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VIRTUAL COACHING CLASSES
ORGANISED BY BOS (ACADEMIC), ICAI

FOUNDATION LEVEL PAPER 3:
BUSINESS MATHEMATICS LOGICAL REASONING AND STATISTICS

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LOGARITHMS

If a^x = n where n > 0 and a > 0 and a ≠ 1, then

'x' is said to be logarithm of the number 'n' to the base 'a'

x = $\log_a n$

i.e. a^x = n and x = $\log_a n$ are transformations of each other.

Logarithm which use 10 as base are called as **Common** logarithm. Written as $\log_{10} m$ = log m

Logarithm which use 'e' as base are called as **Natural** logarithm. Written as $\log_e m$ = ln m

LOGARITHMS

IMPORTANT

i) $\log_a a = 1$

ii) $\log_a 1 = 0$

iii) $\log_a b \times \log_b a = 1$

iv) $\log_b a \times \log_c b = \log_c a$

v) $\log_b a = 1/\log_a b$

vi) $\log_b a = \log a / \log b$ (Base is 10)

LAWS OF LOGARITHM

- i) $\log_a mn = \log_a m + \log_a n$
- Ii) $\log_a(\frac{m}{n}) = \log_a m - \log_a n$
- iii) $\log_a m^n = n \log_a m$
- iv) Change of base $\log_b m = \frac{\log_a m}{\log_a b}$
- v) Inverse logarithm property $a^{\log_a x} = x$

LOGARITHMS

- **IMPORTANT**
- We **cannot** find logarithms of negative numbers or zero.
- There is no rule for finding $\log_a(x \pm y)$. It cannot be simplified.
- Log 20 = $\log_{10} 20$ = 1.3010 → MANTISSA

CHARACTERISTIC

Characteristic is one less than no. of digits to the left of decimal and one more than the no. of zeroes to the immediate right of decimal with proper sign.

$\log_{10} 2 = 0.3010$, $\log_{10} 200 = 2.3010$,

$\log_{10} 0.002 = \bar{3}.3010 = -2.699 = -2.70$

LOGARITHMS

1. If $\log_a \sqrt{2} = \frac{1}{6}$, find the value of a.

2. Find the logarithm of 5832 to the base $3\sqrt{2}$.

Illustration II: 1(a) Find the logarithm of 1728 to the base $2\sqrt{3}$.

1(b) Solve $\frac{1}{2}\log_{10} 25 - 2\log_{10} 3 + \log_{10} 18$

Example 2: Prove that $\frac{\log_3 8}{\log_9 16 \log_4 10} = 3\log_{10} 2$

LOGARITHMS

Example 1: Find the value of log 5 if log 2 is equal to .3010.

Example 1: Find the logarithm of 64 to the base $2\sqrt{2}$

Example 2: If $\log_a bc = x$, $\log_b ca = y$, $\log_c ab = z$, prove that

$$\frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}=1$$

Example 3: If $a=\log_{24}12$, $b=\log_{36}24$, and $c=\log_{48}36$ then prove that

$1+abc = 2bc$

LOGARITHMS

2. $\log_2 8$ is equal to
   (a) 2 (b) 8 (c) 3 (d) none of these

3. log 32/4 is equal to
   (a) log 32/log 4 (b) log 32 – log 4 (c) 2^3 (d) none of these

4. log (1 × 2 × 3) is equal to
   (a) log 1 + log 2 + log 3 (b) log 3 (c) log 2 (d) none of these

5. The value of log 0.0001 to the base 0.1 is
   (a) –4 (b) 4 (c) 1/4 (d) none of these

LOGARITHMS

6. If $2 \log x = 4 \log 3$, the x is equal to
   (a) 3 (b) 9 (c) 2 (d) none of these

7. $\log_{\sqrt{2}} 64$ is equal to
   (a) 12 (b) 6 (c) 1 (d) none of these

8. $\log_{2\sqrt{3}} 1728$ is equal to
   (a) $2\sqrt{3}$ (b) 2 (c) 6 (d) none of these

