LOGARITHMS

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CONCEPT

1. $\log_a(xy) = \log_a x + \log_a y$

2. $\log_a\left(\dfrac{x}{y}\right) = \log_a x - \log_a y$

3. $\log_x x = 1$

4. $\log_a 1 = 0$

5. $\log_a(x^n) = n(\log_a x)$

6. $\log_a x = \dfrac{1}{\log_x a}$

7. $\log_a x = \dfrac{\log_b x}{\log_b a} = \dfrac{\log x}{\log a}$

If $a^x = N$,

Then, $\log_a N = x$

- **Logarithms are defined only for positive numbers.**
- **Logarithms are not defined for zero or negative numbers.**
- **Characteristic:** The internal part of the logarithm.
- **Mantissa:** The decimal part of the logarithm.

12.3456

- **Natural log:** Base "e".
- **Common log:** Base "10".

i. $a^m \times a^n = a^{m+n}$

ii. $\dfrac{a^m}{a^n} = a^{m-n}$

iii. $(a^m)^n = a^{mn}$

iv. $(ab)^n = a^n b^n$

v. $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$

vi. $a^0 = 1$

1. $\log_x y = 100$ and $\log_x 2 = 10$, then the value of y is

A. 2^10   B. 2^1000   C. 2^100   D. 2^10000

$$x^{100} = y$$

$$\left(x^{10}\right)^{10} = \left(2\right)^{10}$$

$$= x^{100} = 2^{10} = y$$

2. What is the value of $\log(ab^2) - \log(ac) + \log(abc^4) - 3\log(bc)$?

A. log (ab)   B. log c   C. log b   D. log a ✓

$$\log\left[\frac{ab^2 \times abc^4}{ac \times b^3c^3}\right]$$

$$\log a$$

3. The value of log 9/8 – log 27/32 + log 3/4 is ?

A. 0   B. 1   C. 2   D. 3

$$\log \left[\frac{9 \times 32 \times 3}{8 \times 27 \times 4} \right]$$

$$\log 1 = \underline{\underline{0}}$$

4. The simplified form of log(75/16) - 2 log(5/9) + log(32/243) is?

A. 2 log 2   B. log 2 ✓   C. log 3   D. log 5

$$\log\left[\frac{75 \times 9^2 \times 32}{16 \times 5^2 \times 243}\right]$$

$$\underline{\underline{\log 2}}$$

5. Find the value of log (a² / bc) + log (b² / ac) + log (c² / ab)?
A. 0   B. 1   C. abc   D. ab²c²

$$\log \left[\frac{a^2 \times b^2 \times c^2}{bc \times ac \times ab} \right]$$

$$\log 1 = 0$$

6. The equation $\log_a (x) + \log_a (1+x) = 0$ can be written as?

A. $x^2 + x + 1 = 0$ B. $x^2 + x - 1 = 0$

C. $x^2 - x - 1 = 0$ D. $x^2 - x + 1 = 0$

$$\log_a x + \log_a^{1+x} = \log_a 1$$

$$\log_a \left[x(1+x) \right] = \log_a 1$$

$$x + x^2 = 1$$

$$x^2 + x - 1 = 0$$

7. $\log_{10}(10) + \log_{10}(100) + \log_{10}(1000) + \log_{10}(10000) + \log_{10}(100000)$ is equal to?

A. 15   B. 12   C. 16   D. $14 \log_{10}(100)$

$1 + 2 + 3 + 4 + 5$

$= 15$

8. The value of $\log_2 (1/64)$ is?

A. 6　　　　　　　　B. − 6　　　　　　C. 7　　　　　　　D. None of these

$$2^6 = 64$$

$$2^{-6} = \frac{1}{64}$$

9. If log 125 / log 5 = x, then x is equal to?

A. 2   B. 3   C. 4   D. 1 / 2

$$\frac{\log 5^3}{\log 5} = \frac{3 \log 5}{\log 5}$$

$$= 3$$

10. If $\log_x (0.1) = -1/3$, then the value of x is -

A. 10   B. 100   ✓ C. 1000   D. 1/1000

$$x^{-1/3} = \frac{1}{10}$$

$$x^{1/3} = 10$$

$$\left(x^{1/3}\right)^3 = 10^3$$

$$x = \underline{\underline{1000}}$$

11. If $\log_8 x + \log_8 (1/6) = 1/3$ then, the value of x will be:

A. 12   B. 16   C. 18   D. 24

$$\log_8 \frac{x}{6} = \frac{1}{3}$$

$$8^{1/3} = \frac{x}{6} = \sqrt[3]{8} = 2$$

$$x = 2 \times 6$$

$$= 12$$

12. If log {(a+b)/3} = 0.5 (log a + log b), then the correct relation between a and b will be:

A. $a^2+b^2 = 7ab$

B. $a^2-b^2 = 7ab$

B. C. $(a+b)^2 = 2$

D. $(a+b)/3 = (1/2)(a+b)$

$$\log\left[\frac{(a+b)}{3}\right] = \log(ab)^{0.5}$$

$$\frac{a+b}{3} = (ab)^{1/2}$$

$$\frac{(a+b)^2}{3^2} = ab$$

$$a^2 + b^2 + 2ab = 9ab$$

$$a^2 + b^2 = 9ab - 2ab$$

$$a^2 + b^2 = 7ab$$

13. If log x = log 3 + 2 log 2 - (3/4) log 16. The value of x will be:

A. 1/2   B. 1   C. 3/2 ✓   D. 2

$$= \log \left[\frac{3 \times 2^2}{16^{3/4}} \right]$$

$$= \log \left[\frac{3 \times 4}{2^{4 \times 3/4}} \right]$$

$$= \log \left[\frac{3 \times 4}{8_2} \right]$$

14. It is given that $\log_{64} x = 2/6$, then, the value of x will be?

A. 2   B. 4   C. 6   D. 8

15. What will be the value of $\log_3 (1/9) + \log_9 81$?

A. 2   B. -2   C. 0   D. 4

ANSWER KEY - LOGARITHMS

QUESTION	ANSWER	QUESTION	ANSWER	QUESTION	ANSWER
1	A	6	B	11	A
2	D	7	A	12	A
3	A	8	B	13	C
4	B	9	B	14	B
5	A	10	C	15	C