1}{4}$$

2. Solve the equation $\log_3(x + 17) - 2 = \log_3 2x$.

3. Given that $4 \ln 2 - 3\ln 4 = -\ln k$, find the value of k.

4. Solve the equation $2^{2x+2} - 10 \times 2^x + 4 = 0, x \in \mathbb{R}$.