SNS College of Technology(Autonomous)
Coimbatore-35
Academic Year 2023 – 2024 (Even)

UNIT 1 QUANTITATIVE ABILITY III

T4: Logarithms, Equations, Progressions.

Introduction

Logarithm is an important topic that needs to be prepared well for the Quantitative Aptitude. It requires practicing a lot of questions within time. Logarithmic formulas make it easy to solve questions easily in competitive examinations. The following article covers the concepts, formulas, and rules that a learner needs to know before approaching the questions.

Logarithmic function is inverse to the exponential function. A logarithm to the base b is the power to which b must be raised to produce a given number. For example, is equal to the power to which 2 must be raised in order to produce 8. Clearly, 2^3 = 8 so = 3. In general, for b > 0 and b not equal to 1.

Logarithmic identity:
*log(b^x) = x * log(b)*

Product rule:
log(b, xy) = log(b, x) + log(b, y)

Quotient rule:
log(b, x/y) = log(b, x) – log(b, y)

Power rule:
*log(b, x^p) = p * log(b, x)*

Change of base formula:
log(b, x) = log(a, x) / log(a, b)

***Where**:*
***b** is the base of the logarithm*
***x** and y are the arguments of the logarithm*
***p** is a constant*
***a** is a different base, usually chosen to be 10 or e.*

Find the value of x in equation given $8^{x+1} – 8^{x-1} = 63$
Solution:
Take 8^{x-1} common from the eq.
It reduce to
$8^{x-1}(8^2 – 1) = 63$
$8^{x-1} = 1$
Hence, $x – 1 = 0$
$x = 1$

Find the value of x for the eq. given $\log_{0.25}x = 16$
Solution:
$\log_{0.25}x = 16$
It can be write as
$x = (0.25)^{16}$
$x = (1/4)^{16}$
$x = 4^{-16}$

Solve the equation $\log_{12}1728 \times \log_{9}6561$

Solution:

It can be written as:

$\log_{12}(12^3) \times \log_{9}(9^4)$

$= 3\log_{12}12 \times 4\log_{9}9$

$= 3 \times 4 =$ **12**

Question 4: Solve for x : $\log_x 3 + \log_x 9 + \log_x 27 + \log_x 81 = 10$

Solution:

It can be write as:

$\log_x(3 \times 9 \times 27 \times 81) = 10$

$\log_x(3^1 \times 3^2 \times 3^3 \times 3^4) = 10$

$\log_x(3^{10}) = 10$

$10 \log_x 3 = 10$

then, $x = 3$

If log(a + 3) + log(a – 3) = 1 ,then a=?
Solution:
$\log_{10}((a + 3)(a – 3))=1$
$\log_{10}(a^2 – 9) = 1$
$(a^2 – 9) = 10$
$a^2 = 19$
$a = \sqrt{19}$

Solve $1/\log_{ab}(abcd) + 1/\log_{bc}(abcd) + 1/\log_{cd}(abcd) + 1/\log_{da}(abcd)$
Solution:
$=\log_{abcd}(ab) + \log_{abcd}(bc) + \log_{abcd}(cd) + \log_{abcd}(da)$
$=\log_{abcd}(ab * bc * cd * da)$
$=\log_{abcd}(abcd)^2$
$=2 \log_{abcd}(abcd)$
$=2$

If xyz = 10 , then solve $\log(x^n y^n / z^n) + \log(y^n z^n / x^n) + \log(z^n x^n / y^n)$

Solution:

$\log(x^n y^n / z^n * y^n z^n / x^n * z^n x^n / y^n)$

$= \log x^n y^n z^n$

$= \log(xyz)^n$

$= \log_{10} 10^n$

= **n**

Question 8: Find $(121/10)^x = 3$

Solution:

Apply logarithm on both sides

$\log_{(121/10)}(121/10)^x = \log_{(121/10)}3$

$x = (\log 3) / (\log 121 – \log 10)$

$x = (\log 3) / (2 \log 11 – 1)$

Solve $\log(2x^2 + 17) = \log(x - 3)^2$

Solution:

$\log(2x^2 + 17) = \log(x^2 - 6x + 9)$

$2x^2 + 17 = x^2 - 6x + 9$

$x^2 + 6x + 8 = 0$

$x^2 + 4x + 2x + 8 = 0$

$x(x + 4) + 2(x + 4) = 0$

$(x + 4)(x + 2) = 0$

$x = -4, -2$

Question 10: $\log_2(33 - 3^x) = 10^{\log(5 - x)}$. Solve for x.

Solution:

Put $x = 0$

$\log_2(33 - 1) = 10^{\log(5)}$

$\log_2 32 = 5$

$5 \log_2 2 = 5$

$5 = 5$

LHS = RHS