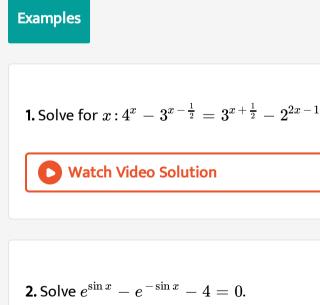




MATHS

BOOKS - CENGAGE

LOGARITHM AND ITS PROPERTIES



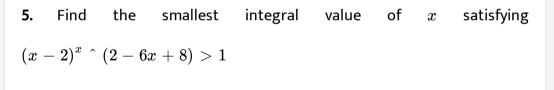
. Solve
$$e^{\sin x} - e^{-\sin x} - 4 = 0.$$

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



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

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

7. Find the value of $(\log)_{2\sqrt{3}}1728$.



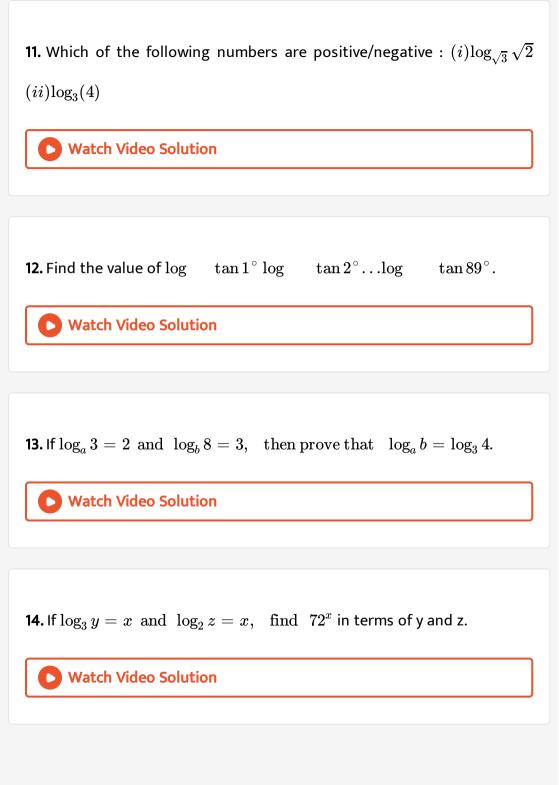
8. Prove that
$$rac{2}{5} < \log_{10} 3 < rac{1}{2}.$$

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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.



15.

$$rac{x(y+z-x)}{\log x} = rac{y(z+x-y)}{\log y} rac{z(x+y-z)}{\log z}, prover hat x^y y^x = z^x y^z = x^z$$

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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 $\frac{1}{x^{\log y}} + \frac{1}{(\log z)} \frac{1}{y^{\log z}} + \frac{1}{(\log x)} \frac{1}{z^{\log x}} + \frac{1}{(\log y)}$ Watch Video Solution

17. Solve
$$: 2(25)^x - 5(10^x) + 2(r^x) \ge 0.$$

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18. Find the number of solution to equation $\left(\log\right)_2(x+5)=6-x$:

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



20. Find the value of the following:

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

- (ii) $\log_3\left(\sqrt{11}-\sqrt{2}
 ight)+\log_3\left(\sqrt{11}+\sqrt{2}
 ight)$
- (iii) $\log_7 35 \log_7 5$

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21. Find the value of $\log_2(2\sqrt[3]{9}-2) + \log_2(12\sqrt[3]{3}+4+4\sqrt[3]{9}).$

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



23. If
$$(\log)_e\left(rac{a+b}{2}
ight) = rac{1}{2}\left((\log)_e a + (\log)_e b
ight)$$
, 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? $f_1(x) = 2(\log)_2 x and f_2(x) = (\log)_{10} x^2$ $f_1(x) = (\log)_{\times}^2 and f_2(x) = 2$ $f_1(x) = (\log)_{10}(x-2) + (\log)_{10}(x-3)and f_{2(x)} = (\log)_{10}(x-2)(x-3)$ Watch Video Solution

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

26. If sum $\log_2 x + \log_4 x + \log_{16} x + \log_{256} x + \ldots = 6$, then find the value of x.

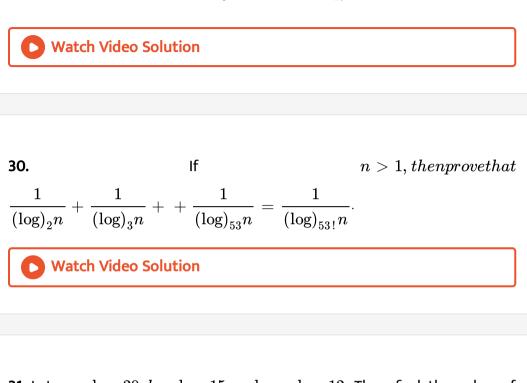
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27. Suppose that a and b are positive real numbers such that $\log_{27}a + \log_9(b) = \frac{7}{2}$ and $\log_{27}b + \log_9a = \frac{2}{3}$. Then the value of the ab equals

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

29. Which is greater: $x = (\log)_3 5$ or $y = (\log)_{17} 25$?



31. Let
$$a = \log_3 20, b = \log_4 15$$
 and $c = \log_5 12$. Then find the value of $\frac{1}{a+1} + \frac{1}{b+1} + \frac{1}{c+1}$.

