MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

LOGARITHM AND ITS PROPERTIES

Examples

1. Solve for x: $4^x - 3^{x-\frac{1}{2}} = 3^{x+\frac{1}{2}} - 2^{2x-1}$.

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2. Solve $e^{\sin x} - e^{-\sin x} - 4 = 0$.

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3. Solve $|x-3|^{3x^2-10x+3}=1$.

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4. Solve$(1/2)^{x^2-2x}<1/2$.

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5. Find the smallest integral value of x satisfying $(x-2)^{x^2-6x+8}>1$.

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6. Find the sumber of solutions of equation $(2x-3)2^x=1$.

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7. Find the value of $\log_{2\sqrt{3}}1728$.

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8. Prove that $\frac{2}{5} < \log_{10} 3 < \frac{1}{2}$.

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9. Arrange $\log_2 5, \log_{0.5} 5, \log_7 5, \log_3 5$ in decreasing order.

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10. Prove that number $\log_2 7$ is an irrational number.

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11. Which of the following numbers are positive/negative : $(i)\log_{\sqrt{3}} \sqrt{2}$

$(ii)\log_3(4)$

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12. Find the value of $\log \quad \tan 1^\circ \log \quad \tan 2^\circ \ldots \log \quad \tan 89^\circ$.

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13. If $\log_a 3 = 2$ and $\log_b 8 = 3$, then prove that $\log_a b = \log_3 4$.

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14. If $\log_3 y = x$ and $\log_2 z = x$, find 72^x in terms of y and z.

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15. If

$$\frac{x(y+z-x)}{\log x} = \frac{y(z+x-y)}{\log y} \frac{z(x+y-z)}{\log z}, prove that x^y y^x = z^x y^z = x^z$$

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16. Suppose $x; y; z > 0$ and are not equal to 1 and $\log x + \log y + \log z = 0$. Find the value of $x^{\frac{1}{\log y}+\frac{1}{\log z}} \times y^{\frac{1}{\log z}+\frac{1}{\log x}} \times z^{\frac{1}{\log x}+\frac{1}{\log y}}$ (base 10)

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17. Solve $2(25)^x - 5(10^x) + 2(4^x) \geq 0$.

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18. Find the number of solution to equation $\log_2(x+5) = 6 - x$:

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19. Find the number of solutions of the following equations: $x^{-\frac{1}{2}}(\log)_{0.5}x = 1\, x^2 - 4x + 3 - (\log)_2 x = 0$

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20. Find the value of the following:

(i) $\log_{10} 2 + \log_{10} 5$

(ii) $\log_3\left(\sqrt{11} - \sqrt{2}\right) + \log_3\left(\sqrt{11} + \sqrt{2}\right)$

(iii) $\log_7 35 - \log_7 5$

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21. $y = \log_{\sqrt{3}} 81\sqrt{3} + \log_{\frac{1}{4}} 32$

A. $\frac{11}{2}$

B. $\frac{13}{2}$

C. $\frac{15}{2}$

D. $\frac{17}{2}$

Answer: B

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22. What is logarithm of $32\sqrt[5]{4}$ to the base $2\sqrt{2}$?

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23. If $(\log)_e\left(\frac{a+b}{2}\right)=\frac{1}{2}\left((\log)_e a+(\log)_e b\right)$, then find the relation between $aandb$.

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24. Which of the following pairs of expression are defined for the same set of values of x ? $f_1(x)=2(\log)_2 xandf_2(x)=(\log)_{10}x^2$

$f_1(x)=(\log)_{\times}^2 andf_2(x)=2$

$f_1(x)=(\log)_{10}(x-2)+(\log)_{10}(x-3)andf_{2(x)}=(\log)_{10}(x-2)(x-3)$

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25. Find the value of $7\log\left(\frac{16}{15}\right)+5\log\left(\frac{25}{24}\right)+3\log\left(\frac{81}{80}\right)$.

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26. $y = \log_{10} 20 \times \log_{400} 10$

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

B. $\frac{1}{4}$

C. $\frac{1}{6}$

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

Answer: A

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27. Suppose that a and b are positive real numbers such that $\log_{27} a + \log_9(b) = \frac{7}{2}$ and $\log_{27} b + \log_9 a = \frac{2}{3}$.Then the value of the ab equals

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28. Solve for x:$11^{4x-5} \cdot 3^{2x} = 5^{3-x} \cdot 7^{-x}$.

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29. Which is greater : $x = \log_3 5$ or $y = \log_{17}(25)$

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30. If $n > 1$ then prove that

$$\frac{1}{\log_2 n} + \frac{1}{\log_3 n} + \ldots\ldots\ldots\ldots\ldots + \left(\frac{1}{\log_{53} n} = \frac{1}{\log_{53!} n} \right.$$

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31. Let $a = \log_3 20, b = \log_4 15$ and $c = \log_5 12$. Then find the value of

$$\frac{1}{a+1} + \frac{1}{b+1} + \frac{1}{c+1}.$$

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32. If $\log_a(ab) = x$ then $\log_b(ab)$ is equals to

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33. If $(\log)_{12}27 = a,$ then find $(\log)_6 16 \int ermsofa$

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34. If $a^x = b, b^y = c, c^z = a,$ then find the value of $xyz.$

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35. Find the value of

$((\log)_3 4)((\log)_4 5)((\log)_5 6)((\log)_6 7)((\log)_7 8)((\log)_8 9).$

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36. Simplify: $\frac{1}{1+(\log)_a bc}+\frac{1}{1+(\log)_b ca}+\frac{1}{1+(\log)_c ab}$

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

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38. If $\log_a a.\log_c a+\log_c b.\log_a b+\log_a c.\log_b c=3$(where a, b, c are different positive real nu then find the value of abc.

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39. If y= $2^{\frac{1}{\log_x 4}}$ then prove that $x=y^2$.

