

DIGITAL PAPER SOLUTION

BASIC MATHAMETICS (3300001)

FOR DIPLOMA ENGINEERING STUDENTS, SEM-I

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- ⇒ **12 NOs of Papers from June 2013 to January 2019.**
- ⇒ **Chapter wise Paper Solution.**
- ⇒ **For simplify your learning, All Topics are linked with Videos.**
- ⇒ **Guideline for How to do preparation of chapter wise learning.**

UNIT-1

LOGARITHMS

(લઘુગણિત)



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How to Prepare Unit 1

LOGARITHMS

(લઘુગણિત)

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LOGARITHM (લઘુગણિત)

* Important Equations (અગત્યના સૂત્રો) :

1. $y = a^x \Rightarrow x = \log_a y$

\nearrow ઇન્ડેક્સ (Index)
 \searrow આધાર (base)

(Exponential Function) (Logarithm Function)
(ઘાતીય વિધેય) (લઘુગણિત વિધેય)

Where, $y \in \mathbb{R}^+$, $x \in \mathbb{R}$, $a \in \mathbb{R}^+ - \{1\}$

2. $\log_a xy = \log_a x + \log_a y$

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3. $\log_a \left(\frac{x}{y}\right) = \log_a x - \log_a y$

4. $\log_a x^n = n \log_a x$

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5. $\log_y x = \frac{\log_a x}{\log_a y}$ ($a \neq 1$)

[Law of change of base (આધાર પરિવર્તન નો નિયમ)]

6. $a^{\log_a y} = y$, $a \in \mathbb{R}^+ - \{1\}$

7. $\log_a a = 1$

8. $\log_a 1 = 0$ ($a \neq 1$)

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MCQs

1. $\log_a a = \underline{1}$

2. $\log x^4 = \underline{4 \log x}$

3. $\log_2 8$
 $= \log_2 2^3$
 $= 3 \log_2 2$ ($\because \log x^n = n \log x$)
 $= 3 \times 1$ ($\because \log_a a = 1$)
 $= \underline{3}$ Ans.

4. $\log_5 125$
 $= \log_5 5^3$
 $= 3 \log_5 5$
 $= 3 \times 1$
 $= \underline{3}$ Ans.

5. $\log_a \left(\frac{1}{a}\right)$
 $= \log_a a^{-1}$
 $= (-1) \log_a a$
 $= (-1) \times 1$
 $= \underline{-1}$ Ans.

6. $\log_2 \left(\frac{1}{8}\right)$
 $= \log_2 \left(\frac{1}{2^3}\right)$
 $= \log_2 2^{-3}$
 $= (-3) \log_2 2$
 $= (-3) \times 1$
 $= \underline{-3}$ Ans.

7. $\log_3 (\log_3 27)$
 $= \log_3 (\log_3 3^3)$
 $= \log_3 (3 \log_3 3)$
 $= \log_3 (3 \times 1)$
 $= \log_3 3$
 $= \underline{1}$ Ans.

8. $a^{\log_a b} = \underline{b}$

9. $3^{\log_3 1} = \underline{1}$

10. $4^{\log_4 2} = \underline{2}$
($\because a^{\log_a y} = y$)

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$$\begin{aligned}
 \underline{11.} \quad & 9^{\log_3 2} \\
 &= 3^{2 \log_3 2} \\
 &= 3^{\log_3 2^2} \\
 &= 3^{\log_3 4} \\
 &= \textcircled{4} \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \underline{12.} \quad & 1024^{\log_2 m} \\
 &= 2^{10 \log_2 m} \\
 &= 2^{\log_2 m^{10}} \\
 &= \textcircled{m^{10}} \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \underline{13.} \quad & 16^{-\log_{16} \left(\frac{1}{5}\right)} \\
 &= 16^{\log_{16} \left(\frac{1}{5}\right)^{-1}} \\
 &= \left(\frac{1}{5}\right)^{-1} \\
 &= \textcircled{5} \text{ Ans.}
 \end{aligned}$$

$$\underline{14.} \quad \log m - \log n = \log \left(\frac{m}{n}\right)$$

$$\begin{aligned}
 \underline{15.} \quad & \log_5 625 + \log_5 \sqrt{5} \\
 &= \log_5 5^4 + \log_5 5^{\frac{1}{2}} \\
 &= 4(\log_5 5) + \frac{1}{2}(\log_5 5) \\
 &= (4 \times 1) + \left(\frac{1}{2} \times 1\right) \\
 &= 4 + \frac{1}{2} \\
 &= \frac{8+1}{2} \\
 &= \textcircled{\frac{9}{2}} \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \underline{16.} \quad & \log_3 27 + \log_3 9 \\
 &= \log_3 3^3 + \log_3 3^2 \\
 &= 3(\log_3 3) + 2(\log_3 3) \\
 &= (3 \times 1) + (2 \times 1) \\
 &= 3 + 2 \\
 &= \textcircled{5} \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \underline{17.} \quad & \log(\tan \theta) + \log(\cot \theta) \\
 &= \log(\tan \theta \cdot \cot \theta) \\
 &= \log 1 \quad (\because \tan \theta \cdot \cot \theta = 1) \\
 &= \textcircled{0} \text{ Ans.}
 \end{aligned}$$

