Chapter

5

Logarithm

Single Correct Option Type Questions

Q.1 (a, b) and (c, d) are solutions of simultaneous equation $5(\log_y x + \log_x y) = 26$, $xy = 64$ then $a + b + c + d =$

(A) 51 (B) 17 (C) 68 (D) 34

Q.2 If $\log_k x \log_5 k = \log_x 5$, $k \neq 1$, $k > 0$, then sum of all values of x is

(A) 5 (B) $\frac{24}{5}$ (C) $\frac{26}{5}$ (D) $\frac{37}{5}$

Q.3 Complete set of solution of $\log_{1/3}(2^{x+2} - 4^x) \geq -2$ is

(A) $(-\infty, 2)$ (B) $(-\infty, 2 + \sqrt{13})$ (C) $(2, \infty)$ (D) None of these

Q.4 In which of the following intervals does $\frac{1}{\log_{1/2}(1/3)} + \frac{1}{\log_{1/5}(1/3)}$ lies

(A) (1, 2) (B) (2, 3) (C) (3, 4) (D) (4, 5)

Q.5 If $T_r = \frac{1}{\log_{2^r} 4}$ (where $r \in N$), then the value of $\sum_{r=1}^{4} T_r$ is :

(A) 3 (B) 4 (C) 5 (D) 10

Q.6 Sum of all the solutions of the equation $|x - 3| + |x + 5| = 7x$, is :

(A) $\frac{6}{7}$ (B) $\frac{8}{7}$ (C) $\frac{58}{63}$ (D) $\frac{8}{45}$

Q.7 If $2^x = 3^y = 6^{-z}$, the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is equal to

(A) 0 (B) 1 (C) 2 (D) 3

Q.8 Complete set of real values of x for which $\log_{(2x-3)}(x^2 - 5x - 6)$ is defined is

(A) $\left(\frac{3}{2}, \infty\right)$ (B) $(6, \infty)$ (C) $\left(\frac{3}{2}, 6\right)$ (D) $\left(\frac{3}{2}, 2\right) \cup (2, \infty)$

Q.9 Suppose $\log_a b + \log_b a = C$. The smallest possible integral value of C for all a, $b > 1$ is

(A) 4 (B) 3 (C) 2 (D) 1

Q.10 $\log_{0.01} 1000 + \log_{0.1} 0.0001$ is equal to

(A) –2 (B) 3 (C) $-\frac{5}{2}$ (D) $\frac{5}{2}$

Q.11 If $7\log_a \frac{16}{15} + 5\log_a \frac{25}{24} + 3\log_a \frac{81}{80} = 8$, then $a =$

(A) $2^{1/8}$ (B) $(10)^{1/8}$ (C) $(30)^{1/8}$ (D) 1

Q.12 $\log_8(128) - \log_9\cot\left(\frac{\pi}{3}\right) =$

(A) $\frac{31}{12}$ (B) $\frac{19}{12}$ (C) $\frac{13}{12}$ (D) $\frac{11}{12}$

Q.13 The value of $\left(\frac{1}{\sqrt{27}}\right)^{2-\left(\frac{\log_3 16}{2\log_3 9}\right)}$ equals to

(A) $\frac{5\sqrt{2}}{27}$ (B) $\frac{\sqrt{2}}{27}$ (C) $\frac{4\sqrt{2}}{27}$ (D) $\frac{2\sqrt{2}}{27}$

Q.14 The sum of all the roots of the equation $\log_2(x-1) + \log_2(x+2) - \log_2(3x-1) = \log_2 4$

(A) 12 (B) 2 (C) 10 (D) 11

Q.15 Let $\lambda = \log_5 \log_5(3)$. If $3^{k+5^{-\lambda}} = 405$. then the value of k is

(A) 3 (B) 5 (C) 4 (D) 6

Q.16 A circle has a radius $\log_{10}(a^2)$ and a circumference of $\log_{10}(b^4)$. Then the value of $\log_a b$ is equal to

(A) $\frac{1}{4\pi}$ (B) $\frac{1}{\pi}$ (C) 2π (D) π

Q.17 If $2^x = 3^y = 6^{-z}$, the value of $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$ is equal to

(A) 0 (B) 1 (C) 2 (D) 3

Q.18 The value of $\log_{(\sqrt{2}-1)}(5\sqrt{2}-7)$ is

(A) 0 (B) 1 (C) 2 (D) 3

Q.19 The value of $\log_{ab}\left(\frac{\sqrt[3]{a}}{\sqrt{b}}\right)$, if $\log_{ab} a = 4$ is equal to

