



| KGS



Logarithm (\log)

ମୂଳାଣକ

ର୍ଵୀଜିତ → ଜୀନ ନେପିଆ

By: P.K Sir

$$a^x = b$$

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

$$x \log a = \log b$$

$$x = \frac{\log b}{\log a} = \log_b a$$

$$x = \log_b a$$

$$\log m^n = n \log m$$

$$\begin{array}{l} a^x = b \\ \log_a b = x \end{array}$$

$$\begin{array}{l} b > 0 \\ a > 0 \end{array}$$

$$a^x = b$$

$$\log_a b = x$$

$$\log_a b = x$$

$$a^x = b$$

$$\log_2 16 = x$$

$$2^x = 16$$

log Anti log

$$2^x = 2^4$$

x = 4

$$\log_2 16 = \log_2 2^4$$

$$= 4 \log_2 2 = 4 \times 1$$

$$= 4$$

$$\boxed{\log_a a = 1}$$

$$\sqrt{2} = 2^{\frac{1}{2}}$$

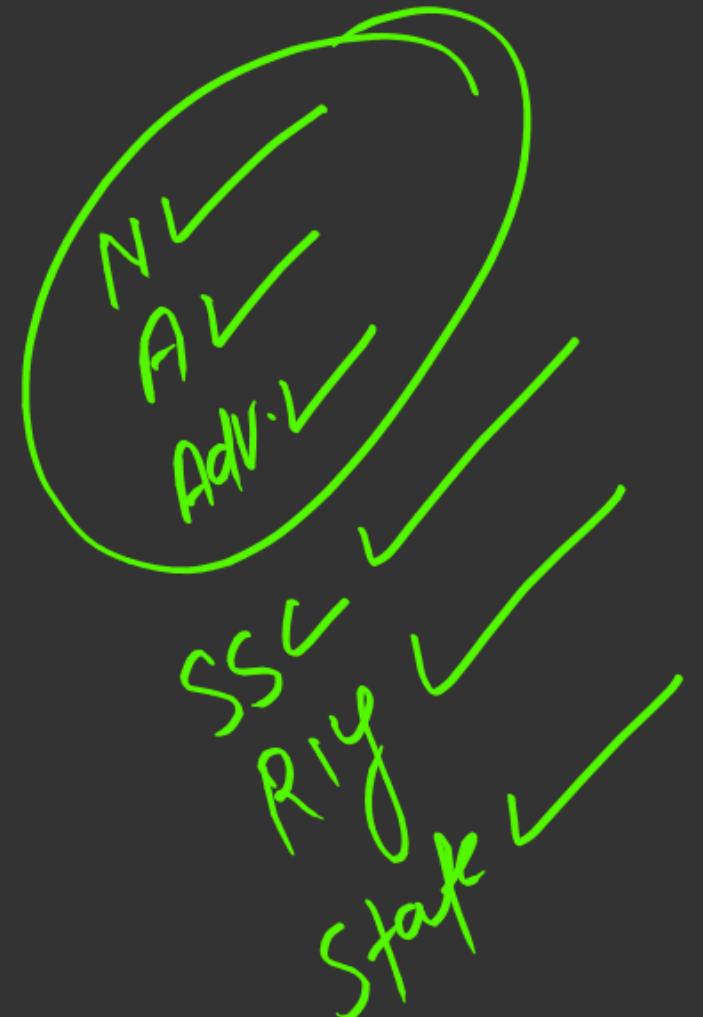
$$\log_{\sqrt{2}} 32 = x$$

$$(\sqrt{2})^x = 32$$

$$\sqrt[2]{2}^x = 2^5$$

$$\frac{x}{2} = 5$$

$$x = 10$$



$$\log_{\sqrt{5}} 125 = x$$

$$(\sqrt{5})^x = 125$$

$$5^{\frac{x}{2}} = 5^3$$

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

$$x = 6$$

Formulae

✓ (i)

$$\log(m \times n) = \log m + \log n$$

(ii) $\log\left(\frac{m}{n}\right) = \log m - \log n$

(iii) $\log a^b = b \log a \Rightarrow \boxed{\log m^n = n \log m}$

(iv) $\log_x y^{a^b} = \frac{b}{y} \log_x a \Rightarrow \log_{x^b} y = \frac{b}{y} \log_x a$

