MATHS

BOOKS - CALCUTTA BOOK HOUSE MATHS (BENGALI ENGLISH)

LOGARITHM

Examples Mcq

1. Select the correct answer (MCQ) :

If $\frac{\log_x 1}{3} = \frac{1}{3}$ then x =

A. 27

B. 9

C. 3

D. $\frac{1}{27}$

Answer: A

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2. Select the correct answer (MCQ) :

If $\log_{\sqrt{2}} x = a$, then $\log_{2\sqrt{2}} x$=

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

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

C. $2a$

D. $3a$

Answer: A

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3. Select the correct answer (MCQ) :

If $\log_2 3 = a$, then $\log_2 27$ =

A. $3a$

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

C. $2a$

D. a

Answer: D

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4. Select the correct answer (MCQ) :

if $\log_{10}(7x-5)=2, then x=$

A. 10

B. 12

C. 15

D. 18

Answer: C

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5. Select the correct answer (MCQ) :

(v) If $\log(\sqrt{x})0.25 = 4, \text{then} x =$

A. 0.5

B. 0.25

C. 4

D. 16

Answer: A

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6. Select the correct answer (MCQ) :

(vi) $\log_a \log_a \log_{a^{a^{a^a}}}$ =

A. 1

B. a

C. a^a

D. Cannot be determined

Answer: B

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7. Select the correct answer (MCQ) :

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

A. a

B. b

C. c

D. 1

Answer: D

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8. Select the correct answer (MCQ) :

$(4)^{\log_9 3}$ =

A. 2

B. 3

C. 4

D. $\sqrt{2}$

Answer: A

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9. Select the correct answer (MCQ) :

$\log_{9\sqrt{3}}(0.1) =$

A. $\frac{4}{5}$

B. $-\frac{4}{5}$

C. $\frac{3}{4}$

D. $-\frac{3}{4}$

Answer: B

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10. If $\log_x\left(\sqrt{5}\right) = \frac{1}{6}$, then $x =$

A. 0.04

B. 0.08

C. 0.008

D. 0.01

Answer: C

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11. 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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12. Show that $a^{\log_a x} = x$.

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13. If $\log_e 2.\ \log_x 25 = \log_{10} 16.\ \log_e 10$, then find the value of x.

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14. Show that $\log_b\left(\frac{1}{b^n}\right) = -n$

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15. If $\frac{1}{\log_x 10} = \frac{2}{\log_{0.5} 10}$, then find the value of x.

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16. Show that $\log_3 \log_2 \log_{\sqrt{3}} 81 = 1$

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17. Show that $\log_b a \times \log_c b \times \log_d c = \log_d a$.

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18. Find the value of $(yz)^{\log y - \log z} \times (zx)^{\log z - \log x} \times (xy)^{\log x - \log y}$.

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19. Prove that :

(iv) $a^{\log_{a^2} x} \times b^{\log_{b^2} y} \times c^{\log_{c^2} z} = \sqrt{xyz}$

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Examples Short Answer Type Questions

1. Find the value of $\log_4 \log_4 \log_4 256$

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Examples Long Answer Type Question

1. If x, y, z be three consecutive intergers, then prove that $\log(1 + xz) = 2 \log y$

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2. If $1 + \log_{10} a = 2 \log_{10} b$, then express a in terms of b^2.

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

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4. Calculate :

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

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5. Calculate :

$\log_3 4 \times \log_4 5 \times \log_5 6 \times \log_6 7 \times \log_7 3$

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6. Calculate :

(iii) $\log_{10}\left(\dfrac{384}{5}\right) + \log_{10}\left(\dfrac{81}{32}\right) + 3\log_{10}\left(\dfrac{5}{3}\right) + \log_{10}\left(\dfrac{1}{9}\right)$

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7. Calculate :

$\log_{x^2} x \times \log_{y^2} y \times \log_{z^2} z$

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8. Prove that

(ii)