(A) 2 (B) $\frac{13}{6}$ (C) $\frac{15}{6}$ (D) $\frac{17}{6}$

Q.20 Identify the correct option

(A) $\log_2 3 < \log_{1/4} 5$ (B) $\log_5 7 < \log_8 3$

(C) $\log_{\sqrt{2}}\sqrt{3} > \log_{\sqrt{2}}\sqrt{5}$ (D) $2^{1/4} > \left(\frac{3}{2}\right)^{1/3}$

Q.21 Sum of all values of x satisfying the system of equations $5(\log_y x + \log_x y) = 26$, $xy = 64$ is

(A) 42 (B) 34 (C) 32 (D) 2

Q.22 The product of all values of x satisfying the equation $\log_3 a - \log_x a = \log_{\sqrt{3}} a$ is :

(A) 3 (B) $\frac{3}{2}$ (C) 18 (D) 27

Q.23 The value of $x + y + z$ satisfying the system of equations

$\log_2 x + \log_4 y + \log_4 z = 2$ is

$\log_3 y + \log_9 z + \log_{10} x = 2$

$\log_4 z + \log_{16} x + \log_{16} y = 2$

(A) $\frac{175}{12}$ (B) $\frac{349}{24}$ (C) $\frac{353}{24}$ (D) $\frac{112}{3}$

Q.24 $\left(\frac{1}{49}\right)^{1+\log_7 2} + 5^{-\log_{1/5} 7} =$

(A) $7\frac{1}{196}$ (B) $7\frac{3}{196}$ (C) $7\frac{5}{196}$ (D) $7\frac{1}{98}$

Q.25 The number of real values of x satisfying the equation $\log_2(3-x) - \log_2\left(\frac{\sin\left(\frac{3\pi}{4}\right)}{(5-x)}\right) = \frac{1}{2} + \log_2(x+7)$ is

(A) 0 (B) 1 (C) 2 (D) 3

Q.26 The number of real values of x satisfying the equation $3|x-2| + |1-5x| + 4|3x+1| = 13$ is

(A) 1 (B) 4 (C) 2 (D) 3

Q.27 The number of values of x satisfying the equation $\log_2(9^{x-1}+7) = 2 + \log_2(3^{x-1}+1)$ is

(A) 1 (B) 2 (C) 3 (D) 0

Q.28 The product of all values of x satisfying the equation $|x-1|^{\log_3 x^2 - 2\log_x 9} = (x-1)^7$, is

(A) 162 (B) $\frac{162}{\sqrt{3}}$ (C) $\frac{81}{\sqrt{3}}$ (D) 81

Q.29 Evaluate $3^{2-\log_3 4}$

(A) $\frac{4}{9}$ (B) $\frac{9}{4}$ (C) 36 (D) None of these

Q.30 Let $P(x) = x^2 + \frac{4x}{3} + \log_{10}(4.\overline{9})$, $A = \prod_{i=1}^{12} P(a_i)$ where $a_1, a_2, \ldots\ldots a_{12}$ are positive reals and $B = \prod_{j=1}^{13} P(b_j)$ where $b_1, b_2, \ldots\ldots, b_{13}$ are non-positive reals then which one of the following is always correct ?

(A) $A > 0, B > 0$ (B) $A > 0, B < 0$

(C) $A < 0, B > 0$ (D) $A < 0, B < 0$

Q.31 The set of all rest values of x for which both $\log_{\frac{x-2}{x+3}}(x^2+x+1)$ and $\sqrt{x^2-9}$ are meaningless, is equal to

(A) $[-4, -3]$ (B) $(-3, -2)$ (C) $(-3, 2]$ (D) $(-3, 1)$

Multiple Correct Option Type Questions

Q.32 If x satisfies $|x-1|+|x-2|+|x-3|>6$, then
(A) $x\in(-\infty, 1)$ (B) $x\in(-\infty, 0)$ (C) $x\in(4, \infty)$ (D) $(2, \infty)$

Q.33 If the equation $\ell n(x^2+5x)-\ell n(x+a+3)=0$ has exactly one solution for x, then possible integral value of a is :
(A) –3 (B) –1 (C) 0 (D) 2

Q.34 If $x\in\left(0,\frac{\pi}{2}\right)$ and $\sin x=\frac{3}{\sqrt{10}}$; Let $k=\log_{10}\sin x=\log_{10}\cos x+2\log_{10}\cot x+\log_{10}\tan x$. Then the value of k satisfies
(A) $k=0$ (B) $k+1=0$ (C) $k-1=0$ (D) $k^2-1=0$

Q.35 If $a<0$, then the value of x satisfying $x^2-2a|x-a|-3a^2=0$ is/are
(A) $a(1-\sqrt{2})$ (B) $a(1+\sqrt{2})$ (C) $a(-1-\sqrt{6})$ (D) $a(-1+\sqrt{6})$

Q.36 If $\log_2(3^{2x-2}+7)=2+\log_2(3^{x-1}+1)$ then x equals
(A) 0 (B) 1 (C) 2 (D) None of these