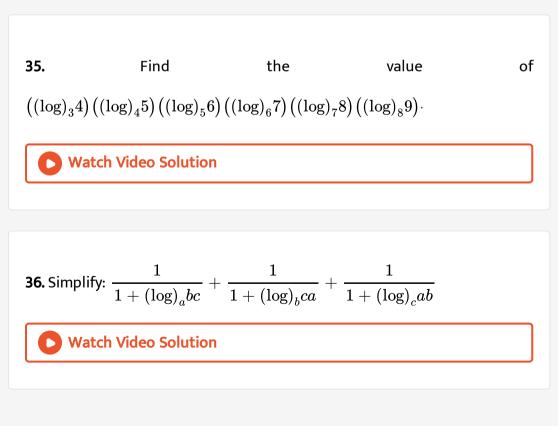
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32. If $\log_a(ab) = x$ then $\log_b(ab)$ is equals to

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



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



$$x = (\log)_{2a}a, y = (\log)_{3a}2a, z = (\log)_{4a}3a, prove that 1 + xyz = 2yz$$

38. If $(\log)_b a (\log)_c a + (\log)_a b (\log)_c b + (\log)_a c (\log)_a 3$ (where a, b, c are

different positive real numbers \neq 1), then find the value of ab \cdot

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

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

41. Prove that
$$\frac{2^{(\log)_{2}\frac{1}{4}x} - 3^{\log} - (27)(x^{2} + 1)^{3} - 2x >}{7^{4(\log)_{40}x} - x - 1} = 0$$

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

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



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

47. Solve:
$$(\log)_2(4x3^x - 6) - (\log)_2(9^x - 6) = 1.$$

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

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49. Solve: $4^{(\log)_2 \log x} = \log x - (\log x)^2 + 1(base ise)$.

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

51. Solve
$$4^{(\log)_9 x} - 6^{(\log)_9 2} + 2^{(\log)_3 27} = 0$$

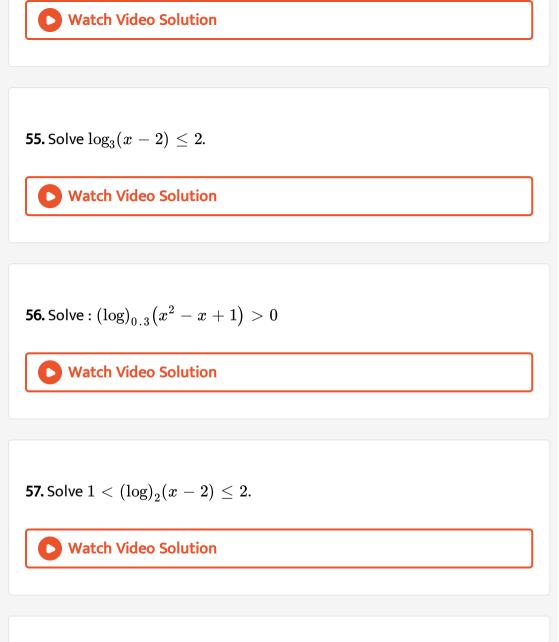
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52. Solve:
$$rac{1}{4}x^{\log_2\sqrt{x}}=\left(2.\ x^{\,(\log)_{\,2}x}
ight)^{rac{1}{4}}$$

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

54. Solve
$$(\log)_2(x-1) > 4$$
.



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



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

60. Solve :
$$(\log)_2rac{x-1}{x-2}>0$$

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

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

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

64. Solve
$$:\left(\log
ight)_{\left(\left.x+3
ight)}\left(x^{2}-x
ight)<1$$

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

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

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

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

69. Solve:
$$rac{x-1}{\left(\log
ight)_3(9-3^x
ight)}\leq 1.$$

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

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71. Write the characteristic of each of the following numbers by using their standard forms: (i) 1235.5 (ii) 346.41 (iii) 62.723 (iv)

 7.12345 (v) 0.35792 (vi) 0.034239 (vii) 0.002385 (viii) 0.0009468

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

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





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.

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 solutions of equation $2^x + 3^x + 4^x - 5^x = 0$

86. Let
$$a, b, c, d$$
 be positive integers such that
 $(\log)_a b = \frac{3}{2} and (\log)_c d = \frac{5}{4}$. If $(a - c) = 9$, then find the value of $(b - d)$.