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40. Find the value of $81^{(1/(\log)_5 3)} + 27^{\log 36} + 3^{\left(\frac{4}{(\log)_7 9}\right)}$

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41. Prove that $\frac{2^{\log_{2^{1/4}} x} - 3^{\log_{27}\left(x^2+1\right)^3} - 2x}{7^{4\log_{49} x} - x - 1} > 0,\ \forall x \in (0, \infty).$

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42. If 60^a=3 and $60^b = 5$ then $12^{\frac{1-a-b}{2(1-b)}}$ is equal to

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43. Solve $\log_4(8) + \log_4(x+3) - \log_4(x-1) = 2$

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44. Solve $\log(-x) = 2\log(x+1)$.

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45. Solve $(\log)_2(3x-2)=(\log)_{\frac{1}{2}}x$

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46. Solve $2^{x+2}27^{x/(x-1)}=9$

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47. Solve $\log_2(4\times 3^x-6)-\log_2(9^x-6)=1.$

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48. Solve : $6\left((\log)_x 2-(\log)_4 x\right)+7=0.$

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49. Solve $4^{\log_2 \log x} = \log x - (\log x)^2 + 1$ (base is e).

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50. Solve: $4(\log)_{\frac{x}{2}}(\sqrt{x}) + 2(\log)_{4x}(x^2) = 3(\log)_{2x}(x^3)$.

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51. Solve $4^{\log_9 x} - 6x^{\log_9 2} + 2^{\log_3 27} = 0$.

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52. Solve $\frac{1}{4}x^{\log_2 \sqrt{x}} = \left(2 \cdot x^{\log_2 x}\right)^{\frac{1}{4}}$.

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53. Solve $|x-1|^{(\log_{10} x)^2 - \log_{10} x^2} = |x-1|^3$

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54. Solve $\log_2(x-1) > 4$.

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55. Solve $\log_3(x-2) \leq 2$.

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56. Solve : $(\log)_{0.3}\left(x^2 - x + 1\right) > 0$

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57. Solve $1 < \log_2(x-2) \leq 2$.

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58. Solve $\log_2|x-1|<1$.

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59. Solve $(\log)_{0.2}|x-3|\geq 0$.

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60. Solve $\log_2.\ \frac{x-1}{x-2}>0$.

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61. Solve: $(\log)_{0.5}\frac{3-x}{x+2}<0$

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62. Solve: $(\log)_3\left(2x^2+6x-5\right)>1$

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63. Solve $(\log)_{0.04}(x-1) \geq (\log)_{0.2}(x-1)$

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64. Solve $\log_{x+3}\left(x^2-x\right) < 1.$

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65. Solve $2\log_3 x - 4\log_x 27 \leq 5.$

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66. Solve: $(\log)_{x+\frac{1}{x}}\left(\frac{\log_2(x-1)}{x+2}\right) > 0$

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67. Solve: $(\log)_{(\log)_2\left(\frac{x}{x}\right)}\left(x^2-10x+22\right)>0$

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68. Solve: $(\log)_{0.1}\left((\log)_2\left(\frac{x^2+1}{x-1}\right)\right)<0$

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69. Solve $\frac{x-1}{\log_3(9-3^x)-3}\leq 1.$

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70. Solve: $\left(\frac{1}{2}\right)^{\log}{}_{-}(10)a^2+2>\frac{3}{2^{(\log)_{10}(-a)}}$

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71. Write the characteristic of each of the following numbers by using their standard forms: 1235.5 (ii) 346.41 (iii) 62.723 (iv) 7.12345 0.35792 (vi) 0.034239 (vii) 0.002385 (viii) 0.0009468

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72. Write the significant digits in each of the following numbers to compute the mantissa of their logarithms: 3.239 (ii) 8 (iii) 0.9 (iv) 0.02 0.0367 (vi) 89 (vii) 0.0003 (viii) 0.00075

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73. Find the mantissa of the logarithm of the number 5395

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74. Find the mantissa of the logarithm of the number 0.002359

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75. Use the logarithm tables to find the logarithm of the following numbers 25975 (ii) 25.795

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76. Find the antilogarithm of each of the following: 2.7523 (ii) 3.7523 (iii) 5.7523 (iv) 0.7523 1.7523 (vi) 2.7523 (vii) 3.7523

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77. Evaluate $(72.3)^{\frac{1}{3}}$; if log 0.723=bar(1).8591`

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78. Using logarithms, find the value of 6.45 x 981.4

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79. Let $x = (0.15)^{20}$. Find the characteristic and mantissa of the logarithm of x to the base 10. Assume $(\log)_{10}2 = 0.301 and (\log)_{10}3 = 0.477$.

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80. If $(\log)_{10}2 = 0.30103, (\log)_{10}3 = 0.47712,$ then find the number of digits in $3^{12}x2^{8}$.

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81. In the 2001 census, the population of India was found to be $8.7x10^{7}$. If the population increases at the rate of 2.5% every year, what would be the population in 2011?

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82. Find the compound interest on Rs. 12000 for 10 years at the rate of 12% per annum compounded annually.

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83. If P is the number of natural numbers whose logarithms to the base 10 have the characteristic $pandQ$ is the number of natural numbers logarithms of whose reciprocals to the base 10 have the characteristic $-q$, then find the value of $\log_{10} P - (\log)_{10} Q$.

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84. Let L denote antilog_32 0.6 and M denote the number of positive integers which have the characteristic 4, when the base of log is 5, and N denote the value of $49^{(1-(\log)_7 2)} + 5^{-(\log)_5 4}$. Find the value of $\frac{LM}{N}$.

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85. Find the number of solution of $2x^2 + 3^x + 4^x - 5^x = 0$

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86. Let a, b, c, d be positive integers such that $\log_a b = 3/2$ and $\log_c d = 5/4$. If (a-c) = 9, then find the value of (b-d).

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87. If $a \geq b > 1$, then find the largest possible value of the expression $\log_a(a/b) + \log_a(b/a)$.

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

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89. Solve $\sqrt{\log(-x)} = \log\sqrt{x^2}$(base is 10).

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90. Solve$3^{(\log_9 x)^2 - \frac{9}{2}\log_9 x + 5} = 3\sqrt{3}$.

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91. Solve for x : $(2x)^{\log_b 2} = (3x)^{\log_b 3}$.

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92. Solve the equations for x and y: $(3x)^{\log 3} = (4y)^{\log 4}$, $4^{\log x} = 3^{\log y}$.

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93. Solve $(\log)_{2x} 2 + (\log)_4 2x = -3/2$.

