MATHS

BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

LOGARITHM

Example

1. Find the logarithms of

(i) 1728 to the base $2\sqrt{3}$

(ii) 0.00001 to the base 0.01

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2. Show that

$\log_2 \log_2 \log_2 16 = 1$

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3. If logarithm of 5832 be 6 find the base

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4. If $3 + \log_{10} x = 2\log_{10} y$, then express x in terms of y.

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5. Prove that

$$7\log\left(\frac{10}{9}\right)+3\log\left(\frac{81}{80}\right)=2\log\left(\frac{25}{24}\right)+\log 2$$

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6. If $\log_{10} 2 = 0.30103, \log_{10} 3 = 0.47712$ and $\log_{10} 7 = 0.84510$ find the values of

$\log_{10} 45$

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7. If $\log_{10} 2 = 0.30103, \log_{10} 3 = 0.47712$ and $\log_{10} 7 = 0.84510$ find the values of

$\log_{10} 105$

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8. Prove that $\log_b a \times \log_c b \times \log_d c = \log_d a$

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9. Show that $\log_4 2 \times \log_2 3 = \log_4 5 \times \log_5 3$

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10. Show that $\log_2 10 - \log_8 125 = 1$

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11. If $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$ show that $x^x y^y z^z = 1$

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12. If $a^{2-x}.\, b^{5x} = a^{x+3}.\, b^{3x}$, show that $x \log\left(\frac{b}{a}\right) = \frac{1}{2}\log a$

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13. Show that $a^{\log_{a^2}^{x}} \times b^{\log_{b^2}^{y}} \times c^{\log_{c^2}^{z}} = \sqrt{xyz}$

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14. If $y = \frac{a^1}{1 - \log_{a^x}}\Bigg)$ and $z = \frac{a^1}{1 - \log_a y}$ show that $x = \frac{a^1}{1 - \log_{a^z}}$

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15. If x,y,z are in G.P prove that

$$\log_a^x + \log_a^z = \frac{2}{\log_y^a}, [x, y, a > 0]$$

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16. Solve :

(ii) $\log_x 2 \log_{\frac{x}{16}} 2 = \log_{\frac{x}{64}} 2.$

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17. Show that $\log_5 \sqrt{5\sqrt{5\sqrt{5...\infty}}} = 1$

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18. Show that the value of $\log_{10} 2$ lies between $\frac{1}{3}$ and $\frac{1}{4}$

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19. If $\log_{10} 2 = 0.30103$ find the value of $\log_5 32$

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20. If $\log_2 x + \log_4 x + \log_{16} x = \frac{21}{4}$ find the value of x

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21. If a,b,c are threee consecutive positive integers show that log (1+ac)=2logb

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22. If a,b,c are in A.P and x,y,z are in G.P prove that

$$(b-c)\log x+(c-a)\log y+(a-b)\log z=0$$

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23. Prove that $(yz)^{\frac{\log y}{z}}\times(zx)^{\frac{\log z}{x}}\times(xy)^{\frac{\log x}{y}}=1$

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24. Show that

$$\frac{1}{\log_a bc+1}+\frac{1}{\log_b ca+1}+\frac{1}{\log_c ab+1}=1$$

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25. If $a > 0, c > 0, b = \sqrt{ac}, a, c$ and $ac \neq 1, N > 0$ prove that $\frac{\log_a N}{\log_c N} = \frac{\log_a N - \log_b N}{\log_b N - \log_c N}$

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26. If $\log_l x, \log_m x$ and $\log_n x$ are in arithmetic progression show that , $\log n^2 = \log(\ln)\log_l m$

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27. If $\frac{r}{r_1} + \log_e\left(\frac{r_2}{r_1}\right) = 1$ and $r_2 = er$ then show that $\frac{r_1}{r}\log_e\left(\frac{r_1}{r}\right) = 1$

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28. If $\frac{\log a}{y+z} = \frac{\log b}{z+x} = \frac{\log c}{x+y}$ show that $\left(\frac{b}{c}\right)^x\left(\frac{c}{a}\right)^y\left(\frac{a}{b}\right)^z = 1$