87. If $a \ge b > 1$, then find the largest possible value of the expression $(\log)_a \left(\frac{a}{b}\right) + (\log)_b \left(\frac{b}{a}\right).$

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88. If
$$y = a^{rac{1}{1-(\log)_a x}} and z = a^{rac{1}{1-(\log)_a y}}, then prove that x = a^{rac{1}{1-(\log)_a x}}$$

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

90. Solve
$$3^{(\log_9 x)^2 - \frac{9}{2}\log_9 x + 5} = 3\sqrt{3}$$
.
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91. Solve for: $x: (2x)^{(\log)_9 2} = (3x)^{(\log)_9 3}$.
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92. Solve the equations for $xandy: (3x)^{\log 3} = (4y)^{\log g4}, 4^{\log x} = 3^{\log y}$.
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93. Solve $(\log)_{2x} 2 + (\log)_4 2x = -3/2$.
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$$\left(\log\right)_{\left(\,2x\,+\,3\,
ight)}\left(6x^{2}\,+\,23\,+\,21
ight)\,+\,\left(\log
ight)_{\left(\,3x\,+\,7\,
ight)}\left(4x^{2}\,+\,12x\,+\,9
ight)\,=\,4$$

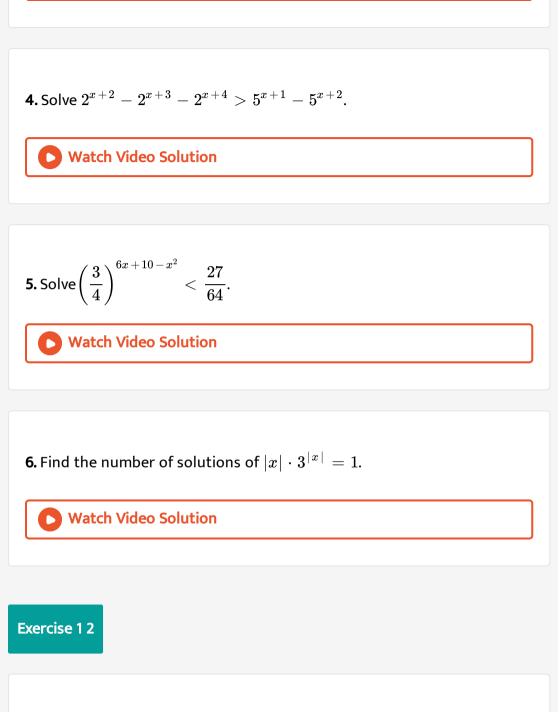


1. For
$$x \leq 2$$
, solve $x^3 3^{|x-2|} + 3^{x+1} = x^3 \cdot 3^{x-2} + 3^{|x-2|+3}$

2. Solve
$$\left(rac{1}{2}
ight)^{x^6-2x^4} < 2^{\left(\,x\,
ight)^2}.$$

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3. Solve for x and y : $y^x = x^y, x = 2y$.Find the value of x + y



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



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

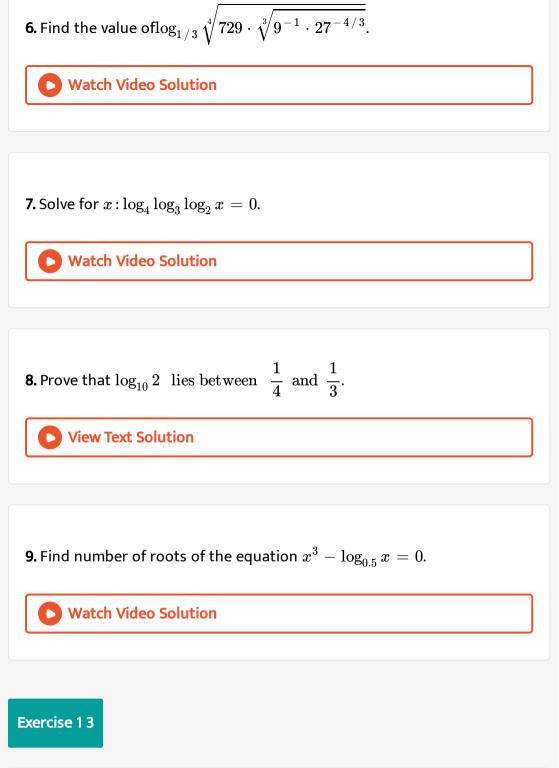
3. If
$$\log_{\sqrt{8}} b = 3\frac{1}{3}$$
, then find the value of b.

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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.



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
$$rac{2}{3} < (\log)_{10} 3 < rac{1}{2}$$
 .

