Exercise 3.2

Q1. Find the common logarithm of the following numbers.

i) 232.92

232.92 can be rounded off as 232.9

Characteristic = 2

Mantissa = .3672

Hence log 232.92 = 2.3672

ii) 29.326

29.326 can be rounded off as 29.33

Characteristic = 1

Mantissa = .4673

Hence log 29.326 = 1.4673

iii) 0.00032

Characteristic = $\bar{4}$

Mantissa = .5051

Hence log 0.0032 = $\bar{4}.5051$

iv) 0.3206

Characteristic = $\bar{1}$

Mantissa = .5060

Hence log 0.3206 = $\bar{1}.5060$

Q2. If log 31.09 = 1.4926, find the values of following:

i) log 3.109

Sol: log 3.109

Characteristic = 0

Mantissa = .4926

So log 3.109 = 0.4926

ii) log 310.9

Sol: log 310.9

Characteristic = 2

Mantissa = .4926

So log 310.9 = 2.4926

iii) log 0.003109

Sol: log 0.003109

Characteristic = $\bar{3}$

Mantissa = .4926

So log 0.003109 = $\bar{3}.4926$

iv) log 0.3109

Sol: log 0.3109

Characteristic = $\bar{1}$

Mantissa = .4926

So log 0.3109 = $\bar{1}.4926$

Q3. Find the numbers whose common logarithms are:

i) 3.5621

let the number be x

log x = 3.5621

Characteristic = 3

Mantissa = .5621

x = antilog 3.5621 = 3648

x = 3648

Hence 3648 is the required number

ii) $\bar{1}.7427$

Let the number be x

Log x = $\bar{1}.7427$

Characteristic = $\bar{1}$

Mantissa = .7427

x = antilog $\bar{1}.7427$ = 0.5530

x = 0.5530

Hence 0.5530 is the required number

Q4. What replacement for the unknown in each of following will make the statement true?

i) $\log_3 81 = L$

In exponential form

$$3^L = 81$$

$$3^L = 3^4$$

$\Rightarrow$ $\boxed{L=4}$ Bases are equal so exponents are equal

ii) $\log_a 6 = 0.5$

In exponential form

$$a^{0.5} = 6$$

$$a^{\frac{1}{2}} = 6$$

Squaring both side

$$\left(a^{\frac{1}{2}}\right)^2 = (6)^2$$

$$\boxed{a = 36}$$

iii) $\log_5 n = 2$

In exponential form

$$5^2 = n$$

$\Rightarrow$ $\boxed{n = 25}$

iv) $10^P = 40$

In logarithmic form

$\text{Log}_{10} 40 = P$

or log 40 = P

Characteristic = 1

Mantissa = .6021

So, P = 1.6021

Q5. Evaluate

i) $\log_2 \frac{1}{128}$

Let $x = \text{Log}_2 \frac{1}{128}$

In exponential form

$$2^x = \frac{1}{128}$$

$$2^x = \frac{1}{2^7}$$

$$2^x = 2^{-7}$$

$\Rightarrow$ $\boxed{x = -7}$

ii) log 512 to the base $2\sqrt{2}$

Sol: $\log_{2\sqrt{2}} 512$

Let $x = \log_{2\sqrt{2}} 512$

In exponential form

$$\left(2\sqrt{2}\right)^x = 512$$

$$\left(2\times 2^{\frac{1}{2}}\right)^x = 2^9$$

$$\left(2^{1+\frac{1}{2}}\right)^x = 2^9$$

$$\left(2^{\frac{3}{2}}\right)^x = 2^9$$

$$2^{\frac{3}{2}x} = 2^9$$

$\Rightarrow$ $\dfrac{3}{2}x = 9$

$$x = {}^{3}\cancel{9}\times\frac{2}{\cancel{3}}$$

$$\boxed{x = 6}$$

Q6. Evaluate the value of 'x' from the following statements.

i) $\log_2 x = 5$

In exponential form

$$2^5 = x$$

$\Rightarrow$ $\boxed{x = 32}$

ii) $\log_{81} 9 = x$

In exponential form

$$81^x = 9$$

$$\left(9^2\right)^x = 9$$

$$9^{2x} = 9^1$$

$\Rightarrow$ $2x = 1$

or $\boxed{x = \dfrac{1}{2}}$

iii) $\log_{64} 8 = \dfrac{x}{2}$

In exponential form

$$(64)^{\frac{x}{2}} = 8$$

$$\left(8^2\right)^{\frac{x}{2}} = 8$$

$$8^{\cancel{2}\times\frac{x}{\cancel{2}}} = 8$$

$$8^x = 8^1$$

$\Rightarrow$ $\boxed{x = 1}$

iv) $\log_x 64 = 2$

In exponential form

$$x^2 = 64$$

$$x^2 = 8^2$$

$\Rightarrow$ $\boxed{x = 8}$

v) $\log_3 x = 4$

In exponential form

$$3^4 = x$$

$\Rightarrow$ $\boxed{x = 81}$