Exercise 2.2

Q.1 Express each of the following in logarithmic form:

(i) $10^3 = 1000$
Solution:
$10^3 = 1000$
$\Rightarrow \log_{10} 1000 = 3$

(ii) $2^8 = 256$
Solution:
$2^8 = 256$
$\Rightarrow \log_2 256 = 8$

(iii)) $3^{-3} = \frac{1}{27}$
Solution:
$3^{-3} = \frac{1}{27}$
$\Rightarrow \log_3 \frac{1}{27} = -3$

iv. $20^2 = 400$
Solution:
$20^2 = 400$
$\Rightarrow \log_{20} 400 = 2$

(v) $16^{-\frac{1}{4}} = \frac{1}{2}$
Solution:
$16^{-\frac{1}{4}} = \frac{1}{2}$
$\Rightarrow \log_{16} \frac{1}{2} = -\frac{1}{4}$

(vi) $11^2 = 121$
Solution:
$11^2 = 121$
$\Rightarrow \log_{11} 121 = 2$

(vii) $p = q^r$
Solution:
$p = q^r$
$\Rightarrow \log_q p = r$

(viii) $(32)^{\frac{-1}{5}} = \frac{1}{2}$
Solution:
$(32)^{\frac{-1}{5}} = \frac{1}{2}$
$\Rightarrow \log_{32} \frac{1}{2} = -\frac{1}{5}$

Q.2 Express each of the following in exponential form:

(i) $\log_5 125 = 3$
Solution:
$\log_5 125 = 3$
$\Rightarrow 5^3 = 125$

(ii) $\log_2 16 = 4$
Solution:
$\log_2 16 = 4$
$\Rightarrow 2^4 = 16$

(iii) $\log_{23} 1 = 0$
Solution:
$\log_1 23 = 0$
$\Rightarrow 23^0 = 1$

(iv) $\log_5 5 = 1$

$\log_5 5 = 1$

$\Rightarrow 5^1 = 5$

(v) $\log_2 \frac{1}{8} = -3$

Solution:

$\log_2 \frac{1}{8} = -3$

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

(vi) $\frac{1}{2} = \log_9 3$

Solution:

$\frac{1}{2} = \log_9 3$

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

(vii) $5 = \log_{10} 100000$

Solution:

$5 = \log_{10} 100000$

$\Rightarrow 10^5 = 100000$

(viii) $\log_4 \frac{1}{16} = -2$

Solution:

$\log_4 \frac{1}{16} = -2$

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

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

(i) $\log_x 64 = 3$

Solution:

$\log_x 64 = 3$

In exponential form

$x^3 = 64$

$x^3 = 4^3$

By comparing bases, we get

$x = 4$

(ii) $\log_5 1 = x$

Solution:

$\log_5 1 = x$

In exponential form

$(5)^x = 1$

$5^x = 1$

$5^x = 5^0$

By comparing exponents, we get

$x = 0$

(iii) $\log_x 8 = 1$

Solution:

$\log_x 8 = 1$

In exponential form

$(x)^1 = 8$

$\Rightarrow x = 8$

(iv) $\log_{10} x = -3$

Solution:

$\log_{10} x = -3$

In exponent form

$10^{-3} = x$

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

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

$\Rightarrow x = 0.001$

(v) $\log_4 x = \frac{3}{2}$

Solution:

$\log_4 x = \frac{3}{2}$

In exponential form

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

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

$2^3 = x$

$8 = x$

$\Rightarrow \boxed{x = 8}$

(vi) $\log_2 1024 = x$

Solution:

$\log_2 1024 = x$

In exponential form

$2^x = 1024$

$2^x = 2^{10}$

By comparing exponents, we get.

$x = 10$

2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1