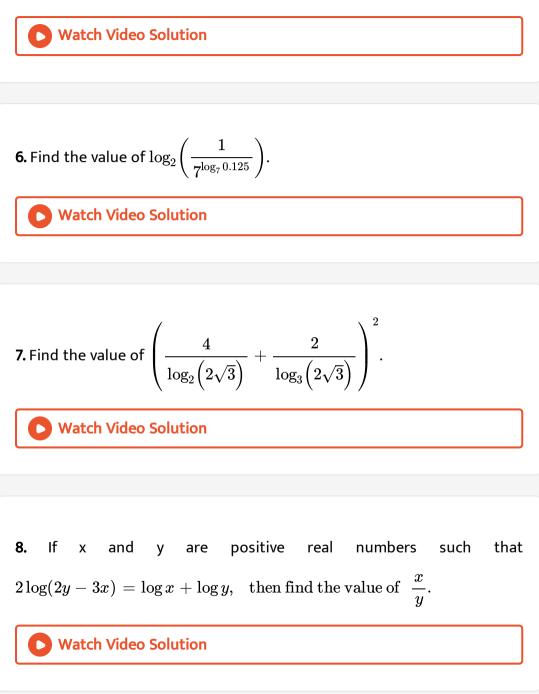
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3. Prove that
$$\log_7 \log_7 \sqrt{7\sqrt{(7\sqrt{7})}} = 1 - 3\log_7 2.$$

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

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



9. If
$$a^2+b^2=7$$
ab, show that $\mathsf{log}igg(rac{a+b}{3}igg)=rac{1}{2}$ (log a + log b).



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

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

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12. If $y^2 = xzanda^x = b^y = c^z, ext{ then prove that } (\log)_6 a = (\log)_c b$.

13. Prove the following identities:

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

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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 $\log_a(bcd)=xigg(rac{1}{y}+rac{1}{z}+rac{1}{w}igg).$

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16. Find the value of
$$\left(\frac{1}{49}\right)^{1+(\log)_{7}^{2}}+5^{-1(\log)(\frac{1}{5})^{(7)}}$$

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

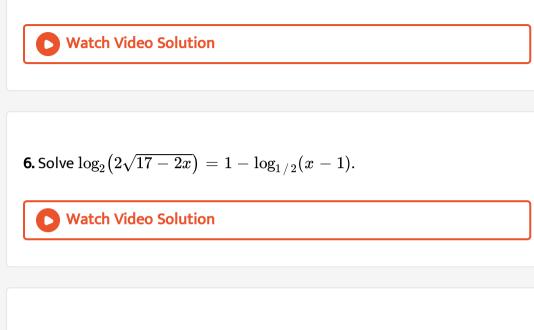
2. Solve
$$\log_4ig(2 imes 4^{x\,-2}-1ig)+4=2x.$$

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

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

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



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

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

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

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

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

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

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



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



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

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

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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.

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



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

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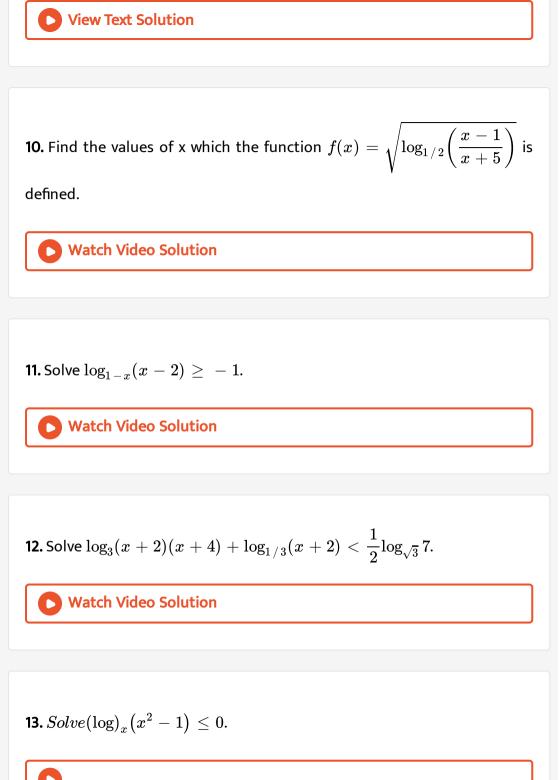
7. Solve
$$\log_{0.2}.rac{x+2}{x}\leq 1.$$

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

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



Exercise 16

1. If $\log_{10}2 = 0.3010~{
m and}~\log_{10}3 = 0.477$, then find the number of digits

in the following numbers:

(a) 3^{40} $(b)2^{22} imes 5^{25}(c)24^{24}$

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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.

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 $\frac{ab^2}{c}$.