Passage Based Questions

Passage # 1 (Q. 37 & 38)

Given a right triangle ABC right angled at C and whose legs are given $1+4\log_{p^2}(2p)$, $1+2^{\log_2(\log_2 p)}$ and hypotenuse is given to be $1+\log_2(4p)$. The area of ΔABC and circle circumscribing it are Δ_1 and Δ_2 respectively, then

Q.37 $\Delta_1+\frac{4\Delta_2}{\pi}$ is equal to
(A) 31 (B) 28 (C) $3+\frac{1}{\sqrt{2}}$ (D) 199

Q.38 The value of $\sin\left(\frac{\pi(25p^2\Delta_1+2)}{6}\right)=$
(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{\sqrt{3}}{2}$ (D) 1

Passage # 2 (Q. 39 & 40)

If $\log_{10}|x^3+y^3|-\log_{10}|x^2-xy+y^2|+\log_{10}|x^3-y^3|-\log_{10}|x^2+xy+y^2|=\log_{10}221$, where x, y are integers, then

Q.39 If x = 111, then y can be
(A) ± 111 (B) ± 2 (C) ± 110 (D) ± 109

Q.40 If y = 2, then value of x can be
(A) ± 111 (B) ± 15 (C) ± 2 (D) ± 110

Column Matching Type Questions

Q.41 Match the following List-I with List-II. (Where [.] denotes the greatest integer function)

	List-I	List-II
(P)	If $\log_4 x=\log_6 y=\log_6(x+y)$ then $\left[\frac{4y}{x}\right]$ is equal to	(1) 3
(Q)	If $a=\log_{245}175$ and $b=\log_{1715}875$ then $\left[\frac{1-ab}{a-b}\right]$ is equal to	(2) 4
(R)	If $\log_2 x+\log_x 2=\frac{10}{3}=\log_2 y+\log_y 2$ and $x\neq y$ then $\left[\frac{x+y}{2}\right]$ is equal to	(3) 5
(S)	If $3^a=4, 4^b=5, 5^c=6, 6^d=7, 7^e=8$ and $8^f=9$ then $\left[\frac{5abcdef}{3}\right]$ is equal to	(4) 6

Codes :

	P	Q	R	S
(A)	4	3	1	2
(B)	4	2	3	1
(C)	4	2	1	3
(D)	4	3	2	1

Numeric Response Type Questions

Q.42 The value $\left[\frac{1}{6}\left(\frac{3\log_{10}(1728)}{1+\frac{1}{2}\log_{10}(0.36)+\frac{1}{3}\log_{10}8}\right)^{1/2}\right]^{-1}$ is

Q.43 How many ordered pair(s) satisfy $\log\left(x^3+\frac{1}{3}y^3+\frac{1}{9}\right)=\log x+\log y$

Q.44 If $\log_{16}(\log_{\sqrt{3}}(\log_{\sqrt{5}}(x)))=\frac{1}{2}$; find x.

Q.45 Find the number of real values of x satisfying the equation $9^{2\log_9 x}+4x+3=0$

Q.46 If x, y, z ∈ (0, 1] such that $(\log x)(\log y)=\log(xy)$ and $2(\log x)(\log z)=\log(zx)$, then the value of $2x+3y+4z$ is equal to _____

Q.47 If sum of maximum and minimum value of $y=\log_2(x^4+x^2+1)-\log_2(x^4+x^3+2x^2+x+1)$ can be expressed in form $((\log_2 m)-n)$, where m and 2 are coprime then compute (m + n).

Q.48 If $1-\log_x 2+\log_{x^2}9-\log_{x^3}64<0$, then range of x is (a, b). Find the minimum value of (a + 9b).

ANSWER KEY

Single Correct Option type Questions

1. (C)	**2.** (C)	**3.** (A)	**4.** (B)	**5.** (C)	**6.** (B)	**7.** (A)
8. (B)	**9.** (C)	**10.** (D)	**11.** (A)	**12.** (A)	**13.** (D)	**14.** (D)
15. (C)	**16.** (D)	**17.** (A)	**18.** (D)	**19.** (D)	**20.** (D)	**21.** (B)
22. (D)	**23.** (C)	**24.** (A)	**25.** (B)	**26.** (C)	**27.** (B)	**28.** (A)
29. (B)	**30.** (A)	**31.** (C)				

Multiple Correct Option type Questions

32. (B,C)	**33.** (B,C,D)	**34.** (B,D)	**35.** (A,D)	**36.** (A,C)

Passage Based Questions

37. (A)	**38.** (C)	**39.** (C)	**40.** (B)

Column Matching Type Questions

41. (D)

Numeric Response Type Questions

42. 2	**43.** 1	**44.** 5	**45.** 0	**46.** 9	**47.** 5	**48.** 25