Review Exercise 3

Q.1 Multiple choice Questions. Choose of the correct answer.

(i) **If** $a^x = n$**, then…**

(a) $a = \log_x n$ **(b)** $x = \log_n a$

(c) $x = \log_a n$ **(d)** $a = \log_n x$

(ii) **The relation** $y=\log_z x$ **implies…**

(a) $x^y=z$ **(b)** $z^y=x$

(c) $x^z=y$ **(d)** $y^z=x$

(iii) **The logarithm of unity to any base is…**

(a) 1 **(b)** 10

(c) e **(d)** 0

(iv) **The logarithm of any number to itself as base is…**

(a) 1 **(b)** 0

(c) e **(d)** 10

(v) **Log e=…,where e** $\approx$ **2.718**

(a) 0 **(b)** 0.4343

(c) ∞ **(d)** 1

(vi) **The value of** $\log\left(\frac{p}{q}\right)$ **is…**

(a) $\log p - \log q$ **(b)** $\frac{\log p}{\log q}$

(c) $\log p + \log q$ **(d)** $\log q - \log p$

(vii) **Log** p**-log** q **is same as …**

(a) $\log\left(\frac{q}{p}\right)$ **(b)** $\log(p-q)$

(c) $\frac{\log p}{\log q}$ **(d)** $\log q - \log p$

(viii) **Log(**m^n**) can be written as…**

(a) $(\log m)^n$ **(b)** $m \log n$

(c) $n \log m$ **(d)** $\log(mn)$

(ix) $\log_b a \times \log_c b$ **can be written as…**

(a) $\log_a c$ **(b)** $\log_c a$

(c) $\log_a b$ **(d)** $\log_b c$

(x) **$\text{Log}_y x$ will be equal to…**

(a) $\dfrac{\log_z x}{\log_y z}$ **(b)** $\dfrac{\log_x z}{\log_y z}$

(c) $\dfrac{\log_z x}{\log_z y}$ **(d)** $\dfrac{\log_z y}{\log_z x}$

ANSWER KEY

i	ii	iii	iv	v	vi	vii	viii	ix	x
c	b	d	a	b	a	d	c	b	c

Q.2 Complete the following:

(i) For common logarithm, the base is…

(ii) The integral part of the common logarithm of a number is called the …

(iii) The decimal part of the common logarithm of a number is called the …

(iv) If x = log y, then y is called the… of x.

(v) If the characteristic of the logarithm of a number have...zero(s) immediately after the decimal point.

(vi) If the characteristic of the logarithm of a number is 1, that number will have digits in its integral part.

ANSWER KEY

i	ii	iii	iv	v	vi
10	**Characteristic**	**Mantissa**	**Antilogarithm**	**One**	**2**

Q.3 Find the value of x in the following.

(i) $\log_3 x = 5$

Solution: $\log_3 x = 5$

Write in exponential form.

$3^5 = x$

$243 = x$ **Ans**

(ii) $\log_4 256 = x$

Solution: $\log_4 256 = x$

Write in exponential form

$4^x = 256$

$4^x = 4^4$

$x = 4$

$x = 4$ **Ans**

(iii) $\log_{625} 5 = \frac{1}{4}x$

Solution: $\log_{625} 5 = \frac{1}{4}x$

Write in exponential form

$(625)^{\frac{1}{4}x} = 5$

$(625)^{\frac{x}{4}} = 5$

$(5^4)^{\frac{x}{4}} = 5$

$5^{\frac{4x}{4}} = 5$
$5^x = 5^1$
$x = 1$ **Ans**

(iv) $\log_{64} x = -\frac{2}{3}$

Solution: $\log_{64} x = -\frac{2}{3}$

Write in exponential form

$(64)^{\frac{-2}{3}} = x$

$\left(4^3\right)^{-\frac{2}{3}} = x$

$4^{-\frac{6}{3}} = x$

$4^{-2} = x$

$\frac{1}{4^2} = x$

$\frac{1}{16} = x$ **Ans**

Q.4 Find the value of x in the following.

(i) $\log x = 2.4543$

Solution: $\log x = 2.4543$

$\log x = 2.4543$

$x = \text{antilog}\, 2.4543$

$\text{Ch} = 2$

$x = 284.6$ **Ans**

(ii) $\log x = 0.1821$

Solution: $\log x = 0.1821$

$\log x = 0.1821$

$x = \text{antilog}\, 0.1821$

$\text{Ch} = 0$

$x = 1.521$ **Ans**

(iii) $\log x = 0.0044$

Solution: $\log x = 0.0044$

$\log x = 0.0044$

$x = \text{antilog}\ 0.0044$

$\text{Ch} = 0$

$x = 1.010$ **Ans**

(iv) $\log x = \bar{1}.6238$

Solution: $\log x = \bar{1}.6238$

$\log x = \bar{1}.6238$

$x = \text{antilog}\, \bar{1}6333$

$\text{Ch} = \bar{1}$

$x = 0.4206$ **Ans**

Q.5 If $\log 2 = 0.3010$, $\log 3 = 0.4771$, and $\log 5 = 0.6990$ then find the values of the following.