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



2. The number of $N-6 = 6(\log)_{10}2 + (\log)_{10}31$ lies between two successive integers whose sum is equal to 5 (b) 7 (c) 9 (c) 10

A. 5 B. 7

C. 9

D. 10

Answer: B

3. Given that $\log(2) = 0.3010$, the number of digits in the number 2000^{2000} is 6601 (b) 6602 (c) 6603 (d) 6604

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 0 (b) 1 (c) 2 (d) 4

A. 0

B. 1

C. 2

Answer: C



5. The value of $\log ab - \log |b| = |\log a|$ (b) $\log |a||$ (c) $-\log a$ (d) none of

these

A. log a

 $\mathsf{B}.\log|a|$

 $C. - \log a$

D. none of these

Answer: B

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

A. log b

B. log a

C. 2

D. 1

Answer: A

3

7. If
$$\frac{a + (\log)_4 3}{a + (\log)_2 3} = \frac{a + (\log)_8 3}{a + (\log)_4 3} = b$$
, then is equal < $o \frac{1}{2}$ (2) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d)
 $\frac{3}{2}$
A. $\frac{1}{2}$
B. $\frac{2}{3}$
C. $\frac{1}{2}$

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

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

9. The value of
$$\frac{1+2(\log)_3 2}{(1+(\log)_3 2)^2} + ((\log)_6 2)^2$$
 is 2 (b) 3 (c) 4 (d) 1
A. 2
B. 3
C. 4
D. 1

Answer: D

10. If
$$(\log)_4 5 = aand (\log)_5 6 = b$$
, 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
$$(\log)_{10} 2 = a$$
, $(\log)_{10} 3 = bthen(\log)_{0.72}(9.6)$ in terms of $aandb$ is
equal to $\frac{2a + 3b - 1}{5a + b - 2}$ (b) $\frac{5a + b - 1}{3a + 2b - 2}$ (c) $\frac{3a + b - 2}{2a + 3b - 1}$ $\frac{2a + 5b - 2}{3a + b - 1}$
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

12. There exists a natural number N which is 50 times its own logarithm to the base 10, then N is divisible by 5 (b) 7 (c) 9 (d) 11

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 3 (b) 0 (c) 2 (d) 1
A. 3
B. 0

C. 2

Answer: A

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14.
$$(\log)_{x-1} x (\log)_{x-2} (x-1) (\log)_{x-12} (x-11) = 2, x$$
 is equal to: 9 (b)

16 (c) 25 (d) none of these

A. 9

B. 16

C. 25

D. none of these

Answer: B

15. If
$$f(x) = \log\left(\frac{1+x}{1-x}\right)$$
, then $f(x_1)f(x) = f(x_1+x_2)$
 $f(x+2) - 2f(x+1) + f(x) = 0$ $f(x) + f(x+1) = f(x^2+x)$
 $f(x_1) + f(x_2) = f\left(\frac{x_1+x_2}{1+x_1x_2}\right)$
A. $f(x_1) \cdot f(x_2) = f(x_1+x_2)$
B. $f(x+2) - 2f(x+1) + f(x) = 0$
C. $f(x) + f(x+1) = f(x^2+x)$
D. $f(x_1) + f(x_2) = f\left(\frac{x_1+x_2}{1+x_1x_2}\right)$

Answer: D

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16. about to only mathematics

A. 9/5

B. 4

C. 5

D.8/5

Answer: A



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



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 1 (b) $(\log)_2 3 - (\log)_3 2 \log\left(\frac{3}{2}\right)$ (d) none of these

A. 1

 $\mathsf{B.}\log_2 3 - \log_3 2$

 $C.\log(3/2)$

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



20.	The	value	of	x	satisfying	the	equation
$3\sqrt{5}^{\log}$ _ $55^{\left(\left(\log ight)_{5}\left(\log ight)_{5}\log_{5}\left(rac{x}{2} ight) ight)}$ 1 (b) 3 (c) 18 (d) 54							
A.	1						
B.	3						
C.	18						
с.	10						
D.	54						
Answer: D							

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

number composite number (d) irrational

A. odd integer

B. prime number

C. composite number

D. irrational

Answer: B

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22. if $(\log)_y x + (\log)_x y = 1, x^2 + y = 12$, the value of xy is 9 (b) 12 (c) 15 (d) 30

A. 9

B. 12

C. 15

D. 21

Answer: A



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



24. If
$$(x + 1)^{(\log)_{10}(x+1)} = 100(x + 1)$$
, then

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

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

A. 2

B. 65/8

C.37/6

D. none of these

Answer: D

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

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

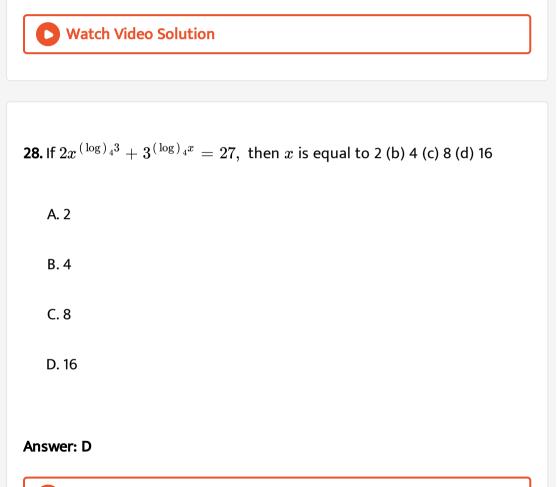
A. 2

B. 4

C. 8

D. 16

Answer: B



29.