(v) $\log a^b = \frac{\log b}{\log a} \Rightarrow \log_a b = \frac{\log b}{\log a}$

(vi) $\log a^b = \frac{1}{\log_b^a} \Rightarrow \log_a b = \frac{1}{\log_b^a}$

(vii) $\log x^a = N \Rightarrow \log_a x = N$

(viii) $x^N = a$

$\boxed{\log x^a = N}$

(ix) $\log a^a = 1$

(x) $\log a^1 = 0 \Rightarrow \log_a 1 = 0$

(xi) $\log_1^1 = \text{Undifine (अपरिभाषित)}$

$\log_1^1 = N.D$

By: P.K Sir

$$\log b = \log_{10} b$$

$$\log_a a = 1$$

① $\log 10 \Rightarrow \log_{10} 10 = 1$

② $\log 100 \Rightarrow \log_{10} 100 = \log_{10} 10^2 = 2 \log_{10} 10 = 2 \times 1 = 2$

③ $\log 1000 \Rightarrow \log_{10} 1000 = \log_{10} 10^3 = 3 \log_{10} 10 = 3 \times 1 = 3$

④ $\log_{10} 10000 \Rightarrow 4$

⑤ $\log_{10} 100000 \Rightarrow 5$

(Exercise) अभ्यास

1. $\log 16 - \log 2 = ?$

- ~~(a)~~ 3 $\log 2$
(c) $\log 3$

- (b) 2 $\log 3$
(d) $\log 3 \times 2$

$$\log \frac{m}{n} = \log m - \log n$$

$$\log 16 - \log 2 = \log \frac{16}{2} = \log 8 = \log 2^3 = 3\log 2$$

(Exercise) अभ्यास

2. $\log 8 + \cancel{2\log 2} - \log 32 + \log 5 = ?$

$\log_2^2 = \log 4$

(a) $\log 2$

(c) $\log 2^5$

(b) $\log 5$

(d) $\log 2$

i) $\log(m \times n) = \log m + \log n$

ii) $\log\left(\frac{m}{n}\right) = \log m - \log n$

$\log 8 + \log 4 - \log 32 + \log 5$

$\log [8 \times 4 \div 32 \times 5]$

$\log 5$

(Exercise) अभ्यास :

$$3. \quad \log_5 125 - \log_2 8 = ?$$

- ~~(a)~~ 0 (b) 2
(c) 3 (d) 4

$$\log_5 5^3 - \log_2 2^3$$

$$3 \log_5 -3 \log_2$$

$$3-3=0$$

(Exercise) अभ्यास

4. $\log \frac{x^2}{y^2} + \log \frac{y^2}{z^2} + \log \frac{z^2}{x^2} = ?$

$\log 1 = 0$

- (a) 1
- (b) 0
- (c) 2
- (d) 3

$$\log \left[\frac{x^2}{y^2} \times \frac{y^2}{z^2} \times \frac{z^2}{x^2} \right]$$

$\log 1 = 0$

(Exercise) अभ्यास

5. $\log \frac{2}{3} + \log \frac{6}{7} - \log \frac{4}{7} = ?$

- (a) 1
(c) 2

- (b) 0
(d) 3

$$\log \left[\frac{2}{3} \times \frac{6}{7} \div \frac{4}{7} \right]$$

$$\log \left[\cancel{\frac{2}{3}} \times \cancel{\frac{6}{7}} \times \cancel{\frac{7}{4}} \right] = \log 1 = 0$$