(i) $\log 45$

Solution: $\log 45$

$= \log(9 \times 5)$

$= \log\left(3^2 \times 5\right)$

$= \log 3^2 + \log 5$

$= 2\log 3 + \log 15$

$= 2(0.4771) + 0.6990$

$= 0.9542 + 0.6990$

$= 1.6532$ **Ans**

(ii) $\log \frac{16}{15}$

Solution: $\log \frac{16}{15}$

$= \log \frac{2^4}{3 \times 5}$

$= \log 2^4 - \log(3 \times 5)$

$= 4\log 2 - (\log 3 + \log 5)$

$= \log 2^4 - \log 3 - \log 5$

$= 4\log 2 - \log 3 - \log 5$

$= 4(0.3010) - 0.4771 - 0.6990$

$= 1.2040 - 0.4771 - 0.6990$

$= 0.0279$ **Ans**

(iii) $\log 0.048$

Solution: $\log 0.048$

$$= \log \frac{48}{1000}$$

$$= \log \frac{2\times2\times2\times2\times3}{2\times2\times2\times5\times5\times5}$$

$$= \log \frac{2^4\times3}{2^3\times5^3}$$

$$= \log 2^4 + \log 3 - \log 2^3 - \log 5^3$$

$$= 4\log 2 + \log 3 - 3\log 2 - 3\log 5$$

$$= 4(0.3010) + 0.4771 - 3(0.3010) - 3(0.6990)$$

$$= 1.2040 + 0.4771 - 0.9030 - 2.0970$$

$$= -1.3189$$

$$= -1 - 0.3189$$

$$= -1 - 1 + 1 - 0.3189$$

$$= -2 + 0.6811$$

$= \bar{2}.6811$ **Ans**

Q.6 Simplify the following.

(i) $\sqrt[3]{25.47}$

Solution: $\sqrt[3]{25.47}$

Let $x = \sqrt[3]{25.74}$

$$= (25.47)^{\frac{1}{3}}$$

Taking log on both sides

$$\log x = \log (25.47)^{\frac{1}{3}}$$

$$= \frac{1}{3}\log 25.47$$

$$= \frac{1}{3}(1.4060)$$

$$\log x = 0.4687$$

$$x = \text{anti}\log 0.4687$$

$$\text{Ch} = 0$$

$x = 2.943$ **Ans**

(ii) $\sqrt[5]{342.2}$

Solution: $\sqrt[5]{342.2}$

Let

$$x = \sqrt[5]{342.2}$$

$$x = (242.)^{\frac{1}{5}}$$

Taking log on both sides

$$\log x = (342.2)^{\frac{1}{5}}$$

$$\log x = \frac{1}{5}\log 342.2$$

$$= \frac{1}{5}(2.5343)$$

$$\log x = 0.5069$$

$$\log x = \text{antilog}\, 0.5069$$

$$\text{Ch} = 0$$

$x = 3.213$ **Ans**

(iii) $\dfrac{(8.97)^3\times(3.95)^2}{\sqrt[3]{15.37}}$

Solution: $\dfrac{(8.97)^3\times(3.95)^2}{\sqrt[3]{15.37}}$

Let $x = \dfrac{(8.97)^3\times(3.95)^2}{\sqrt[3]{15.37}}$

Taking log on both sides

$$\log x = \log \frac{(8.97)^3\times(3.95)^2}{\sqrt[3]{15.37}}$$

$$= \log (8.97)^3 + \log (3.95)^2 - \log (15.37)^{\frac{1}{3}}$$

$$= 3\log 8.97 + 2\log 3.95 - \frac{1}{3}\log 15.37$$

$$= 3(0.9528) + 2(0.5966) - \frac{1}{3}(1.1867)$$

$$= 2.8584 + 1.1932 - 0.3956$$

$$\log x = 3.656$$

$$x = \text{antilog}\, 3.656$$

$$\text{Ch} = 3$$

$x = 4529$ **Ans**

Unit 3: Logarithms

Overview

Scientific Notation:

A number written in the form $a \times 10^n$, where $1 \le a < 10$ and n is an integer, is called the scientific notation.

Logarithm of a Real Number:

If $a^x = y$ they x is called the logarithm of y to the base 'a' and is written as $\log_a y = x$, where $a > 0, a \ne 1$ and $y > 0$

Characteristic of logarithm of the Number:

An integral part which is positive for a number greater than 1 and negative for a number less than 1, is called the characteristic of logarithm of the number.

Mantissa of the logarithm of the Number:

A decimal part which is always positive, is called the mantissa of the logarithm of the number.

Antilogarithm:

The number whose logarithm is given is called antilogarithm.