 $\log_4(2-x) + \log_{0.25}(2+x) = \log_4(1-x) + \log_{0.25}(2x+1)$ 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 value of *b* for which the equation

$$2(\log)_{\frac{1}{25}}(bx+28) = -(\log)_5(12-4x-x^2)$$
 has coincident roots is
 $b = -12$ (b) $b = 4$ or $b = -12$ $b = 4$ or $b = -12$ (d)
 $b = -4$ or $b = 12$

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

 $\mathsf{B}.\,x+\log_2(1-2^x)$

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

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

Answer: B



32. The number of solution of $x^{\log}x(x+3)^2=16$ is a)0 (b) 1 (c) 2 (d) ∞

A. 0

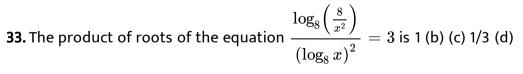
B. 1

C. 2

D. ∞

Answer: A

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1/4

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. Then the number of roots equation $a^{2(\log)_2 x}=15+4x^{(\log)_2 a}$ is 2 (b) infinite (c) 0 (d) 1

A. 2

B. infinite

C. 0

D. 1

Answer: D

35. The number of roots of the equation $(\log)_{3\sqrt{x}}x + (\log)_{3x}\sqrt{x} = 0$ is 1 (b) 2 (c) 3 (d) 0

- A. 1
- B. 2
- C. 3
- D. 0

Answer: B

36. The set of all
$$x$$
 satisfying the equation
 $x^{\log} - 3x^2 + ((\log)_3 x)^{2-10} = \frac{1}{x^2} is \ 1 \ (b) \ 2 \ (c) \ 3 \ (d) \ 0$
A. $\{1, 9\}$
B. $\{1, 9, 1/81\}$
C. $\{1, 4, 1/81\}$

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

Answer: B

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37. Number of real values of x satisfying the equation $(\log)_2(x^2-x)(\log)_2\left(\frac{x-1}{x}\right) + ((\log)_2x)^2 = 4$, is 0 (b) 2 (c) 3 (d) 7

A. 0

B. 2

C. 3

D. 7

Answer: B

38. Find the value of x satisfying the equations $log_3(log_2 x) + log_{1/3}(log_{1/2} y) = 1$ and $xy^2 = 9$ 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. $x_1 = x_2^2$

 $\mathsf{C}.\, 2x_1=x_2^2$

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

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



43. If $S = \left\{x \in R: \left((\log)_{0.6} 0.\ 216\right) (\log)_5 (5-2x) \le 0\right\}$, 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

 $\begin{array}{l} \textbf{44. Solution set of the inequality } \frac{1}{2^x-1} > \frac{1}{1-2^{x-1}} \ \text{is } 1,\infty) \ \text{(b)} \\ 0, \left(\log\right)_2 \left(\frac{4}{3}\right) \text{(c)} \left(-1,\infty\right) \left(0, \left(\log\right)_2 \left(\frac{4}{3}\right) \cup (1,\infty) \end{array}\right) \end{array}$

A. $(1,\infty)$

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

 $\mathsf{C.}\,(\,-1,\infty)$

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

Answer: D

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45. If $(\log)_2 x + (\log)_2 y \ge 6$, then the least value of x + y is 4 (b) 8 (d) 16 (d) 32

A. 4

B. 8

C. 16

D. 32

Answer: C

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 $(\log)_{10}(x^2 - 16) \leq (\log)_{10}(4x - 11) \text{ is } 4, \infty)$ (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 $(\log)_{0.8} igg((\log)_6 rac{x^2 + x}{x+4} igg) < 0$ is)`

A.
$$(-4, -3)$$

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

$$\mathsf{C.}\left(-3,\infty
ight)$$

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

Answer: D

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

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

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

D. none of these

Answer: C

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

to
$$2,\infty$$
) (b) $\left(2,\frac{1+\sqrt{21}}{2}\right)$ $\left(\frac{1-\sqrt{21}}{2},\frac{1+\sqrt{21}}{2}\right)$ (d) $\left(\frac{1+\sqrt{21}}{2},\infty\right)$

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



Exercise Multiple

1. For
$$a > 0, \neq 1$$
, the roots of the equation
 $(\log)_{ax}a + (\log)_xa^2 + (\log)_{a^2a}a^3 = 0$ 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



2. The real solutions of the equation 2^{x+2} . $5^{6-x} = 10^x$ ^ 2 is/are 1 (b) 2

(c) $\left(\log\right)_{10}(250)$ (d) $\left(\log\right)_{10}4-3$

A. 1

B. 2

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

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

Answer: B::C::D

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? A. xyz = 1B. $x^ay^bz^c = 1$ C. $x^{b+c}y^{c+a}z^{a+b} = 1$ D. $xyz = x^ay^bz^c$