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29. If a,b,c are in A.P and x,y,z are in G.P then prove that

$a^{(b-c)\log_a^x} \times b^{(c-a)\log_b^y} \times c^{(a-b)\log_c^z} = 1$

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30. Solve :

(i) $x^{\log_{10} x} = 100x.$

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31. Solve : $2\log_2 \log_2 x + \log_{\frac{1}{2}} \log_2 \left(2\sqrt{2x}\right) = 1$

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Multiple Choice Type Question

1. $\log_{\sqrt{7}}(49)=$

A. 1

B. 2

C. 3

D. 4

Answer: D

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2. $\log_3\left(\frac{1}{81}\right)=$

A. -1

B. -2

C. -3

D. -4

Answer: D

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3. $\log_4 2^{-8}$ =

A. -4

B. -3

C. -2

D. -1

Answer: A

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4. $\log_{25}\left(\frac{1}{125}\right)=$

A. $\frac{1}{2}$

B. $-\frac{1}{2}$

C. $\frac{3}{2}$

D. $-\frac{3}{2}$

Answer: D

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5. $\log_{\frac{1}{3}} 81 =$

A. 2

B. -2

C. 4

D. -4

Answer: D

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6. $\frac{\log_3}{\sqrt{2}} 32 =$

A. 3

B. 5

C. 15

D. 20

Answer: C

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7. If $\log_x \left(\frac{1}{3}\right) = -\frac{1}{3}$ then x=

A. 3

B. 9

C. 27

D. 81

Answer: C

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8. If $\log_{\sqrt{x}} 0.25 = 4$ then x=

A. 0.1

B. 0.5

C. 1.5

D. 2.5

Answer: B

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9. If $\log_x 243 = 10$ then which of the following is the value of x ?

A. 3

B. $\frac{1}{3}$

C. 9

D. $\sqrt{3}$

Answer: D

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10. If $\log_{10}(7x-5)=2$ then which of the following is the value of x ?

A. 10

B. 12

C. 15

D. 18

Answer: C

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11. If $\log_{\sqrt{7}}(343) = x$ then which of the following is the value of x

A. 3

B. 6

C. 9

D. 12

Answer: B

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12. If $\log_2 3 = a$ then which of the following is the value of $\log_8 27$?

A. 3a

B. $\frac{1}{a}$

C. 2a

D. a

Answer: D

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13. If $\log_{\sqrt{2}} x = a$ then which of the following is the value of $\log_{2\sqrt{2}} x$?

A. $\frac{a}{3}$

B. a

C. 2a

D. 3a

Answer: A

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14. State which of the following is the value of $\log_{0.008}\sqrt{5}$?

A. $-\frac{1}{6}$

B. $-\frac{1}{3}$

C. $-\frac{1}{2}$

D. $-\frac{1}{8}$

Answer: A

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Very Short Answer Type Question

1. If $\log_e 2.\ \log_x 25 = \log_{10} 16.\ \log_e 10$ find the value of

x

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2. Find the values

$\log_{2\sqrt{3}} 1728$

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3. Find the values

$\log_{3\sqrt{7}} 2401$

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4. Find the base when 3 is the logarithm of 343

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5. Find the simplest value of $\log_3 5 \times \log_{25} 27$

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6. Express M in terms of N:

$$\frac{1}{2}\log_3 M + \log_3 N = 1$$

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7. Express M in terms of N:

$$\log_{10} N = 3 - 2\log_{10} M$$

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8. Prove that

$$\log_a b \times \log_b c \times \log_c a = 1$$

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9. Find the value of

$$\log\left(\frac{a^n}{b^n}\right) + \log\left(\frac{b^n}{c^n}\right) + \log\left(\frac{c^n}{a^n}\right)$$

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10. Prove that

$$\log_4 \log_4 \log_4 256 = 0$$

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11. If $\log_{30} 3 = a$ and $\log_{30} 5 = b$ find the value of $\log_{30} 8$

