Logarithms Questions for XAT

Instructions
For the following questions answer them individually

Question 1

If $log_3 2, log_3(2^x - 5), log_3(2^x - 7/2)$ are in arithmetic progression, then the value of x is equal to

A 5

B 4

C 2

D 3

Answer: D

Explanation:
$2log(2^x - 5) = log2 + log(2^x - 7/2)$
Let $2^x = t$
=> $(t - 5)^2 = 2(t - 7/2)$
=> $t^2 + 25 - 10t = 2t - 7$
=> $t^2 - 12t + 32 = 0$
=> t = 8, 4
Therefore, x = 2 or 3, but 2^x > 5, so x = 3

Question 2

Let $u = (\log_2 x)^2 - 6\log_2 x + 12$ where x is a real number. Then the equation $x^u = 256$, has

A no solution for x

B exactly one solution for x

C exactly two distinct solutions for x

D exactly three distinct solutions for x

Answer: B

Explanation:
$x^u = 256$

Taking log to the base 2 on both the sides,

$u * \log_2 x = \log_2 256$

=>$[(\log_2 x)^2 - 6\log_2 x + 12] * \log_2 x = 8$

$(log_2 x)^3 - 6(log_2 x)^2 + 12log_2 x = 8$

Let $log_2 x = t$

$t^3 - 6t^2 + 12t - 8 = 0$

$(t - 2)^3 = 0$

Therefore, $log_2 x = 2$

=> $x = 4$ is the only solution

Hence, option B is the correct answer.

Question 3

If $log_y x = (a * log_z y) = (b * log_x z) = ab$, then which of the following pairs of values for (a, b) is not possible?

A (-2, 1/2)

B (1,1)

C (0.4, 2.5)

D (π, 1/ π)

E (2,2)

Answer: E

Explanation:
$log_y x = ab$
$a * log_z y = ab => log_z y = b$
$b * log_x z = ab => log_x z = a$
$log_y x = log_z y * log_x z => logx/logy = logy/logz * logz/logx$
$=> \frac{logx}{logy} = \frac{logy}{logx}$
$=> (logx)^2 = (logy)^2$
$=> logx = logy$ or $logx = -logy$
So, x = y or x = 1/y
So, ab = 1 or -1
Option 5) is not possible

XAT Previous Papers

Question 4

If x >= y and y > 1, then the value of the expression $log_x(x/y) + log_y(y/x)$ can never be

A -1

B -0.5

C 0

D 1

Answer: D

Explanation:
$log_x(x/y) + log_y(y/x) = 1 - log_x(y) + 1 - log_y(x)$
$= 2 - (log_x y + 1/log_x y) <= 0$ (Since $log_x y + 1/log_x y >= 2$)
So, the value of the expression cannot be 1.

Question 5

If $\log_2 \log_7 (x^2 - x + 37) = 1$, then what could be the value of ‘x’?

A 3

B 5

C 4

D None of these

Answer: C

Explanation:

$\log_2 \log_7 (x^2 - x + 37)$ = 1

$\log_7 (x^2 - x + 37)$ = 2

$(x^2 - x + 37)$ = 7^2

Given eq. can be reduced to $x^2 - x + 37 = 49$

So x can be either -3 or 4.

Question 6

If $\log_2 x.\log_{64}^{x} 2 = \log_{16}^{x} 2$. Then x is

A 2

B 4

C 16

D 12

Answer: B

Explanation:
$\log_2 x.\log_{64}^{x} 2 = \log_{16}^{x} 2$

i.e. $\frac{logx}{log2} * \frac{log_2}{logx-log64} = \frac{log2}{logx-log16}$

i.e. $\frac{logx*(logx-log16)}{logx-log64}$ = $\log 2$

let t = log x

Therefore, $\frac{t*(t-log16)}{t-log64}$ = $\log 2$

$t^2 - 4*log2*t = t*log2 - 6*(log2)^2$

I.e. $t^2 - 5*log2*t - 6*(log2)^2$ = 0

I.e. $t^2 - 3*log2*t - 2*log2*t - 6*(log2)^2$ = 0

i.e. $t*(t-3*log2) - 2*log2*(t-3*log2)$ = 0

i.e $t = 2*log2$ or $t = 3*log2$

i.e $logx = log4$ or $logx = log8$

therefore $x = 4$ or 8

therefore our answer is option 'B'