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

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4. If $(\log)_k x \log_5 k = (\log)_x 5, k
eq 1, k > 0$, 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 $x^x = (\sqrt{x})^2$, then pandq are relatively prime (b) twin prime (c) coprime if $(\log)_q p$ is defined, then $(\log)_p q$ is not and vice versa

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



6. Which of the following, when simplified, reduces to unity? $(\log)_{10}5\log_{10}20 + ((\log)_{10}2)^2 \cdot (c) - (\log)_5(\log)_3\sqrt{5\sqrt{9}} \frac{1}{6}(\log)_{\frac{\sqrt{3}}{2}}\left(\frac{64}{27}\right)$

A. $\log_{10} 5 \cdot \log_{10} 20 + (\log_{10} 2)^2$ B. $\frac{2 \log 2 + \log 3}{\log 48 - \log 4}$ C. $-\log_5 \log_3 \sqrt{\sqrt[5]{9}}$ D. $\frac{1}{6} \log_{\sqrt{3}/2} \left(\frac{64}{27}\right)$

Answer: A::B::C



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

Watch Video Solution 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

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)

 $\mathsf{C}.\,(1,\,3]$

D.[1, 4)

Answer: A::B



11. If the equation
$$x^{\log_a x^2} = rac{x^{k-2}}{a^k}, a
eq 0$$
 has exactly one solution for x,

then the value of k is/are

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

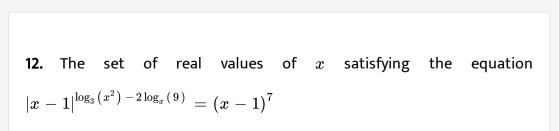
 $\mathsf{B.}\,2+6\sqrt{3})$

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

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

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Answer: A::C



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
 $\log_e(x^2 + 15a^2) - \log_e(a - 2) = \log_e\left(\frac{8ax}{a - 2}\right)$, then
A. $a = \frac{3}{5}$
B. $a = 3$
C. $x = 15$
D. $x = 2$

Answer: B

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

A.
$$m=\left(\log_2 5
ight)^2 ext{ and } n=\log_2 20$$

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.
$$m = \log_{1/2} \left(rac{1}{3}
ight) \, ext{ and } \, n = \log_{1/3} \left(rac{1}{2}
ight)$$

Answer: A::D

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

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

B. $\log_{40} 15 = rac{a+b}{3-2a}$
C. $\log_{243} 32 = rac{1-a}{b}$

D. none of these

Answer: A::B::C



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

A. independent of a

B. independent of b

C. dependent on a

D. dependent on b

Answer: A::B



17. The inequality $\sqrt{x^{(\log)_2\sqrt{x}}} \ge 2$ is satisfied by (A) only one value of x(B) $x \in \left[0, \left(rac{1}{4}
ight)
ight]$ $(C)x \in [4,\infty]$ (d) $x \in (1,2)$

A. only one value of x

B. $x \in \left(0, rac{1}{4}
ight]$ C. $x \in [4,\infty)$ D. $x \in (1,2)$

Answer: B::C

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Exercise Comprehension

1. Find the value of x satisfying the equations $\log_3(\log_2 x) + \log_{1/3}(\log_{1/2} y) = 1$ and $xy^2 = 9$

A. (200, 300)

B. (400, 500)

C. (700, 800)

D. none of these

Answer: C

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2. Find the value of x satisfying the equations

$$\log_3(\log_2 x) + \log_{1/3}(\log_{1/2} y) = 1$$
 and $xy^2 = 9$
A. (5, 7)
B. (7, 10)
C. (11, 15)

D.(25, 30)

Answer: B

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
$$x^{\,(\log)_y x} = 2andy^{(\log)_x y} = 16$$

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

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

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

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

Answer: D



5.	Prove	that:	`2(sqrt((log)_a4sqrt(a	b)+(l	og)_b4sqrt(a	b))-
(log)_a4sqrt(2	2/b)+(log)_b4sqrt(a/b))dotsqrt((lo	g)_a	b)={2ifbgeqa	>1
2^((log)_a bif	1				
/	4. 1					

B. 2

 $\mathsf{C.}\, 2^{\log_a b}$

D. $2^{\log_b a}$

Answer: B

6. Prove that: `2(sqrt((log)_a4sqrt(a b)+(log)_b4sqrt(a b))-(log)_a4sqrt(2/b)+(log)_b4sqrt(a/b))dotsqrt((log)_a b)={2ifbgeqa >1 2^((log)_a bif1

A. 1

B. 2

 $\mathsf{C.}\, 2^{\log_a b}$

D. $2^{\log_b a}$

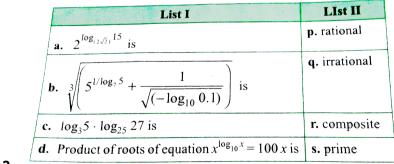
Answer: C

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Exercise Matrix

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 <i>(abcdef)</i> is	q. 3
c. Characteristic of the logarithm of 2008 to the base 2 is	r. 1
1. 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.