$\log_{10} 15(1+\log_{15} 30)+\frac{1}{2}\log_{10} 16(1+\log_4 7)-\log_{10} 6(\log_6 3+1+\log_6 7)$

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9. Prove that

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

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10. Prove that

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

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11. Prove that

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

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12. Prove that

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

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13. Prove that

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

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14. Prove that

$$\log_7 \sqrt{7\sqrt{7\sqrt{7\ldots\ldots\ldots\ldots\ldots\ldots\ldots\infty}}} = 1$$

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

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16. If $a^4 + b^4 = 14a^2b^2$, then show that $\log\left(a^2 + b^2\right) = \log a + \log b + 2\log 2$.

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17. 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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18. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$, then prove that $x^{b+c} . y^{c+a} . z^{a+b} = 1$

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19. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$, then prove that $x^{b^2+bc+c^2} . y^{c^2+ca+a^2} . z^{a^2+ab+b^2} = 1$

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

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22. Solve :

(i) $\log_8[\log_2\{\log_3(4^x+17)\}]=\frac{1}{3}$

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

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24. Solve :

(iii) $4^{\log_9 3}+9^{\log_{24}}=10^{\log_x 83}$

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25. Solve :

(iv) $\log_{10} x - \log_{10} \sqrt{x} = \dfrac{2}{\log_{10} x}$

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Exercise 7 Mcq

1. Select the correct answer (MCQ) :

(i) If $x = 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = \lfloor 10,$ then

$$\frac{1}{\log_2 + \frac{1}{\log_3 x} + \frac{1}{\log_4 x} + \ldots\ldots\ldots\ldots + \frac{1}{\log_{10} x}} =$$

A. -1

B. 0

C. 1

D. $\lfloor 10$

Answer: C

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2. Select the correct answer (MCQ) :

(ii) $\log_b a \times \log_c b \times \log_a c =$

A. -1

B. 0

C. 1

D. $\log(abc)$

Answer: C

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3. Select the correct answer (MCQ) :

(iii) $(25)^{\frac{1}{2}+\log_{\frac{1}{5}} 27+\log_{25} 81}$ =

A. $\frac{5}{9}$

B. $\frac{5\sqrt{5}}{3}$

C. $\frac{5\sqrt{7}}{27}$

D. $\frac{5\sqrt[3]{7}}{81}$

Answer: A

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4. Select the correct answer (MCQ) :

(iv) The least value of the quantity $2\log_{10}(x) - \log_x(0.01)[x > 1] =$

A. 2

B. 4

C. 6

D. None of these

Answer: B

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5. Select the correct answer (MCQ) :

(v) If $n = 2016!$, then $\frac{1}{\log_2 n} + \frac{1}{\log_3 n} + \ldots\ldots\ldots\ldots + \frac{1}{\log_{2016} n} =$

A. 0

B. 1

C. -1

D. $2016!$

Answer: B

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6. Select the correct answer (MCQ) :

(vi) $\log 2 + \log 4 + \log 8 + \ldots\ldots\ldots\ldots + \log 1024$ =

A. $90 \log 2$

B. $55 \log 2$

C. $110 \log 2$

D. $\log 2$

Answer: B

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7. Select the correct answer (MCQ) :

If $2 \log_8 N = p, \log_2 2N = q$ and $q - p = 4$, then $N =$

A. 512

B. 1024

C. 256

D. 2048

Answer: A

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8. Select the correct answer (MCQ) :

Which one of the following is correct ?

A. $\log_{10} 2 > 0.5$

B. $\log_{10} 2 > 0.4$

C. $\log_{10} 2 > 0.3$

D. None of these

Answer: C

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9. Select the correct answer (MCQ) :

(ix) If $\log_{10} y = 3 + \log_{10} x$ which one of the following is correct?