(Exercise) अभ्यास

6. $\log 3^{x-2} = \log 81$ तो $x = ?$

- (a) 5
- (c) 4

$$\log 3^4 = 4 \log 3$$

- (b) 6
- (d) 0

$$\begin{array}{r} 3 \\ | \\ 81 \\ - 27 \\ \hline 3 \\ | \\ 27 \\ - 27 \\ \hline 0 \end{array}$$

$$81 = 3^4$$

$$\log m^n = n \log m$$

~~$$(x-2) \log 3_{10} = 4 \log 3_{10}$$~~

$$x-2 = 4$$

$$x = 6$$

(Exercise) अभ्यास

7.

$$2\log\left(\frac{11}{13}\right) + 2\log\left(\frac{130}{33}\right) - \log\left(\frac{4}{9}\right)$$

(a) $2\log 2$

(b) 2.4431

(c) $\log \frac{25}{11}$

~~(d) $2\log 5$~~

$$\log \frac{121}{169} + \log \frac{16900}{1089} - \log \frac{4}{9}$$

$$\begin{aligned} & \log \left[\frac{121}{169} \times \frac{16900}{1089} \div \frac{4}{9} \right] \\ & \log \left[\frac{121}{169} \times \frac{16900}{1089} \times \frac{9}{4} \right] \\ & \log_{25} = \log_5^2 \\ & = 2 \log 5 \end{aligned}$$

(Exercise) अभ्यास

8. यदि $\log_3 x = -2$, हो तो x का मान है—

(a) -9

(c) -8

(b) -6

(d) $\frac{1}{9}$

$$3^{-2} = x$$

$$\frac{1}{3^2} = x$$

$$\left(\frac{1}{9}\right) = x$$

(Exercise) अभ्यास

9.

$$\frac{1}{2} \log_{10} 25 - 2 \log_{10} 3 + \log_{10} 18$$

$$\log_{10} 25^{\frac{1}{2}} = \log 5$$

(a) 18

(c) $\log 10^3$

(b) 1

(d) None

$$25^{\frac{1}{2}} = \sqrt{25}$$

$$\log_{10} 5 - 2 \log_{10} 3 + \log_{10} 18$$

$$= \log_{10} \left[\frac{5}{9} \times 18 \right] = \log_{10} 10 = 1 \text{ Ans}$$

$$\log_a a = 1$$

(Exercise) अभ्यास

10. $[\log_{10} 50 + \log_{10} 40 + \log_{10} 20 + \log_{10}(2.5)] = ?$

(a) 3

(c) 5

(b) 4

(d) 10

$$\log_{10} [50 \times 40 \times 20 \times 2.5]$$

$\overbrace{50 \times 40 \times 20 \times 2.5}^{2000}$
 $\overbrace{2000}^{10000 \times 10}$

$$\log_{10} a = 1$$

$$\begin{aligned}
 \log_{10} 100000 &= \log_{10} 10^5 = 5 \log_{10} 10 \\
 &= 5 \times 1 \\
 &= 5
 \end{aligned}$$

(Exercise) अभ्यास

11. निम्नलिखित में से क्या असत्य होगा ?

(a) $\log_{100} 1 = 0$ ✓

(b) $\log_c c = 1$ ✓

(c) $\log \log_a 1 = 1$ ✗

(d) $\log_{10} 10 = 1$ ✓

① $\boxed{\log_a 1 = 0}$

\log

② $\log_a a = 1$

(Exercise) अभ्यास

12.

$$\left[1 + \frac{1}{2} \log_{10} 16 - 3 \log_{10} 2 \right]$$

↓
log₁₀ 10
log₁₀ 4

का मान होगा—

- (a) $\log_{10} 5$ (b) $\log_{10} 4$
- (c) $\log_{10} 2$ (d) 1

$$\log_{10} 10 + \log_{10} 4 - \log_{10} 8 = \log_{10} \left[\frac{10 \times 4}{8} \right] = \log_{10} 5$$

