Exercise 3.3

Q.1 **Write the following into sum or difference $\log(A \times B)$**

(i) $\log(A \times B)$

Solution: $\log(A \times B)$

$\log A \times B = \log A + \log B$ **Ans**

(ii) $\log \dfrac{15.2}{30.5}$

Solution: $\log \dfrac{15.2}{30.5}$

$\log \dfrac{15.2}{30.5} = \log 15.2 - \log 30.5$ **Ans**

(iii) $\log \dfrac{21 \times 5}{8}$

Solution: $\log \dfrac{21 \times 5}{8}$

$\log \dfrac{21 \times 5}{8} = \log(21 \times 5) - \log 8$

$\qquad = \log 21 + \log 5 - \log 8$ **Ans**

(iv) $\log \sqrt[3]{\dfrac{7}{15}}$

Solution: $\log \sqrt[3]{\dfrac{7}{15}}$

$\log \sqrt[3]{\dfrac{7}{15}} = \log \left(\dfrac{7}{15}\right)^{\frac{1}{3}}$

$\qquad = \dfrac{1}{3} \log \left(\dfrac{7}{15}\right)$

$\qquad = \dfrac{1}{3}(\log 7 - \log 15)$

$\qquad = \dfrac{1}{3}\log 7 - \dfrac{1}{3}\log 15$ **Ans**

(v) $\log \dfrac{(22)^{\frac{1}{3}}}{5^3}$

Solution: $\log \dfrac{(22)^{\frac{1}{3}}}{5^3}$

$\log \dfrac{(22)^{\frac{1}{3}}}{5^3} = \log 22^{\frac{1}{3}} - \log 5^3$

$\qquad = \dfrac{1}{3}\log 22 - 3 \log 5$ **Ans**

(vi) $\log \dfrac{25 \times 97}{29}$

Solution: $\log \dfrac{25 \times 97}{29}$

$\log \dfrac{25 \times 47}{29} = \log(25 \times 47) - \log 29$

$\qquad = \log 25 + \log 47 - \log 29$ **Ans**

Q.2 **Express**

$\log x - 2\log x + 3\log(x+1) - \log(x^2 - 1)$ **as a single logarithm.**

Solution:

$\log x - 2\log x + 3\log(x+1) - \log(x^2 - 1)$

$= \log x - \log x^2 + \log(x+1)^3 - \log(x^2 - 1)$

$= \log\left(\dfrac{x}{x^2}\right) + \log \dfrac{(x+1)^3}{x^2 - 1}$

$= \log\left(\dfrac{x}{x^2} \times \dfrac{(x+1)^3}{x^2 - 1}\right)$

$= \log\left(\dfrac{x(x+1)^3}{x^2(x^2 - 1)}\right)$

$= \log \dfrac{\cancel{x}(x+1)^2 \cancel{(x+1)}}{x \times \cancel{x}(x-1)\cancel{(x+1)}}$

$= \log \dfrac{(x+1)^2}{x(x-1)}$ **Ans**

Q.3 **Write the following in the form of a single logarithm.**

(i) $\log 21 + \log 5$

Solution: $\log 21 + \log 5$
$$= \log(21 \times 5) \text{ Ans}$$

(ii) $\log 25 - 2\log 3$

Solution: $\log 25 - 2\log 3$
$$= \log 25 - 2\log 3$$
$$= \log 25 - \log 3^2$$
$$= \log \frac{25}{3^2} \text{ Ans}$$

(iii) $2\log x - 3\log y$

Solution: $2\log x - 3\log y$
$$= 2\log x - 3\log y$$
$$= \log x^2 - \log y^3$$
$$= \log \frac{x^2}{y^3} \text{ Ans}$$

(iv) $\log 5 + \log 6 - \log 2$

Solution: $\log 5 + \log 6 - \log 2$
$$= \log 5 + \log 6 - \log 2$$
$$= \log(5 \times 6) - \log 2$$
$$= \log \frac{5 \times 6}{2} \text{ Ans}$$

Q.4 **Calculate the following.**

(i) $\log_3 2 \times \log_2 81$

Solution: $\log_3 2 \times \log_2 81$
$$= \frac{\log 2}{\log 3} \times \frac{\log 81}{\log 2}$$
$$= \frac{\log 81}{\log 3}$$
$$= \frac{\log 3^4}{\log 3}$$
$$= \frac{4\log 3}{\log 3}$$
$$= 4 \text{ Ans}$$

(ii) $\log_3 \times \log_3 25$

Solution: $\log_3 \times \log_3 25$
$$= \frac{\log 3}{\log 5} \times \frac{\log 25}{\log 3}$$
$$= \frac{\log 25}{\log 5}$$
$$= \frac{\log 5^2}{\log 5}$$
$$= \frac{2\log 5}{\log 5}$$
$$= 2 \text{ Ans}$$

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

(i) $\log 32$
$$= \log 2^5$$
$\because$ using 3rd law of logarithm
$$= 5\log 2$$
By putting the value of $\log 2$
$$= 5(0.3010)$$
$$= 1.5050 \text{ Ans}$$

(ii) $\log 24$

Solution: log 24
$$= \log(2^3 \times 3)$$
$$= \log 2^3 + \log 3$$
$$= 3\log 2 + \log 3$$
By putting the value of $\log 2$ and $\log 3$
$$= 3(0.3010) + 0.4771$$
$$= 0.9030 + 0.4771$$
$$= 1.3801 \text{ Ans}$$

(iii) $\log \sqrt{3\frac{1}{3}}$

Solution: $\log \sqrt{3\frac{1}{3}}$
$$= \log \left(\frac{10}{3}\right)^{\frac{1}{2}}$$

$$= \frac{1}{2}\log\left[\frac{2 \times 5}{3}\right]$$

$$= \frac{1}{2}\left(\log 2 + \log 5 - \log 3\right)$$

By putting the values of $\log 2, \log 3$ and $\log 5$

$$= \frac{1}{2}\left(0.3010 + 0.69900 - 0.4771\right)$$

$$= \frac{1}{2}\left(1 - 0.4771\right)$$

$$= \frac{1}{2}\left(0.5229\right)$$

$$= 0.26145 \ \textbf{Ans}$$

(iv) $\log \frac{8}{3}$

Solution: $\log \frac{8}{3}$

$$= \log \frac{2^3}{3}$$

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

$$= 3\log 2 - \log 3$$

By putting the values of $\log 2$ and $\log 3$

$$= 3(0.3010) - 0.4771$$

$$= 0.9030 - 0.4771$$

$$= 0.4259 \ \textbf{Ans}$$

(v) $\log 30$

Solution: $\log 30$

$$= \log(5 \times 2 \times 3)$$

$\because$ using first law of logarithm

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

By putting the values of $\log 2, \log 3 \ \log 5$

$$= (0.6990) + (0.3010) + (0.4771)$$

$$= 1.4771 \ \textbf{Ans}$$