

Unit No. 2

Logarithms

Exercise No. 2.2

Question No. 1

Express each of the following in logarithmic form:

We use the logarithmic form of an exponential equation:

$$a^b = c \Rightarrow \log_a c = b$$

(i). $10^3 = 1000$

In log form:

$$\text{Log}_{10} 1000 = 3$$

(ii). $2^8 = 256$

In log form:

$$\text{Log}_2 256 = 8$$

(iii). $3^{-3} = \frac{1}{27}$

In log form:

$$\text{Log}_3 \frac{1}{27} = -3$$

(iv). $20^2 = 400$

In log form:

$$\text{Log}_{20} 400 = 2$$

(v). $16^{-\frac{1}{4}} = \frac{1}{2}$

In log form:

$$\text{Log}_{16} \frac{1}{2} = -\frac{1}{4}$$

(vi). $11^2 = 121$

In log form:

$$\text{Log}_{11} 121 = 2$$

(vii). $p = q^r$

$$q^r = p$$

In log form:

$$\text{Log}_q p = r$$

(viii). $(32)^{-\frac{1}{5}} = \frac{1}{2}$

In log form:

$$\text{Log}_{32} \frac{1}{2} = -\frac{1}{5}$$

Question No. 2

Express each of the following in exponential form:

We use the exponential form of a logarithm:

$$\log_a b = c \Rightarrow a^c = b$$

(i). $\text{Log}_5 125 = 3$

In exponential form:

$$5^3 = 125$$

(ii). $\text{Log}_2 16 = 4$

In exponential form:

$$2^4 = 16$$

(iii). $\text{Log}_{23} 1 = 0$

In exponential form:

$$23^0 = 1$$

(iv). $\text{Log}_5 5 = 1$

In exponential form:

$$5^1 = 5$$

(v). $\text{Log}_2 \frac{1}{8} = -3$

In exponential form:

$$2^{-3} = \frac{1}{8}$$

(vi). $\frac{1}{2} = \text{Log}_9 3$

$$\text{Log}_9 3 = \frac{1}{2}$$

In exponential form:

$$9^{\frac{1}{2}} = 3$$

(vii). $5 = \text{Log}_{10} 100000$

$$\text{Log}_{10} 100000 = 5$$

In exponential form:

$$10^5 = 100000$$

(viii). $\text{Log}_4 \frac{1}{16} = -2$

In exponential form:

$$4^{-2} = \frac{1}{16}$$

Question No. 3

Find the value of x in each of the following:

(i). $\text{Log}_x 64 = 3$

In exponential form:

$$x^3 = 64$$

$$x^3 = 4^3$$

Taking the cube root on both sides:

$$x = 4$$

(ii). $\text{Log}_5 1 = x$

In exponential form:

$$5^x = 1$$

$$5^x = 5^0$$

$$x = 0$$

(iii). $\text{Log}_x 8 = 1$

In exponential form:

$$x^1 = 8$$

$$x^1 = 8^1$$

$$x = 8$$

(iv). $\text{Log}_{10} x = -3$

In exponential form:

$$10^{-3} = x$$

$$x = \frac{1}{10^3}$$

$$x = \frac{1}{1000}$$

(v). $\text{Log}_4 x = \frac{3}{2}$

In exponential form:

$$4^{\frac{3}{2}} = x$$

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

$$x = 2^3$$

$$x = 8$$

(vi). $\text{Log}_2 1024 = x$

In exponential form:

$$2^x = 1024$$

$$2^x = 2^{10}$$

$$x = 10$$