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94. Solve:

$$(\log)_{(2x+3)}\left(6x^2+23+21\right)+(\log)_{(3x+7)}\left(4x^2+12x+9\right)=4$$

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Exercise 11

1. For $x \leq 2$, solve $x^3 3^{|x-2|}+3^{x+1}=x^3 \cdot 3^{x-2}+3^{|x-2|+3}$

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2. Solve $\left(\frac{1}{2}\right)^{x^6-2x^4}<2^{(x)^2}$.

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3. Solve for x and y: $y^x = x^y, x = 2y$.

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4. Solve $2^{x+2} - 2^{x+3} - 2^{x+4} > 5^{x+1} - 5^{x+2}$.

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5. Solve $\left(\frac{3}{4}\right)^{6x+10-x^2} < \frac{27}{64}$.

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6. Find the number of solutions of $|x| \cdot 3^{|x|} = 1$.

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Exercise 1 2

1. Find the value of $3^{2\log_9 3}$.

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2. Find the value of $\sqrt{(\log_{0.5} 4)^2}$.

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3. If $\log_{\sqrt{8}} b = 3\frac{1}{3}$, then find the value of b.

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4. Find the value of $\log_5 \log_2 \log_3 \log_2 512$.

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5. If $\log_5 x = a$ and $\log_2 y = a$, find 100^{2a-1} in terms of x and y .

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6. Find the value of $\log_{1/3} \sqrt[4]{729 \cdot \sqrt[3]{9^{-1} \cdot 27^{-4/3}}}$.

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7. Solve for $x : \log_4 \log_3 \log_2 x = 0$.

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8. Prove that $\log_{10} 2$ lies between $\frac{1}{4}$ and $\frac{1}{3}$.

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9. Find number of roots of the equation $x^3 - \log_{0.5} x = 0$.

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Exercise 1 3

1. Write each of the following as single logarithm:

$(a) 1 + \log_2 5 \qquad (b) 2 - \log_3 7$

$(c) 2\log_{10} x + 3\log_{10} y - 5\log_{10} z$

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2. Prove that $\frac{1}{3} < \log_{20} 3 < \frac{1}{2}$.

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3. Prove that $\log_7 \log_7 \sqrt{7\sqrt{(7\sqrt{7})}} = 1 - 3\log_7 2$.

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4. If $\log_{10} x = y$, then find $\log_{1000} x^2$ in terms of y.

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5. If $\log_7 2 = m$, then find $\log_{49} 28$ in terms of m.

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6. Find the value of $\log_2\left(\frac{1}{7^{\log_7 0.125}}\right)$.

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7. Find the value of $\left(\frac{4}{\log_2\left(2\sqrt{3}\right)} + \frac{2}{\log_3\left(2\sqrt{3}\right)}\right)^2$.

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8. If x and y are positive real numbers such that $2\log(2y-3x) = \log x + \log y$, then find the value of $\frac{x}{y}$.

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9. If $a^2 + b^2 = 7ab$, prove that $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$.

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10. If $\log_b n = 2$ and $\log_n 2b = 2$, then find the value of b.

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11. If $\log_2 x \times \log_3 x = \log_2 x + \log_3 x$, then find x .

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12. If $y^2 = xz$ and a^x=b^y=c^z$then prove$ ^log_b (a)= log_c (b)

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13. Prove the following identities:

(a) $\dfrac{\log_a n}{\log_{ab} n} = 1 + \log_a b$ $\qquad$ $(b) \log_{ab} x = \dfrac{\log_a x \log_b x}{\log_a x + \log_b x}$.

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14. Compute $\log_{ab}\left(\sqrt[3]{a}/\sqrt{b}\right)$ if $\log_{ab} a = 4$.

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15. If $a^x = b^y = c^z = d^w$, show that $\log_a(bcd) = x\left(\dfrac{1}{y} + \dfrac{1}{z} + \dfrac{1}{w}\right)$.

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16. Find the value of $\left(\dfrac{1}{49}\right)^{1+\log_7 2} + 5^{-\log_{(1/5)}(7)}$.

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Exercise 1 4

1. Solve $\log_2\left(25^{x+3}-1\right)=2+\log_2\left(5^{x+3}+1\right)$.

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2. Solve $\log_4\left(2\times 4^{x-2}-1\right)+4=2x$.

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3. Solve: $27^{\log_3\sqrt[3]{x^2-3x+1}}=\dfrac{\log_2(x-1)}{|\log_2(x-1)|}$.

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4. Solve $\log_4(x-1)=\log_2(x-3)$.

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5. Solve $\log_6 9 - \log_9 27 + \log_8 x = \log_{64} x - \log_6 4$..

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6. Solve $\log_2\left(2\sqrt{17 - 2x}\right) = 1 - \log_{1/2}(x - 1)$.

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7. Solve : $3\log_x(4) + 2\log_{4x} 4 + 3\log_{16x} 4 = 0$

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8. Solve$(\log_3 x)(\log_5 9) - \log_x 25 + \log_3 2 = \log_3 54$.

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9. Solve $\left(x^{\log_{10} 3}\right)^2 - \left(3^{\log_{10} x}\right) - 2 = 0$.

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10. Solve $x^{\log_4 x} = 2^{3(\log_4 x + 3)}$.

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11. Find the sum of the squares of all the real solution of the equation

$$2\log_{\left(2+\sqrt{3}\right)}\left(\sqrt{x^2+1}+x\right)+\log_{\left(2-\sqrt{3}\right)}\left(\sqrt{x^2+1}-x\right)=3$$

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12. Prove that the equation $x^{\log_{\sqrt{x}} 2x} = 4$ has no solution.

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Exercise 1 5

1. Solve $\log_3|x| > 2$.

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2. Solve $\log_2 \cdot \frac{x-4}{2x+5} < 1$.

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3. Solve $\log_{10}\left(x^2 - 2x - 2\right) \leq 0$.

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4. Let $f(x) = \sqrt{\log_{10} x^2}$.Find the set of all values of x for which f (x) is real.

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5. Solve $2^{\log_2(x-1)} > x+5$.

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6. Solve $\log_2|4-5x| > 2$.