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12. If $\log 2 = 0.3010, \log 3 = 0.4771, \log 7 = 0.8451$

find the values of

log 45

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13. If $\log 2 = 0.3010, \log 3 = 0.4771, \log 7 = 0.8451$

find the values of

log108

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14. If $\log 2 = 0.3010, \log 3 = 0.4771, \log 7 = 0.8451$

find the values of

log84

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15. If $\log 2 = 0.3010, \log 3 = 0.4771, \log 7 = 0.8451$

find the values of

log294

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16. If

$\log 2 = 0.3010, m \log 3 = 0.4771, \log 7 = 0.8451$ find

the values of

log12.6

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17. If three positive real number a,b and c are in G.P

show that log a , log b and log c are in A.P

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Short Answer Type Question

1. Find the values :

$$\log_3 \sqrt[4]{(729)\sqrt[3]{9^{-1}.(27)^{-\frac{4}{3}}}}$$

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2. Find the values :

$$\log_2\left[\log_2\left\{\log_3\left(\log_3 27^3\right)\right\}\right]$$

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3. Find the values :

$$(\log_a b) \times (\log_b c) \times (\log_c d) \times (\log_d a)$$

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4. Calculate :

(i) $\frac{\log\sqrt{27}+\log 8-\log\sqrt{1000}}{\log 1.2}$

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5. Find the values :

$\log_6\sqrt{6\sqrt{6...\infty}}$

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6. Find the values :

$$\frac{\log_{10} 385}{5} + \frac{\log_{10} 81}{32} + 3\frac{\log_{10} 5}{3} + \frac{\log_{10} 1}{9}$$

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7. Prove that

$$\log 2 + 16\log\left(\frac{16}{15}\right) + 12\log\left(\frac{25}{24}\right) + 7\log\left(\frac{81}{80}\right) = 1$$

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8. Prove that

$$\log\left(\frac{36}{25}\right)^3 + 3\log\left(\frac{2}{9}\right) - \log 2 = 2\log\left(\frac{16}{125}\right)$$

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9. Prove that

$$\log\left(\frac{75}{16}\right) - 2\log\left(\frac{5}{9}\right) + \log\left(\frac{32}{243}\right) = \log 2$$

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10. Prove that

$$x^{\log y - \log z} \times y^{\log z - \log x} \times z^{\log x - \log y} = 1$$

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11. Prove that

$$\log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ca}\right) + \log\left(\frac{c^2}{ab}\right) = 0$$

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12. Prove that

$$\log_2 \log_2 \log_4 256 + 2\log_{\sqrt{2}} 2 = 5$$

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13. Prove that

(v) $$\frac{1}{\log_{xy}(xyz)} + \frac{1}{\log_{yz}(xyz)} + \frac{1}{\log_{zx}(xyz)} = 2$$

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14. Prove that

$$\log_{b^3} a \times \log_{c^3} b \times \log_{a^3} c = \frac{1}{27}$$

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15. Prove that

$$\log a + \log a^2 + \log a^3 + \ldots. + \log a^n = \frac{n(n+1)}{2} \log a$$

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16. Prove that

$$\log a + \log a^3 + \log a^5 + \ldots + \log a^{2n-1} = n^2 \log a$$

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17. Prove that

$$\log_{\frac{1}{y}} x \times \log_{\frac{1}{z}} y \times \log_{\frac{1}{x}} z = -1$$

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18. Prove that

$$\log_{x^2} x \times \log_{y^2} y \times \log_{z^2} = \frac{1}{8}$$

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19. Given $\log_{10} 2 = 0.30103, \log_{10} e = 0.43429,$ find the value of $\log_e(125) + \log_3 81 + e^{\log_e 2}$

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20. If $a^2 + b^2 = 7ab$ show that

$$\log\left[\frac{1}{3}(a+b)\right] = \frac{1}{2}(\log a + \log b)$$

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21. If $\log\left(\frac{x+y}{5}\right) = \frac{1}{2}(\log x + \log y)$ show that $\frac{x}{y} + \frac{y}{x} = 23$