(Exercise) अभ्यास

13. $\log \frac{75}{16} - 2 \log \frac{5}{9} + \log \frac{32}{243}$ का मान होगा—

- (a) 0
(c) $\log 2$

- (b) 1
(d) -1

H.W | R.W

(Exercise) अभ्यास

14. यदि $\log(2+3+x) = \log 2 + \log 3 + \log x$ हो, तो x होगा—

- (a) 0
- (c) 10

- (b) 1
- (d) None

$$\cancel{\log(5+x)} = \cancel{\log[2 \times 3 \times x]}$$

$$5+x = 6x$$

$$5 = 5x$$

$$x = 1$$

(Exercise) अभ्यास :

15. यदि $3\log 2 + 2\log 3 + \log 5 = \log k$ हो, तो k का मान होगा—

$$\log 8 + \log 9 + \log 5 = \log K$$

$$\cancel{\log} [8 \times 9 \times 5] = \cancel{\log k}$$

$$360 = k$$

(Exercise) अभ्यास

16. $\frac{\log x}{\log a} = ?$ log_ax

$$\log_a x = \sqrt{\log a}$$

(a) $\log_x a$

(b) $\log_x x$

(c) x/a

(d) $x - a$

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

~~$$\log_a x$$~~

(Exercise) अभ्यास

17. यदि $\log \frac{a}{b} + \log \frac{b}{a} = \log(a+b)$ तो-

(a) $a = b$

(b) $a^2 + b^2 = 1$

~~(c) $a + b = 1$~~

(d) $a - b = 1$

$$\cancel{\log \left[\frac{a}{b} \times \frac{b}{a} \right] = \cancel{\log [a+b]}}$$

$$\cancel{\frac{a}{b} \times \frac{b}{a}} = a+b$$

$$1 = a+b$$

(Exercise) अभ्यास

18. $\log_b a \times \log_c b \times \log_a c = ?$

(a) 0

(b) 1

(c) abc

(d) 11abc

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

$$\frac{\log a}{\log b} \times \frac{\log b}{\log c} \times \frac{\log c}{\log a} = 1 \text{ Ans.}$$

(Exercise) अभ्यास

19. $\log_{10} 125 + \log_{10} 8 = x$ तो $x = ?$

- (a) 5
 - (b) 16
 - (c) 35
 - ~~(d) None~~

$$\log_{10} [125 \times 8] = \log_{10} 1000 = 3$$

$$\log_{10} 3^3 = 3 \log_{10} 10$$

$$= 3 \times 1$$

$$= 3 \text{ Ans}$$

(Exercise) अभ्यास

20. $\log_{12} 144 + \log_{13} 169 = ?$

(a) 4

(b) 6

(c) 8

(d) 4

2+2=4

(Exercise) अभ्यास

21. $\log_{10} \left(\frac{55}{46} \right) - \log_{10} \left(\frac{65}{69} \right) + \log_{10} \left(\frac{26}{33} \right) = ?$

~~(a) 0~~

~~(c) 3~~

(b) 1

(d) 3

$\log_{10} 1 = 0$

$$\log_{10} \left[\frac{\cancel{55}}{\cancel{46}} \times \frac{\cancel{69}}{\cancel{65}+3} \times \frac{\cancel{26}}{\cancel{33}} \right]$$

$$\log_{10} 1 = 0$$

(Exercise) अभ्यास

22. यदि $\log_4 x + \log_2 x = 6$, तो $x = ?$

(a) $2^{\frac{1}{2} \log_2 x + \log_2 x}$

(c) 8

(b) 4

(d) 16

$$\frac{1}{2} \log_2 x + 1 \log_2 x = 6$$

$$\left(\frac{3}{2}\right) \log_2 x = 6$$

$$\log_2 x = 6 \times \frac{2}{3}$$

$$\log_2 x = 4$$

$$2^4 = x$$

$$16 = x$$

$$\log_y x^a = \frac{a}{y} \log_y x$$

$$\log_2 x^1 = \frac{1}{2} \log_2 x$$

(Exercise) अभ्यास

23. $\log 5 + \log 20 + \log 24 + \log 25 - \log 600$?

