

Exercise 2.2

1. Express each of the following in logarithmic form:

(i) $10^3 = 1000$

$$10^3 = 1000$$

$$\log_{10} 1000 = 3$$

(ii) $2^8 = 256$

$$2^8 = 256$$

$$\log_2 256 = 8$$

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

$$3^{-3} = \frac{1}{27}$$

$$\log_3 \frac{1}{27} = -3$$

(iv) $20^2 = 400$

$$20^2 = 400$$

$$\log_{20} 400 = 2$$

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

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

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

(vi) $11^2 = 121$

$$11^2 = 121$$

$$\log_{11} 121 = 2$$

(vii) $p = q^r$

$$p = q^r$$

$$q^r = p$$

$$\log_q p = r$$

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

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

$$\log_{32} \frac{1}{2} = -\frac{1}{5}$$

2. Express each of the following in exponential form:

(i) $\log_5 125 = 3$

$$\log_5 125 = 3$$

$$5^3 = 125$$

(ii) $\log_2 16 = 4$

$$\log_2 16 = 4$$

$$2^4 = 16$$

(iii) $\log_{23} 1 = 0$

$$\log_{23} 1 = 0$$

$$23^0 = 1$$

(iv) $\log_5 5 = 1$

$$\log_5 5 = 1$$

$$5^1 = 5$$

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

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

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

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

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

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

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

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

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

$$5 = \log_{10} 100000$$

$$\log_{10} 100000 = 5$$

$$10^5 = 100000$$

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

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

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

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

(i) $\log_x 64 = 3$

$$\log_x 64 = 3$$

$$x^3 = 64$$

$$x^3 = 4^3$$

$$\Rightarrow x = 4$$

(ii) $\log_5 1 = x$

$$\log_5 1 = x$$

$$5^x = 1$$

$$5^x = 5^0$$

$$\Rightarrow x = 0$$

(iii) $\log_x 8 = 1$

$$\log_x 8 = 1$$

$$x^1 = 8$$

$$x = 8$$

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

$$\log_{10} x = -3$$

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

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

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

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

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

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

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

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

$$2^3 = x$$

$$8 = x$$

$$x = 8$$

$$(vi) \log_2 1024 = x$$

$$\log_2 1024 = x$$

$$2^x = 1024$$

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

$$\Rightarrow x = 10$$

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