9. log (1/81) to the base 9 is equal to
   (a) 2 (b) ½ (c) –2 (d) none of these

LOGARITHMS

12. The value of $\log_2 \log_2 \log_2 16$

(a) 0 (b) 2 (c) 1 (d) none of these

13. The value of log $\frac{1}{3}$ to the base 9 is

(a) – ½ (b) ½ (c) 1 (d) none of these

14. If log x + log y = log (x+y), y can be expressed as

(a) x–1 (b) x (c) x/x–1 (d) none of these

15. The value of $\log_2 [\log_2 \{\log_3 (\log_3 27^3)\}]$ is equal to

(a) 1 (b) 2 (c) 0 (d) none of these

LOGARITHMS

16. If $\log_2 x + \log_4 x + \log_{16} x = 21/4$, these x is equal to
 (a) 8 (b) 4 (c) 16 (d) none of these

17. Given that $\log_{10} 2 = x$ and $\log_{10} 3 = y$, the value of $\log_{10} 60$ is expressed as
 (a) $x - y + 1$ (b) $x + y + 1$ (c) $x - y - 1$ (d) none of these

18. Given that $\log_{10} 2 = x$, $\log_{10} 3 = y$, then $\log_{10} 1.2$ is expressed in terms of x and y as
 (a) $x + 2y - 1$ (b) $x + y - 1$ (c) $2x + y - 1$ (d) none of these

19. Given that $\log x = m + n$ and $\log y = m - n$, the value of $\log 10x/y^2$ is expressed in terms of m and n as
 (a) $1 - m + 3n$ (b) $m - 1 + 3n$ (c) $m + 3n + 1$ (d) none of these

61. log (1 + 2 + 3) is exactly equal to

(a) log 1 + log 2 + log 3 (b) log(1×2×3) (c) Both the above (d) None

62. The logarithm of 21952 to the base of $2\sqrt{7}$ and 19683 to the base of $3\sqrt{3}$ are

(a) Equal (b) Not equal (c) Have a difference of 2269 (d) None

63. The value of is $4\log\frac{8}{25} - 3\log\frac{16}{125} - \log 5$ is

(a) 0 (b) 1 (c) 2 (d) –1

64. $a^{\log b - \log c} \times b^{\log c - \log a} \times c^{\log a - \log b}$ has a value of

(a) 1 (b) 0 (c) –1 (d) None

LOGARITHMS-AQB

65. $\frac{1}{\log_{ab}(abc)} + \frac{1}{\log_{bc}(abc)} + \frac{1}{\log_{ca}(abc)}$ is equal to

(a) 0 (b) 1 (c) 2 (d) –1

66. $\frac{1}{1+\log_a(bc)} + \frac{1}{1+\log_b(ca)} + \frac{1}{1+\log_c(ab)}$ is equal to

(a) 0 (b) 1 (c) 3 (d) –1

67. $\frac{1}{\log_{a/b}(x)} + \frac{1}{\log_{b/c}(x)} + \frac{1}{\log_{c/a}(x)}$ is equal to

(a) 0 (b) 1 (c) 3 (d) –1

68. $\log_b(a).\log_c(b).\log_a(c)$ is equal to

(a) 0 (b) 1 (c) –1 (d) None

69. $\log_b\left(a^{\frac{1}{2}}\right).\log_c(b^3).\log_a(c^{\frac{2}{3}})$ is equal to

(a) 0 (b) 1 (c) –1 (d) None

74. $\log(a^9) + \log a = 10$ if the value of *a* is given by

(a) 0 (b) 10 (c) –1 (d) None

75. If $\frac{\log a}{y\text{-}z} = \frac{\log b}{z\text{-}x} = \frac{\log c}{x\text{-}y}$ the value of *abc* is

(a) 0 (b) 1 (c) –1 (d) None

85. $\frac{1}{a^{\log_b a}}$ has a value of

(a) a (b) b (b) b (c) (a + b) (d) None

86. The value of the following expression $a^{\log_a b.\log_b c.\log_c d.\log_d t}$ is given by

(a) t (b) abcdt (c) (a + b +c + d + t) (d) None

87. For any three consecutive integers *x y z* the equation $\log(1+xz) - 2\log y = 0$ is

(a) True (b) False (c) Sometimes true

(d) cannot be determined in the cases of variables with cyclic order.

THANK YOU