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7. Solve $\log_{0.2}.\ \frac{x+2}{x} \leq 1$.

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8. Solve $\log_{1/2}\left(x^2-6x+12\right) \geq -2$.

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9. Solve $(0.5)^{\log_3 \log_{(1/5)}\left(x^2-\frac{4}{5}\right)} > 1$.

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10. Find the values of x which the function $f(x) = \sqrt{\log_{1/2}\left(\frac{x-1}{x+5}\right)}$ is defined.

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11. Solve $\log_{1-x}(x-2) \geq -1$.

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12. Solve $\log_3(x+2)(x+4) + \log_{1/3}(x+2) < \frac{1}{2}\log_{\sqrt{3}} 7$.

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13. Solve $\log_x\left(x^2-1\right) \leq 0$.

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Exercise 1 6

1. If $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.477$, then find the number of digits in the following numbers:

(a)3^{40} $(b)2^{32} \times 5^{25}$ $(c)24^{24}$

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2. If characteristic of three numbers a, b and c and 5, -3 and 2, respectively, then find the maximum number of digits in N = abc.

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3. There are 3 number a, b and c such that $\log_{10} a = 5.71, \log_{10} b = 6.23$ and $\log_{10} c = 7.89$. Find the number of digits before dicimal in $\frac{ab^2}{c}$.

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4. Rupees 10,000 is invested at 6% interest compounded annually. How long will it take to accumulate Rs. 20, 000 in the account?

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5. An initial number of bacteria presented in a culture is 10000. This number doubles every 30 minutes. How long will it take to bacteria to reach the number 100000 ?

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6. Charles Richter defined the magnitude of an earthquake to be $M = \frac{\log_{10} I}{S}$, where I is the intensity of the earthquake (measured by the amplitude of a seismograph reading taken 100 km from the epicentre of the earthquake) and S is the intensity of a "standed earthquake" (whose amplitude is 1 micron $= 10^{-1}$ cm).

Each number increase on the Richter scale indicates an intensity ten times stronger. For example. an earthquake of magnitude 5. An earthquake of magnitude 7 is 100 times stronger then an earthquake of magnitude 5. An earthquake of magnitude 8 is 1000 times stronger than an earthquake of magnitude 5.

The earthquake in city A registered 8.3 on the Richter scale. In the same year, another earthquake was recorded in city B that was four times stronger. What was the magnitude of the earthquake in city B ?

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Exercise Single

1. $\log_4 18$ is

A. a rational number

B. an irrational number

C. a prime number

D. none of these

Answer: B

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2. The number $N = 6\log_{10} 2 + \log_{10} 31$ lies between two successive integers whose sum is equal to

A. 5

B. 7

C. 9

D. 10

Answer: B

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3. Given that $\log(2) = 0.3010$, the number of digits in the number 2000^{2000} is

A. 6601

B. 6602

C. 6603

D. 6604

Answer: C

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4. If $(21.4)^a = (0.00214)^b = 100$, then the value of $\frac{1}{a} - \frac{1}{b}$ is

A. 0

B. 1

C. 2

D. 4

Answer: C

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5. The value of $\log ab - \log|b| =$

A. log a

B. $\log|a|$

C. $-\log a$

D. none of these

Answer: B

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6. If a, b, c are consecutive positive integers and log (1+ac) = 2K, then the value of K is

A. log b

B. log a

C. 2

D. 1

Answer: A

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7. if $\frac{a+\log_4 3}{a+\log_2 3} = \frac{a+\log_8 3}{a+\log_4 3} = b$ then find the value of b

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

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

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

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

Answer: C

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8. If $p > 1 and q > 1$ are such that $\log(p+q) = \log p + \log q,$ then the value of $\log(p-1) + \log(q-1)$ is equal to 0 (b) 1 (c) 2 (d) none of these

A. 0

B. 1

C. 2

D. none of these

Answer: A

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9. The value of $\left(1 + 2\frac{\log_3 2}{\left(1 + (\log)_3 2\right)^2} + \left((\log)_6 2\right)^2\right.$ is 2 (b) 3 (c) 4 (d) 1

A. 2

B. 3

C. 4

D. 1

Answer: D

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10. If $(\log)_4 5 = a and (\log)_5 6 = b,$ then $(\log)_3 2$ is equal to $\frac{1}{2a+1}$ (b) $\frac{1}{2b+1}$ (c) $2ab+1$ (d) $\frac{1}{2ab-1}$

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

B. $\frac{1}{2b+1}$

C. $2ab+1$

D. $\frac{1}{2ab-1}$

Answer: D

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11. If $\log_{10} 2 = a, \log_{10} 3 = b$ then $\log_{0.72}(9.6)$ in terms of a and b is equal to

A. $\frac{2a + 3b - 1}{5a + b - 2}$

B. $\frac{5a + b - 1}{3a + 2b - 2}$

C. $\frac{3a + b - 2}{2a + 3b - 1}$

D. $\frac{2a + 5b - 2}{3a + b - 1}$

Answer: B

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12. There exists a natural number N which is 50 times its own logarithm to the base 10, then N is divisible by

A. 5

B. 7

C. 9

D. 11

Answer: A

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13. The value of $\frac{(\log)_2 24}{(\log)_{96} 2} - \frac{(\log)_2 192}{(\log)_{12} 2}$ is

A. 3

B. 0

C. 2

D. 1

Answer: A

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14. $\log_{x-1} x \cdot \log_{x-2}(x-1) \cdot \ldots \cdot \log_{x-12}(x-11) = 2$,x is equal to

A. 9

B. 16

C. 25

D. none of these

Answer: B

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15. If $f.(x) = \log\left(\frac{1+x}{1-x}\right)$, then

A. $f(x_1) \cdot f(x_2) = f(x_1 + x_2)$

B. $f(x+2) - 2f(x+1) + f(x) = 0$

C. $f(x) + f(x+1) = f\left(x^2 + x\right)$

D. $f(x_1) + f(x_2) = f\left(\frac{x_1 + x_2}{1 + x_1 x_2}\right)$

Answer: D

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16. If $a^4b^5 = 1$ then the value of $\log_a\left(a^5b^4\right)$ equals