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$$\underline{18.} \log\left(\frac{a}{b}\right) + \log\left(\frac{b}{a}\right) = \log(a+b)$$

$$\therefore \log\left(\frac{a}{b} \times \frac{b}{a}\right) = \log(a+b)$$

$$\therefore \log 1 = \log(a+b)$$

$$\therefore 0 = \log_e(a+b)$$

$$\therefore a+b = e^0$$

$$\therefore \boxed{a+b=1} \text{ Ans.}$$

નોંધ : જ્યારે \log માં base ન આપેલ હોય ત્યારે base તરીકે e લેવું.

$$\underline{19.} \log 81 \div \log 27$$

$$= \frac{\log 81}{\log 27}$$

$$= \frac{\log 3^4}{\log 3^3}$$

$$= \frac{4 \log 3}{3 \log 3}$$

$$= \left(\frac{4}{3}\right) \text{ Ans.}$$

$$\underline{20.} \log 27 \div \log 9$$

$$= \frac{\log 27}{\log 9}$$

$$= \frac{\log 3^3}{\log 3^2}$$

$$= \frac{3 \log 3}{2 \log 3}$$

$$= \left(\frac{3}{2}\right) \text{ Ans.}$$

$$\underline{21.} \log_b a \times \log_a b$$

$$= \frac{\log a}{\log b} \times \frac{\log b}{\log a}$$

$$= \textcircled{1} \text{ Ans. } \left(\because \log_y x = \frac{\log_a x}{\log_a y}\right)$$

આધાર - પરિવર્તન નું સૂત્ર

$$\underline{22.} \log_3 2 \times \log_2 3$$

$$= \frac{\log 2}{\log 3} \times \frac{\log 3}{\log 2}$$

$$= \textcircled{1} \text{ Ans.}$$

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23. $\log_4 \left(\frac{1}{2} \right)$

$$= \frac{\log \frac{1}{2}}{\log 4}$$

$$= \frac{\log 2^{-1}}{\log 2^2}$$

$$= \frac{(-1) \log 2}{2 \log 2}$$

$$= \left(-\frac{1}{2} \right) \text{ Ans.}$$

24. $\log_3 (\log_8 2)$

$$= \log_3 \left(\frac{\log 2}{\log 8} \right) \quad (\because \text{आधार-परिवर्तन})$$

$$= \log_3 \left(\frac{\log 2}{\log 2^3} \right)$$

$$= \log_3 \left(\frac{\log 2}{3 \log 2} \right)$$

$$= \log_3 \left(\frac{1}{3} \right)$$

$$= \log_3 3^{-1} \quad (\because \log x^n = n \log x)$$

$$= (-1) \log_3 3 \quad (\because \log_a a = 1)$$

$$= -1 \times 1$$

$$= \boxed{-1} \text{ Ans.}$$

25. If $\log_2 x = 5$, Find x .

$$\Rightarrow \log_2 x = 5$$

$$\therefore 2^5 = x$$

$$\therefore \boxed{x = 32} \text{ Ans.}$$

26. If $\log_a 32 = 5$, Find a .

$$\Rightarrow \log_a 32 = 5$$

$$\therefore a^5 = 32$$

$$\therefore a^5 = 2^5$$

$$\therefore \boxed{a = 2} \text{ Ans.}$$

27. If $\log_7 x = 1$, Find x .

$$\Rightarrow \log_7 x = 1$$

$$\therefore 7^1 = x$$

$$\therefore \boxed{x = 7} \text{ Ans.}$$

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28. If $\log_x \left(\frac{9}{16}\right) = -2$,

Find x .

$$\Rightarrow \log_x \left(\frac{9}{16}\right) = -2$$

$$\therefore x^{-2} = \frac{9}{16}$$

$$\therefore x^2 = \frac{16}{9}$$

$$\therefore \boxed{x = \frac{4}{3}} \text{ Ans.}$$

29. If $\sqrt{\log_2 x} = 3$, Find x .

$$\Rightarrow \sqrt{\log_2 x} = 3$$

Both side square

$$\therefore \log_2 x = (3)^2$$

$$\therefore \log_2 x = 9$$

$$\therefore 2^9 = x$$

$$\therefore \boxed{x = 512} \text{ Ans.}$$

30. The Logarithmic

form of (सहस्रानुपात)

संख्या) $3^4 = 81$.

$$\Rightarrow 3^4 = 81$$

$$\therefore \boxed{\log_3 81 = 4} \text{ Ans.}$$

$$(\because y = a^x \Rightarrow x = \log_a y)$$

31. If $a^x = b^y$, then

Find $\frac{x}{y} = ?$

$$\Rightarrow a^x = a^y$$

Both side Taking Log

$$\therefore \log a^x = \log b^y$$

$$\therefore x \log a = y \log b$$

$$\therefore \boxed{\frac{x}{y} = \frac{\log b}{\log a}} \text{ Ans.}$$