Question 7

What is the value of $\sqrt{\frac{a}{b}}$, If $\log_4 \log_4 4^{a-b} = 2\log_4(\sqrt{a}-\sqrt{b})+1$

A -5/3

B 2

C 5/3

D 1

Answer: C

Explanation:
$\sqrt{\frac{a}{b}}$, If $\log_4 \log_4 4^{a-b} = 2\log_4(\sqrt{a}-\sqrt{b}) + \log_4 4$

i.e. $\log_4 \log_4 4^{a-b} = \log_4((\sqrt{a}-\sqrt{b})^2) * 4$

i.e. $\log_4 4^{a-b} = ((\sqrt{a}-\sqrt{b})^2) * 4$

i.e. (a-b)*$\log_4 4 = ((\sqrt{a}-\sqrt{b})^2) * 4$

i.e. a-b = 4a+4b-8 $\sqrt{ab}$

i.e. 3a + 5b - 8 $\sqrt{ab}$ = 0

i.e. 3$\sqrt{\frac{a}{b}}^2$ - 8$\sqrt{\frac{a}{b}}$+5 = 0

put $\sqrt{\frac{a}{b}}$ = t

therefore 3t^2 - 8t + 5 = 0

solving we get t = 1 or t = $\frac{5}{3}$

i.e. $\sqrt{\frac{a}{b}}$ = 1 or $\frac{5}{3}$

but if $\sqrt{\frac{a}{b}}$ = 1 then a=b then $\log_4(\sqrt{a}-\sqrt{b})$ will become indefinite

Therefore $\sqrt{\frac{a}{b}}$ = $\frac{5}{3}$

Therefore our answer is option 'C'

Question 8

Find the value of x from the following equation:
$\log_{10} 3 + \log_{10}(4x+1) = \log_{10}(x+1) + 1$

A 2/7

B 7/2

C 9/2

D None of the above

Answer: B

Explanation:
$\log_{10} 3 + \log_{10}(4x+1) = \log_{10}(x+1) + 1$ can be written as

$\log_{10} 3 + \log_{10}(4x+1) = \log_{10}(x+1) + \log_{10} 10$

We know that $\log_{10} a + \log_{10} b = \log_{10} ab$

$\log_{10} 3 * (4x+1) = \log_{10}(x+1) * 10$

$12x + 3 = 10x + 10$

$x = 7/2$. Hence, option B is the correct answer.

Question 9

If $\log 3, log(3^x - 2)$ and $log(3^x + 4)$ are in arithmetic progression, then x is equal to

A $\frac{8}{3}$

B $\log_3 8$

C $\log_2 3$

D 8

Answer: B

Explanation:

If $log3, log(3^x - 2)$ and $log(3^x + 4)$ are in arithmetic progression

Then, $2 * log(3^x - 2) = log3 + log(3^x + 4)$

Thus, $log(3^x - 2)^2 = log3(3^x + 4)$

Thus, $(3^x - 2)^2 = 3(3^x + 4)$

=> $3^{2x} - 4 * 3^x + 4 = 3 * 3^x + 12$

=> $3^{2x} - 7 * 3^x - 8 = 0$

=> $(3^x + 1) * (3^x - 8) = 0$

But $3^x + 1 \neq 0$

Thus, $3^x = 8$

Hence, $x = log_3 8$

Hence, option B is the correct answer.

XAT Decision Making Mock Tests

Question 10

If $log_{10}x - log_{10}\sqrt[3]{x} = 6log_x 10$ **then the value of x is**

A 10

B 30

C 100

D 1000

Answer: D

Explanation:

$\log_{10} x - \log_{10} \sqrt[3]{x} = 6 \log_x 10$

Thus, $\frac{\log x}{\log 10} - \frac{1}{3} * \frac{\log x}{\log 10} = 6 * \frac{\log 10}{\log x}$

=> $\frac{2}{3} * \frac{\log x}{\log 10} = 6 * \frac{\log 10}{\log x}$

Thus, => $\frac{1}{9} * (\log x)^2 = (\log 10)^2 = 1$

Thus, $(\log x)^2 = 9$

Thus $\log x = 3$ or -3

Thus, $x = 1000$ or $\frac{1}{1000}$

From amongst the given options, 1000 is the correct answer.

Hence, option D is the correct answer.

XAT Previous Papers

XAT Free Mock Test

XAT Decision Making Mock Tests

Download XAT GK PDF