A. $9/5$

B. 4

C. 5

D. $8/5$

Answer: A

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17. The value of $3^{(\log)_4 5} - 5^{(\log)_4 3}$ is 0 (b) 1 (c) 2 (d) none of these

A. 0

B. 1

C. 2

D. none of these

Answer: A

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18. If $2^{x+y} = 6^y$ and $3^{x-1} = 2^{y+1}$, then the value of $(\log 3 - \log 2)/(x - y)$ is

A. 1

B. $\log_2 3 - \log_3 2$

C. $\log(3/2)$

D. none of these

Answer: C

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19. The value of x satisfying $\sqrt{3}^{-4+2\log_{\sqrt{5}} x} = 1/9$ is

A. 2

B. 3

C. 4

D. none of these

Answer: D

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20. The value of x satisfying the equation

$\sqrt[3]{5}^{\log_5 5^{\log_5 5^{\log_5 5^{\log_5\left(\frac{x}{2}\right)}}}}$ = 3, is

A. 1

B. 3

C. 18

D. 54

Answer: D

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21. If $\sqrt{(\log)_2 x} - 0.5 = (\log)_2 \sqrt{x,}$ then x equals

A. odd integer

B. prime number

C. composite number

D. irrational

Answer: B

Watch Video Solution

22. If $\log_y x + \log_x y = 2, x^2 + y = 12$, then the value of xy is

A. 9

B. 12

C. 15

D. 21

Answer: A

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23. $4^{\log_9 3} + 9^{\log_2 4} = 10^{\log_x 83}$, then x is equal to

A. 2

B. 3

C. 10

D. 30

Answer: C

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24. Solve $(x+1)^{\log_{10}(x+1)} = 100(x+1)$

A. all the roots are positive real numbers.

B. all the roots lie in the interval (0, 100)

C. all the roots lie in the interval [-1, 99]

D. none of these

Answer: C

Watch Video Solution

25. If $\log_2 x + \log_x 2 = \frac{10}{3} = \log_2 y + \log_y 2$ and $x \neq y$,then $x + y =$

A. 2

B. $65/8$

C. $37/6$

D. none of these

Answer: D

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26. If $(\log)_{10}\left[\frac{1}{2^x + x - 1}\right] = x\left[(\log)_{10}5 - 1\right]$, then $x =$ 4 (b) 3 (c) 2 (d) 1

A. 4

B. 3

C. 2

D. 1

Answer: D

Watch Video Solution

27. If $(\log)_3\{5+4(\log)_3(x-1)\}=2,$ then x is equal to 4 (b) 3 (c) 8 (d) $(\log)_2 16$

A. 2

B. 4

C. 8

D. 16

Answer: B

Watch Video Solution

28. If $2x^{\log_4 3}+3^{\log_4 x}=27,$ then x is equal to

A. 2

B. 4

C. 8

D. 16

Answer: D

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29. The equation $\log_4(2-x)+\log_{0.25}(2+x)=\log_4(1-x)+\log_{0.25}(2x+1)$ has

A. only one prime solution

B. two real solutions

C. no real solution

D. none of these

Answer: D

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30. The values of b for which the equation $2\log_{\frac{1}{25}}(bx+28)=1\log_5\left(12-4x-x^2\right)$ has coincident roots is/are

A. b = - 12

B. b = 4

C. b = 4 or b =- 12

D. b =- 4 or b = 12

Answer: C

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31. If the equation $2^x + 4^y = 2^y$ is solved for y in terms of x where $x < 0$, then the sum of the solution is $x(\log)_2(1 - 2^x)$ (b) $x + (\log)_2(1 - 2^x)$ $(\log)_2(1 - 2^x)$ (d) $x(\log)_2(2^x + 1)$

A. $x \log_2(1 - 2^x)$

B. $x + \log_2(1 - 2^x)$

C. $\log_2(1 - 2^x)$

D. $x \log_2(2^x + 1)$

Answer: B

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32. The number of solution of $x^{\log_x (x+3)^2} = 16$ is

A. 0

B. 1

C. 2

D. ∞

Answer: A

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33. The product of roots of the equation $\frac{\log_8 (8/x^2)}{(\log_8 x)^2} = 3$ is

A. 1

B. $1/2$

C. $1/3$

D. $1/4$

Answer: D

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34. Let $a > 1$ be a real number . If S is the set of real number x that are solutions to the equation $a^{2\log_2 x} = 5 + 4x^{\log_2 a}$, then

A. 2

B. infinite

C. 0

D. 1

Answer: D

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35. the number of roots of the equation $\log_{3\sqrt{x}} x + \log_{3x}\left(\sqrt{x}\right) = 0$ is

A. 1

B. 2

C. 3

D. 0

Answer: B

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36. The set of all x satisfying the equation $x^{\log} \_ 3x^2 + \left((\log)_3 x\right)^{2-10} = \frac{1}{x^2} is$ 1 (b) 2 (c) 3 (d) 0

A. $\{1, 9\}$

B. $\{1, 9, 1/81\}$

C. $\{1, 4, 1/81\}$

D. $\{9, 1/81\}$

Answer: B

Watch Video Solution

37. Number of real values of x satisfying the equation $(\log)_2(x^2 - x)(\log)_2\left(\frac{x-1}{x}\right) + \left((\log)_2 x\right)^2 = 4, is$ 0 (b) 2 (c) 3 (d) 7

A. 0

B. 2

C. 3

D. 7

Answer: B

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38. If $xy^2 = 4$ and $\log_3(\log_2 x) + \log_{1/3}\left(\log_{1/2} y\right) = 1$, then x equals

A. 4

B. 8

C. 16

D. 64

Answer: D

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39. If $x_1 and x_2$ are the roots of the equation $e^2 x^{\ln x} = x^3$ with $x_1 > x_2$, then $x_1 = 2x_2$ (b) $x_1 = x22\ 2x_1 = x22$ (d) $x12 = x23$

A. $x_1 = 2x_2$

B. $x_1 = x_2^2$

C. $2x_1 = x_2^2$

D. $x_1^2 = x_2^3$

Answer: B

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40. The number of real values of the parameter k for which $(\log_{16} x)^2 - (\log)_{16} x + (\log)_{16} k = 0$ with real coefficients will have exactly one solution is 2 (b) 1 (c) 4 (d) none of these