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22. If $a^{3-x}.b^{5x} = a^{5+x}.b^{3x}$, then show that $x\log\left(\frac{b}{a}\right) = \log a.$

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23. If $a^4 + b^4 = 14a^2b^2$ show that $\log_e\left(a^2 + b^2\right) = \log_e a + \log_e b + 2\log_e 2$

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24. If $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$, then prove that $xyz = 1.$

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25. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$ prove that

(a) $x^a y^b z^c = 1$

(b) $x^{b+c}.\ y^{c+a}.\ z^{a+b} = 1$

(c) $x^{b^2+bc+c^2}.y^{c^2+ca+a^2}.z^{a^2+ab+b^2}$=1

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26. If a sequence of posivtive numbers are in G.P show that their logarithms in A.P

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27. The first and the last terms of a G.P are a and k respectively if the number of terms be n prove that $n = 1 + \frac{\log k - \log a}{\log r}$ where r is the common ratio

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28. Prove that :

(viii) $\frac{\log_a x}{\log_{ab} x} = 1 + \log_a b.$

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29. If $\log_p x = a$ and $\log_q x = b$ prove that $\log_{\frac{p}{q}} x = \frac{ab}{a-b}$

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30. If $\log\left(x^2y^3\right) = a$ and $\log(x)\frac{\cdot}{y} = b$ find log x and logy in terms of a and b

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31. If $x = \frac{e^y - e^{-y}}{e^y + e^{-y}}$ show that $y = \frac{1}{2}\log_e\left(\frac{1+x}{1-x}\right)$

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32. If $\log_a b = 10$ and $\log_{6a}(32b) = 5$ find the value of a

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33. If the logarthim of a^2 top the base b^3 and the logarithm of b^8 to the base a^{12} be equal find the value of each logarithm

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34. Solve :

$$\log_{10} x - \log_{10} \sqrt{x} = \frac{2}{\log_{10} x}$$

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35. Solve : $\log_2 \log_2 \log_2 x = -1$

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36. Solve : $\log_8 x + \log_4 x + \log_2 x = 11$

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37. Solve : $\frac{1}{\log_x 10} + 2 = \frac{2}{\log_{0.5}(10)}$

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38. Prove that $\log_{10} 2 > 0.3$

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Long Answer Type Question

1. $\frac{\log x}{ry - pz} = \frac{\log y}{pz - rx} = \frac{loz}{qx - py}$ show that $x^p y^q z^r = 1$

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2. If $y = 10^{\frac{1}{1-\log_{10} x}}$ and $z = 10^{\frac{1}{1-\log_{10} y}}$ show that $x = 10^{\frac{1}{1-\log_{10} z}}$

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3. If the pth ,qth and rth terms of a G.P are a,b and c respectively show that

$$(q-r)\log a + (r-p)\log b + (p-q)\log c = 0$$

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4. If $x = \log_a(bc), y = \log_b(ca), z = \log_c(ab)$, then find $\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$

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5. If $x = \log_a(bc), y = \log_b(ca)$ and $z = \log_c(ab)$ show that

$x + y + z + 2 = xyz$

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6. If $x = \log_{2a} a, y = \log_{3a} 2a, z = \log_{4a} 3a$, then show that $xyz + 1 = 2yz$.

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7. If x=1 +$\log_a(bc)$, $y = 1 + \log_b(ca)$ and z=1+$\log_c(ab)$

prove that xy+yz+zx=xyz

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8. Prove that the value of $\log_{10} 3$ lies in between $\frac{1}{2}$ and $\frac{2}{5}$.

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9. Solve

$$\log_x 3 \frac{\log_x}{81} 3 = \frac{\log_x}{729} 3$$

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10. Solve :

(iv) $x^{\log_2 a} + a^{\log_2 x} = 2a^2.$

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11. Solve

$$\log_4(x-1) = \log_2(x-3)$$

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12. Solve :

(iii) $4^{\log_9 3} + 9^{\log_2 4} = 10^{\log_x 83}$

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