1.

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

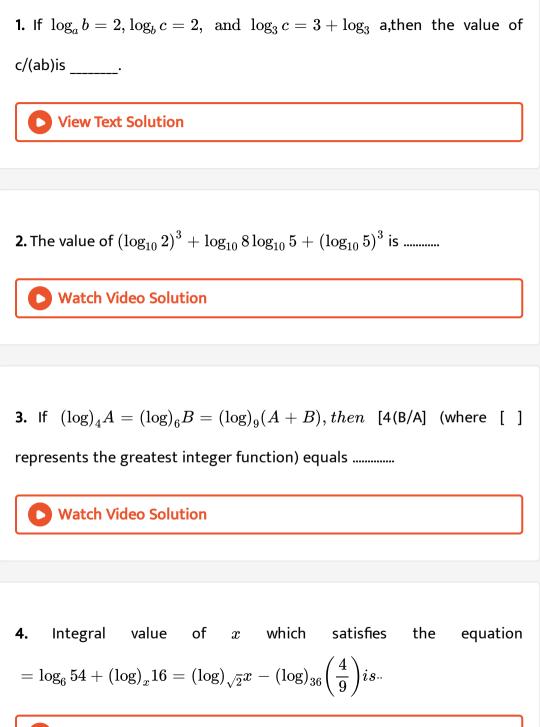
3.

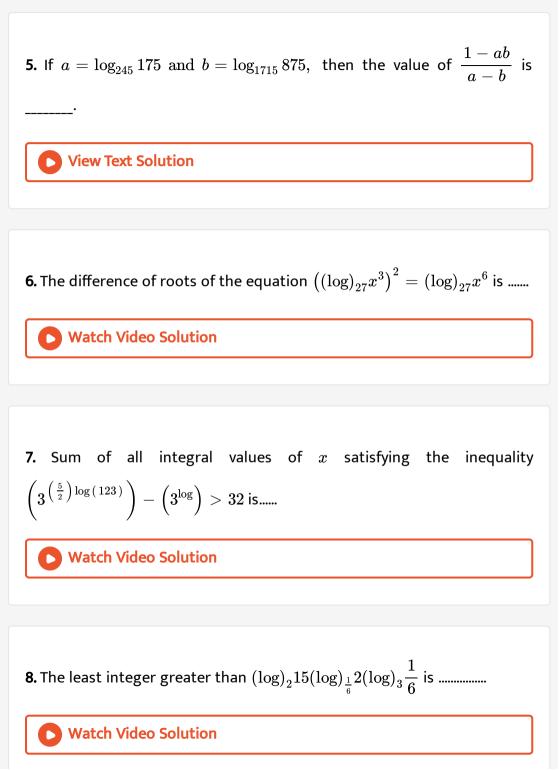


Answer: A

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Exercise Numerical





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 $\sqrt{(\log)_2 x - 1} - \frac{1}{2}(\log)_2(x^3) + 2 > 0$
is.....
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11. Number of integers satisfying the inequality $(\log)_{\frac{1}{2}}|x-3| > 1$ is.....
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12. Number of integers ≤ 10 satisfying the inequality $2(\log)_{\frac{1}{2}}(x-1) \leq \frac{1}{3} - \frac{1}{(\log)_{x^2-x}8}$ is......

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

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

is.....

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

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

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 $a=(\log)_{12}18, b=(\log)_{24}54, ext{ then find the value of } ab+5(a-b).$

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Jee Previous Year

1. Show that the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has no real solution.

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: $(2x)^{1n2} = (3y)^{1n3} 3^{1nx} = 2^{1ny}$ The x_0 is $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) 6

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

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

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

D. 6

Answer: C

3. If
$$3^{x} = 4^{x-1}$$
, then $x = \frac{2(\log_{3}2)}{2(\log_{3}2 - 1)}$ (b) $\frac{2}{2 - (\log_{2}2)} \frac{1}{1 - (\log_{4}3)}$
(d) $\frac{2(\log_{2}2)}{2(\log_{2}2 - 1)}$
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. $\frac{2\log_{2}3}{2\log_{2}3 - 1}$

> / 1

Answer: A::B::C

Watch Video Solution 4. The value of $6 + (\log)_{3/2} \left(\frac{1}{3\sqrt{2}} \sqrt{\sqrt{4 - \frac{1}{3\sqrt{2}}}} \sqrt{4 - \frac{1}{\sqrt{2}}} \sqrt{4 - \frac{1}{3\sqrt{2}}} \right)$ is

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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