A. 2

B. 1

C. 4

D. none of these

Answer: A

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41. $x^{(\log)_5 x} > 5$ implies $x \in (0, \infty)$ (b) [2,2.5] (c) (2,2.5) (d) (0,2.5)

A. $x \in (0, \infty)$

B. $x \in (0, 1/5) \cup (5, \infty)$

C. $x \in (1, \infty)$

D. $x \in (1, 2)$

Answer: B

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42. If $S = \left\{x \in N : 2 + (\log)_2 \sqrt{x+1} > 1 - (\log)_{\frac{1}{2}} \sqrt{4 - x^2}\right\}$, then $S = \{1\}$ (b) $S = Z$ (d) $S = N$ (d) none of these

A. $S = \{1\}$

B. S = Z

C. S = N

D. none of these

Answer: A

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43. If $S = \{x \in R : ((\log)_{0.6} 0.216)(\log)_5(5 - 2x) \leq 0\}$, then S is equal to $(2.5, \infty)$ (b) $(2, 2.5)$ (c) $(2, 2.5)$ (d) $(0, 2.5)$

A. $[2.5, \infty)$

B. $[2, 2.5)$

C. $(2, 2.5)$

D. $(0, 2.5)$

Answer: B

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44. Solution set of the inequality $\frac{1}{2^x - 1} > \frac{1}{1 - 2^{x-1}}$ is

A. $(1, \infty)$

B. $(0, \log_2(4/3))$

C. $(-1, \infty)$

D. $(0, \log_2(4/3)) \cup (1, \infty)$

Answer: D

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45. if $\log_2 x + \log_2 y \geq 6$ then the least value of $x + y$

A. 4

B. 8

C. 16

D. 32

Answer: C

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46. Which of the following is not the solution $(\log x)\left(\frac{5}{2}-\frac{1}{x}\right)>\left(\frac{5}{2}-\frac{1}{x}\right)$?

A. $\left(\frac{2}{5}, \frac{1}{2}\right)$

B. $(1, 2)$

C. $\left(\frac{2}{5}, 1\right)$

D. none of these

Answer: A :: B

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47. The solution set of the inequality $(\log)_{10}\left(x^2-16\right) \leq (\log)_{10}(4x-11)$ is $4, \infty)$ (b) $(4, 5)$ (c) $\left(\frac{11}{4}, \infty\right)$ (d) $\left(\frac{11}{4}, 5\right)$

A. $(4, \infty)$

B. $(4, 5]$

C. $(11/4, \infty)$

D. $\left(\frac{11}{4}, 5\right)$

Answer: B

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48. Solution set of the inequality $(\log)_{0.8}\left((\log)_6 \frac{x^2+x}{x+4}\right) < 0$ is $(-4, -3)$ (b) $(-3, 4) \cup (8, \infty)$ $(-3, \infty)$ (d) $(-4, -3) \cup (8, \infty)$

A. $(-4, -3)$

B. $(-3, 4) \cup (8, \infty)$

C. $(-3, \infty)$

D. $(-4, -3) \cup (8, \infty)$

Answer: D

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49. Which of the following is not the solution of $(\log)_3(x^2-2) < (\log)_3\left(\frac{3}{2}|x|-1\right)$ is $(\sqrt{2}, 2)$ (b) $(-2, -\sqrt{2})$ $(-\sqrt{2}, 2$ (d) none of these

A. $(-\sqrt{2}, 2)$

B. $(-2, -\sqrt{2})$

C. $(-\sqrt{2}, 2)$

D. none of these

Answer: C

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50. The true solution set of inequality $\log_{x+1}(x^2-4) > 1$ is equal to

A. $(2, \infty)$

B. $\left(2, \frac{1+\sqrt{21}}{2}\right)$

C. $\left(\frac{1-\sqrt{21}}{2}, \frac{1+\sqrt{21}}{2}\right)$

D. $\left(\frac{1+\sqrt{21}}{2}, \infty\right)$

Answer: D

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Exercise Multiple

1. For $a > 0, \neq 1,$ the roots of the equation $(\log)_{ax} a + (\log)_x a^2 + (\log)_{a^2 a} a^3 = 0$ are given $a^{-\frac{4}{3}}$ (b) $a^{-\frac{3}{4}}$ (c) a (d) $a^{-\frac{1}{2}}$

A. $a^{-4/3}$

B. $a^{-3/4}$

C. a

D. $a^{-1/2}$

Answer: A::D

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2. 6/ The real solutions of the equation $2^{x+2}.5^{6-x} = 10^{x^2}$ is

A. 1

B. 2

C. $-\log_{10}(250)$

D. $\log_{10} 4 - 3$

Answer: B::C::D

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3. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$, then which of the following is/are true?

$zyz = 1$ (b) $x^a y^b z^c = 1$ $x^{b+c} y^{c+b} = 1$ (d) $xyz = x^a y^b z^c$

A. $xyz = 1$

B. $x^a y^b z^c = 1$

C. $x^{b+c}y^{c+a}z^{a+b}=1$

D. $xyz=x^{a}y^{b}z^{c}$

Answer: A::B::C::D

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4. If $(\log)_{k}x\log_{5}k=(\log)_{x}5, k\neq 1, k>0,$ then x is equal to k (b) 1/5 (c) 5 (d) none of these

A. k

B. $1/5$

C. 5

D. none of these

Answer: B::C

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5. If $p, q \in N$ satisfy the equation $x^{\sqrt{x}} = \left(\sqrt{x}\right)^{x}$, then

A. p+q=5

B. $|p - q| = 4$

C. pq=4

D. if $\log_q p$ is defined, then $\log_p q$ is not and vice versa

Answer: A::C::D

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6. Which of the following, when simplified, reduces to unity?