A. $x = 1000y$

B. $y = 1000x$

C. $x = 10^{3y}$

D. $y = 10^{3x}$

Answer: B

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10. Select the correct answer (MCQ) :

(x) $\log_{0.1}(0.00001) =$

A. 3

B. 4

C. 5

D. 6

Answer: C

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Exercise 7 Short Answer Type Questions

1. Find the logarithm of 1600 with respect to the base $2\sqrt[3]{5}$.

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2. If the logarithm of 1728 be 6 then, find the base of the logarithm.

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3. If $\frac{1}{\log_x 10} = \frac{2}{\log_{0.5} 10}$, then find the value of x.

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4. Simplify : $\frac{1}{\log_{ab}(abc)} + \frac{1}{\log_{bc}(abc)} + \frac{1}{\log_{ca}(abc)}$

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5. Calculate : $\log_2 \log_{\sqrt{2}} \log_3(81)$

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6. Compute x if $\log_x(0.3) = 3$.

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7. 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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8. Calculate : $5^{2-\log_5 2}$

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9. If $a = \log_3 5, b = \log_{17} 25$, then show that a > b.

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10. If $\log_{10} 2 = 0.3010$ determine the value of $\log_4(125)$.

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Exercise 7 Long Answer Type Questions

1. Calculate :

(i) $\log_2 \sqrt[4]{64\sqrt[3]{4^{-1}(8)^{-\frac{4}{3}}}}$

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2. Calculate :

(ii) $\log_5 \sqrt{5\sqrt{5\sqrt{5\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\infty}}}$

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3. Calculate :

(iii) $\log_3(\sqrt{6}) + \log_3\left(\sqrt{\frac{2}{3}}\right) - \log_3 \log_3(9)$

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4. Calculate :

(iv) $2\log_2 \sqrt{2\sqrt{2\sqrt{2.....\infty}}}$

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5. Calculate :

(v) $\frac{1}{6}\sqrt{\frac{3\log 1728}{1+\frac{1}{2}\log 0.36+\frac{1}{3}\log 8}}$

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6. Calculate :

(vi) $\log_2 5 \times \log_6 16 \times \log_5 8 \times \log_8 6.$

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7. Simplify :

(i) $\log_{\frac{1}{\sqrt{x}}}(y) \times \log_{\frac{1}{\sqrt[3]{y}}}(z) \times \log_{\frac{1}{\sqrt[4]{z}}}(x)$

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8. Simplify :

(ii) $23\frac{\log 16}{15} + 17\frac{\log 25}{24} + 10\frac{\log 81}{80}$

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9. Simplify :

(iii) $3\log\left(\frac{36}{25}\right) + \log\left(\frac{6}{27}\right)^3 - 2\log\left(\frac{16}{125}\right)$

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10. 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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11. If $\log_{40} 4 = a$ and $\log_{40} 5 = b$, then show that $\log_{40} 16 = 4(1 - a - b)$.

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12. If $\log_6 15 = \alpha, \log_{12} 18 = \beta$ and $\log_{25} 24 = \gamma$, then prove that $\gamma = \dfrac{5 - \beta}{2(\alpha\beta + \alpha - 2\beta + 1)}$

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13. If $\log_{12} 18 = x$ and $\log_{24} 54 = y$, then show that $xy + 5(x - y) = 1$

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14. If $\log_a M = (\log_b M) \times P$, then express P in terms of a and b.

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15. If $\frac{1}{2}\log_3 M + 3\log_3 N = 1$, then express M in terms of N.

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16. Prove that $\frac{1}{\log_2 \pi} + \frac{1}{\log_6 \pi} > 2$.

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

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18. Prove that the value of $\log_{20} 3$ lies in between $\frac{1}{2}$ and $\frac{1}{3}$.

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19. Prove that :

(i) $\log\left(1^{\frac{1}{5}} + 32^{\frac{1}{5}} + 243^{\frac{1}{5}}\right) = \frac{1}{5}(\log 1 + \log 32 + \log 243)$.

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20. Prove that :

(ii) $\log(1 + 2 + 3) = \log 1 + \log 2 + \log 3$.