- (a) 0
- (b) 1
- (c) 3
- (d) 4
- (e) 2 ✓

$$\log \left[\frac{5 \times 20 \times 24 \times 25}{600} \right]$$

~~$\log \frac{5 \times 20 \times 24 \times 25}{600}$~~

$\log_{10} 100 = 2$

(Exercise) अभ्यास

24. $\frac{\log 8 - \log 4}{\log 12 - \log 6} = ?$

(a) 0

(b) 1

(c) 3

(d) 4

$$\frac{\log \left[\frac{8}{4} \right]}{\log \left[\frac{12}{6} \right]} = \frac{\cancel{\log 2}}{\cancel{\log 2}} = 1$$

(Exercise) अभ्यास

25. $\log_{10} x + \log_{10} 5 = 2$ तो x का मान-

(a) $\frac{2}{5}$

(b) $\frac{5}{2}$

(c) 10

(d) ~~20~~

$$\log_{10} 5x = 2$$

$$10^2 = 5x$$

$$100 = 5x$$

$$x = 20$$

$$\log [x \times 5] = 2$$

$$\log_{10} 5x = 2$$

(Exercise) अभ्यास

26. $\log_{10} 100 + \log_{10} 1000$ का मान = ?

- ~~(a)~~ 5 $2+3=5$ (b) 10
(c) 8 (d) 4

(Exercise) अभ्यास

27. यदि $\log_{10}(x^2 - 6x + 45) = 2$ तो $x = ?$

- (a) 10, 5
- (b) 11, -5
- (c) 6, 9
- (d) 9, -5

$$10^2 = x^2 - 6x + 45$$

$$x^2 - 6x + 45 = 100$$

$$\boxed{x^2 - 6x - 55 = 0}$$

$$x^2 - 6x - 55 = 0$$

$$x^2 - 11x + 5x - 55 = 0$$

$$(x - 11)(x + 5) = 0$$

$$x = 11, -5$$

(Exercise) अभ्यास

28. यदि $\log_{10} 2 = 0.3010$, तो $\log_2 10$ है-

- (a) 3.3220
- (c) 0.3322

- (b) 5
- (d) 3.2320

$$\log_2 (2 \times 5)$$

$$\log_2 2 + \log_2 5$$

$$1 +$$

$$\boxed{\log_{10} 2 = 0.3010}$$

$$\log_a a = 1$$

(Exercise) अभ्यास

28. यदि $\log_{10} 2 = 0.3010$, तो $\log_2 10$ है-

- ~~(a) 3.3220
(c) 0.3322~~

~~(b) 5~~

- (d) 3.2320

$$\boxed{\log_{10} 2 = 0.3010}$$

$$\text{circled } \log_a a = 1$$

$$\log_a b = \frac{1}{\log_b a}$$

$$\log_2 10 = \frac{1}{\log_{10} 2} = \frac{1}{0.3010} = \frac{1000}{301}$$

$$= \frac{1000}{301} \\ \therefore 3.3$$

(Exercise) अभ्यास

29. $\log_2 64$ का मान किसके बराबर है ?

(a) 2

(b) 4

~~(c) 6~~

(d) 8

$$\begin{aligned} \log_2 64 &= x \\ 2^x &= 64 \\ 2^x &= 2^6 \\ x &= 6 \end{aligned}$$

(Exercise) अभ्यास

30. यदि $\log a + \log b = \log(a+b)$, तो $b = ?$

(a) $\frac{a}{a-1}$

(b) 0

(c) 1

(d) None

~~$\log[a \times b] = \log[a+b]$~~

$ab = a+b$

$ab - b = a$

$b(a-1) = a$

$b = \frac{a}{a-1}$