$(\log)_{10}5\log_{10}20 + \left((\log)_{10}2\right)^2$. (c) $-(\log)_5(\log)_3\sqrt{5\sqrt{9}}\,\frac{1}{6}(\log)_{\frac{\sqrt{3}}{2}}\left(\frac{64}{27}\right)$

A. $\log_{10} 5 \cdot \log_{10} 20 + (\log_{10} 2)^2$

B. $\dfrac{2\log 2 + \log 3}{\log 48 - \log 4}$

C. $-\log_5 \log_3 \sqrt{\sqrt[5]{9}}$

D. $\dfrac{1}{6}\log_{\sqrt{3}/2}\left(\dfrac{64}{27}\right)$

Answer: A::B::C

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7. If $(\log)_a x = b$ for permissible values of $aandx$, then identify the statement(s) which can be correct. If $aandb$ are two irrational numbers, then x can be rational. If a is rational and b is irrational, then x can be rational. If a is irrational and b is rational, then x can be rational. If $aandb$ are rational, then x can be rational.

A. If a and b are two irrational numbers, then x can be retional.

B. If a is rational and b is irrational, then x can be rational.

C. If a is irrational and b is rational, then x can be rational.

D. If a and b are rational, then x can be rational.

Answer: A::B::C::D

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8. The number of solutions of the equation $\log_{x+1}(x-0.5) = \log_{x-0.5}(x+1)$ is

A. two real solutions

B. no prime solution

C. one integral solution

D. no irrational solution

Answer: B::C::D

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9. The equation $\sqrt{1+\log_x \sqrt{27}}\log_3 x + 1 = 0$ has

A. no integral solution

B. one irrational solution

C. two real solutions

D. no prime solution

Answer: A::D

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10. If $\log_{1/2}(4-x) \geq \log_{1/2} 2 - \log_{1/2}(x-1)$,then x belongs to

A. $(1, 2]$

B. $[3, 4)$

C. $(1, 3]$

D. $[1, 4)$

Answer: A::B

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11. If the equation $x^{\log_a x^2} = \frac{x^{k-2}}{a^k}, a \neq 0$has exactly one solution for x, then the value of k is/are

A. $6+4\sqrt{2}$

B. $2+6\sqrt{3})$

C. $6-4\sqrt{2}$

D. $2-6\sqrt{3}$

Answer: A::C

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12. The set of real values of x satisfying the equation $|x-1|^{\log_3(x^2)-2\log_x(9)}=(x-1)^7$

A. $\frac{1}{\sqrt{3}}$

B. 1

C. 2

D. 81

Answer: C::D

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13. If x = 9 is one of the solutions of $\log_e\left(x^2+15a^2\right)-\log_e(a-2)=\log_e\left(\frac{8ax}{a-2}\right)$,then

A. $a=\frac{3}{5}$

B. a = 3

C. x = 15

D. x = 2

Answer: B

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14. In which of the following, $m>n(m,n\in R)$?

A. $m=(\log_2 5)^2$ and $n=\log_2 20$

B. $m=\log_{10}2$ and $n=\log_{10}\sqrt[3]{10}$

C. $m = \log_{10} 5 \cdot \log_{10} 20$ and $n = 1$

D. $m = \log_{1/2}\left(\frac{1}{3}\right)$ and $n = \log_{1/3}\left(\frac{1}{2}\right)$

Answer: A::D

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15. if $\log_{10} 5 = a$ and $\log_{10} 3 = b$ then:

A. $\log_{30} 8 = \frac{3(1-a)}{b+1}$

B. $\log_{40} 15 = \frac{a+b}{3-2a}$

C. $\log_{243} 32 = \frac{1-a}{b}$

D. none of these

Answer: A::B::C

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16. The value of $\frac{6a^{\log_e b}(\log_{a^2} b)(\log_{b^2} a)}{e^{\log_e a \cdot \log_e b}}$ is

A. independent of a

B. independent of b

C. dependent on a

D. dependent on b

Answer: A::B

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17. The inequality $\sqrt{x^{(\log)_2 \sqrt{x}}} \geq 2$ is satisfied by only one value of x (b) $x \in \left(\frac{0,1}{4}\right)$ $x \in [4, \infty)$ (d) $x \in (1, 2)$

A. only one value of x

B. $x \in \left(0, \frac{1}{4}\right]$

C. $x \in [4, \infty)$

D. $x \in (1, 2)$

Answer: B::C

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Exercise Comprehension

1. Consider the system of equations

$\log_3(\log_2 x) + \log_{1/3}\left(\log_{1/2} y\right) = 1$ and $xy^2 = 9$.

The value of x in the interval

A. $(200, 300)$

B. $(400, 500)$

C. $(700, 800)$

D. none of these

Answer: C

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2. Consider the system of equations

$\log_3(\log_2 x) + \log_{1/3}\left(\log_{1/2} y\right) = 1$ and $xy^2 = 9.$

The value of 1/y lies in the interval

A. $(5, 7)$

B. $(7, 10)$

C. $(11, 15)$

D. $(25, 30)$

Answer: B

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3. Consider equations $x^{\log_y x} = 2$ and $y^{\log_x y} = 16.$

The value of x is

A. $2^{\sqrt[3]{2}}$

B. $2^{\sqrt[3]{4}}$

C. $2^{\sqrt[3]{64}}$

D. $2\sqrt[3]{256})$

Answer: B

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4. Solve $x^{(\log)_y x} = 2 and y^{(\log)_x y} = 16$

A. $2^{\sqrt[3]{2}}$

B. $2^{\sqrt[3]{4}}$

C. $2^{\sqrt[3]{128}}$

D. $2^{\sqrt[3]{16}}$

Answer: D

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5. $2\left(\sqrt{\log_a(ab)^{\frac{1}{4}}+\log_b(ab)^{\frac{1}{4}}}-\sqrt{\log_a\left(\frac{b}{a}\right)^{\frac{1}{4}}+\log_b\left(\frac{a}{b}\right)^{\frac{1}{4}}}\right)\sqrt{\log_a(b)}=$

A. 1

B. 2

C. $2^{\log_a b}$

D. $2^{\log_b a}$

Answer: C

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6. $2\left(\sqrt{\log_a(ab)^{\frac{1}{4}}+\log_b(ab)^{\frac{1}{4}}}-\sqrt{\log_a\left(\frac{b}{a}\right)^{\frac{1}{4}}+\log_b\left(\frac{a}{b}\right)^{\frac{1}{4}}}\right)\sqrt{\log_a(b)}=$

A. 1

B. 2

C. $2^{\log_a b}$

D. $2^{\log_b a}$

Answer:

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Exercise Matrix

1. Match the following List I to List II

List I	List II
a. The smallest integer greater than $\frac{1}{\log_3 \pi} + \frac{1}{\log_4 \pi}$ is	p. 10
b. Let $3^a = 4$, $4^b = 5$, $5^c = 6$, $6^d = 7$, $7^e = 8$, and $8^f = 9$. Then the value of the product $(abcdef)$ is	q. 3
c. Characteristic of the logarithm of 2008 to the base 2 is	r. 1
d. If $\log_2(\log_2(\log_3 x)) = \log_2(\log_3(\log_2 y)) = 0$, then the value of $(x - y)$ is	s. 2

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2.