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21. Prove that :

(iii) $(yz)^{\log\left(\frac{y}{z}\right)}(zx)^{\log\left(\frac{z}{x}\right)}(xy)^{\log\left(\frac{x}{y}\right)} = 1$

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22. Prove that :

(iv) $a^{\log_{a^2} x} \times b^{\log_{b^2} y} \times c^{\log_{c^2} z} = \sqrt{xyz}$

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23. Prove that :

(v) $p^{\log_x q} = q^{\log_x p}$

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24. Prove that :

(vi) $\log_a x + \log_{a^2} x^2 + \log_{a^3} x^3 + \ldots\ldots\ldots\ldots + \log_{a^n} x^n = \log_a x^n$

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25. Prove that :

(vii) $\log_{\sqrt{a}} b . \log_{\sqrt{b}} c . \log_{\sqrt{c}} a = 8.$

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26. Prove that :

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

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27. If $x^2 + y^2 = z^2$, then prove that $\frac{1}{\log_{z-y} x} + \frac{1}{\log_{z+y} x} = 2.$

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28. If $a = \log_{12} m$ and $b = \log_{18} m$, then prove that $\log_3 2 = \frac{a - 2b}{b - 2a}.$

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29. If $x^2 + y^2 = 6xy$, then prove that $2\log(x + y) = \log x + \log y + 3\log 2$.

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30. If $\log\left(\frac{x+y}{2}\right) = \frac{1}{3}\{\log x + \log y + \log(x + y)\}$, then prove that $\frac{x^2}{y} + \frac{y^2}{x} = 5(x + y)$.

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

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

(i) $x^x . y^y . z^z = 1.$

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33. 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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34. If $\frac{\log x}{ry-qz} = \frac{\log y}{pz-rx} = \frac{\log z}{qx-py}$, then prove that $x^p . Y^q . Z^r = 1.$

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35. If $y = a^{\frac{1}{1-\log_a x}}$ and $z = a^{\frac{1}{1-\log_a y}}$, then show that $x = a^{\frac{1}{1-\log_a z}}$

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36. If $x = \log_c b + \log_b c, y = \log_a c + \log_c a, z = \log_b a + \log_a b,$ then show that $x^2 + y^2 + z^2 - 4 = xyz.$

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37. If a,b,c be three such positive numbers (none of them is 1) that $(\log_b a \log_c a - \log_a a) + (\log_a b \log_c b - \log_b b) + (\log_a c \log_b c - \log_c c) = 0$, the prove that abc = 1.

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

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39. If $a > 0, c > 0, b = \sqrt{ac}, ac \neq 1$ and $N > 0$, then 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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40. If $\frac{a(b+c-a)}{\log a} = \frac{b(c+a-b)}{\log b} = \frac{c(a+b-c)}{\log c}$, then prove that $b^c . c^b = a^c . c^a = a^b . b^a$.

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41. If $\log(a+b+c) = \log a + \log b + \log c$, then prove that

$$\log\left(\frac{2a}{1-a^2} + \frac{2b}{1-b^2} + \frac{2c}{1-c^2}\right) = \frac{\log(2a)}{1-a^2} + \frac{\log(2b)}{1-b^2} + \frac{\log(2c)}{1-c^2}.$$

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42. If $x + y = z$, then prove that

$$\frac{1}{\log_{(\sqrt{z}-\sqrt{y})}(x)} + \frac{1}{\log_{(\sqrt{z}+\sqrt{y})}(x)} = 1.$$

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43. If $y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$ then prove that $y = \frac{e^{2x} - 1}{e^{2x} + 1}$.

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44. Solve :

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

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45. Solve :

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

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46. Solve :

$$\frac{\log_2(x-4)+1}{\log_{\sqrt{2}}\left(\sqrt{x+3}-\sqrt{x-3}\right)}=1.$$

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47. Solve :

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

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48. Solve :

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

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49. Solve :

(vi) $6^{3-4x}.4^{x+5}=8$, given , $\log 2=0.3010, \log 3=0.4771.$

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