List I	LIst II
a. $2^{\log_{(2\sqrt{2})} 15}$ is	p. rational
b. $\sqrt[3]{\left(5^{1/\log_7 5} + \frac{1}{\sqrt{(-\log_{10} 0.1)}}\right)}$ is	q. irrational
c. $\log_3 5 \cdot \log_{25} 27$ is	r. composite
d. Product of roots of equation $x^{\log_{10} x} = 100\,x$ is	s. prime

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3.

List I	List II
a. The value of $\log_2 \log_2 \log_4 256 - \log_{\sqrt{2}} 4$ is	p. 1
b. If $\log_3 (5x-2) - 2\log_3 \sqrt{3x+1} = 1 - \log_3 4$, then $x =$	q. 6
c. Product of roots of the equation $7^{\log_7 x^2 - 4x - 5} = (x-1)$ is	r. 3
d. Number of integers satisfying $\log_2 \sqrt{x} - 2(\log_{\frac{1}{4}} x)^2 - 1 > 0$ are	s. 5

A. $\begin{matrix} a & b & c & d \\ s & p & q & r \end{matrix}$

B. $\begin{matrix} a & b & c & d \\ s & p & q & r \end{matrix}$

C. $\begin{matrix} a & b & c & d \\ q & r & p & s \end{matrix}$

D. $\begin{matrix} a & b & c & d \\ r & p & q & s \end{matrix}$

Answer: A

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Exercise Numerical

1. If $\log_a b = 2, \log_b c = 2,$ and $\log_3 c = 3 + \log_3$ a,then the value of c/(ab)is _____.

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2. The value of $(\log_{10} 2)^3 + \log_{10} 8 \cdot \log_{10} 5 + (\log_{10} 5)^3$ is _____.

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3. If $\log_4 A = \log_6 B = \log_9(A + B),$ then $[4(B/A)]$(where $[\cdot]$ represents the greatest integer function) equals _____.

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4. Integral value of x which satisfies the equation $= \log_6 54 + (\log)_x 16 = (\log)_{\sqrt{2}} x - (\log)_{36}\left(\frac{4}{9}\right) is..$

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5. If $a = \log_{245} 175$ and $b = \log_{1715} 875$, then the value of $\frac{1-ab}{a-b}$ is _____.

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6. The difference of roots of the equation $\left(\log_{27} x^3\right)^2 = \log_{270x^6}$ is _____.

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7. Sum of integral values of x satisfying the inequality $3^{\left(\frac{5}{2}\right)\log_3(12-3x)} - 3^{\log_2(x)} > 32$

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8. The least integer greater than $\log_2 15 \cdot \log_{1/62 \cdot \log_3 1/6}$ is _____.

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9. The reciprocal of $\frac{2}{\log_4 (2000)^6} + \frac{3}{\log_5 (2000)^6}$ is _____.

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10. Sum of integers satisfying $\sqrt{\log_2 x - 1} - 1/2 \log_2 \left(x^3\right) + 2 > 0$ is _____.

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11. Number of integers satisfying the inequality $\log_{1/2} |x - 3| > -1$ is _____.

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12. Number of integers ≤ 10 satisfying the inequality $2\log_{1/2}(x-1) \leq \frac{1}{3} - \frac{1}{\log_{x^2-x} 8}$ is _____.

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13. The value of $\left(\sqrt{3+2\sqrt{2}} + \sqrt{3-2\sqrt{2}}\right)^{2^9}$ is _____.

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14. The value of $5^{(\log)_{\frac{1}{5}}\left(\frac{1}{2}\right)} + (\log)_{\sqrt{2}} \frac{4}{\sqrt{7}+\sqrt{3}} + (\log)_{\frac{1}{2}} \frac{1}{10+2\sqrt{21}}$ is.....

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15. The value of $N = \frac{(\log)_5 250}{(\log)_{50} 5} - \frac{(\log)_5 10}{(\log)_{1250} 5}$ is.....

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16. if $x + \log_{10}(1 + 2^x) = x \log_{10} 5 + \log_{10} 6$ then x

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17. The x, y, z are positive real numbers such that $(\log)_{2x} z = 3, (\log)_{5y} z = 6, and (\log)_{xy} z = \frac{2}{3}$, then the value of $\left(\frac{1}{2z}\right)$ is .....

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18. If $a = \log_{12} 18$ and $b = \log_{24} 54$ then find the value of $ab + 5(a - b)$

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Jee Previous Year

1. the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has.

A. infinite number of real roots

B. no real roots

C. exactly one real root

D. exactly four real roots

Answer: B

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2. Let (x_0, y_0) be the solution of the following equations In $(2x)^{In2} = (3y)^{\ln 3}$ and $3^{\ln x} = 2^{\ln y}$ Then x_0 is

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

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

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

D. 6

Answer: C

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3. If $3^x = 4^{x-1}$, then x =

A. $\frac{2\log_3 2}{2\log_3 2 - 1}$

B. $\frac{2}{2 - \log_2 3}$

C. $\frac{1}{1 - \log_4 3}$

D. $\frac{2\log_2 3}{2\log_2 3 - 1}$

Answer: A::B::C

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4. The value of

$$6+\log_{3/2}\left(\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\ldots}}}\right)$$ is _____.

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5. The value of $\left((\log_2 9)^2\right)^{\frac{1}{\log_2(\log_2 9)}} \times \left(\sqrt{7}\right)^{\frac{1}{\log_4 7}}$ is _____.

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