# Exercise 3.4

**Q.1 Use log tables to find the value of**

**(i)** $0.8176 \times 13.64$

**Solution:** $0.8176 \times 13.64$

Suppose

$x = 0.8176 \times 13.64$

Taking log on both sides

$\log x = \log(0.8176 \times 13.64)$

According to first law of logarithm

$\log x = \log 0.8176 + \log 13.64$

$= \bar{1}.9125 + 1.1348$

$\log x = -1 + 0.9125 + 1.1348$

$\log x = 1.0473$

To find antilog

$x = \text{antilog}\, 1.0473$

Ch $= 1$

$x = 1.115$

Reference point

$x = 11.15$ **Ans**

**(ii)** $(789.5)^{\frac{1}{8}}$

**Solution:** $(789.5)^{\frac{1}{8}}$

Let $x = (789.5)^{\frac{1}{8}}$

Taking log on both sides

$\log x = \log(789.5)^{\frac{1}{8}}$

According to third law

$\log x = \frac{1}{8}\log(789.5)$

$\log x = \frac{1}{8}(2.8974)$

$= \frac{2.8974}{8}$

$\log x = 0.3622$

To find antilog

$x = \text{antilog}\, 0.3622$

Characteristics $= 0$

$x = 2.302$

Reference point

$x = 2.302$ **Ans**

**(iii)** $\dfrac{0.678 \times 9.01}{0.0234}$

**Solution:** $\dfrac{0.678 \times 9.01}{0.0234}$

Suppose

$x = \dfrac{0.678 \times 9.01}{0.0234}$

Taking log on both sides

$\log x = \log \dfrac{0.678 \times 9.01}{0.0234}$

According to 1st and 2nd law of log

$\log x = \log 0.678 + \log 9.01 - \log 0.0234$

$\log x = \bar{1}.8312 + 0.9547 - \bar{2}.3692$

$= -1 + 0.8312 + 0.9547 - (-2 + 0.3692)$

$= 2.4167$

To find antilog

$x = \text{antilog}\, 2.4167$

Characteristics $= 2$

$x = 2.610$

$x = 261.0$ **Ans**

**(iv)** $\sqrt[5]{2.709} \times \sqrt[7]{1.239}$

**Solution:** $\sqrt[5]{2.709} \times \sqrt[7]{1.239}$

$(2.709)^{\frac{1}{5}} \times (1.239)^{\frac{1}{7}}$

Suppose:

$x = (2.709)^{\frac{1}{5}} \times (1.239)^{\frac{1}{7}}$

Taking log on both side

$\log x = \log\left[(2.709)^{\frac{1}{5}} \times (1.239)^{\frac{1}{7}}\right]$

According to law of logarithm

$\log x = \log(2.709)^{\frac{1}{5}} + \log(1.239)^{\frac{1}{7}}$

According to third law of logarithm

$\log x = \frac{1}{5}\log(2.709) + \frac{1}{7}\log(1.239)$

$\log x = \frac{1}{5}\log(2.709) + \frac{1}{7}\log(1.239)$

$= \frac{1}{5}0.4328 + \frac{1}{7}0.0931$

$= \frac{0.4328}{5} + \frac{0.0931}{7}$

$0.0866 + 0.0133$

$= 0.0999$

To find antilog

$x$ = antilog 0.999

Characteristics = 0

$x = 1.259$

Reference point

$x = 1.259$ **Ans**

**(v)** $\frac{1.23 \times 0.6975}{0.0075 \times 1278}$

**Solution:** $\frac{1.23 \times 0.6975}{0.0075 \times 1278}$

Suppose

$x = \frac{1.23 \times 0.6975}{0.0075 \times 1278}$

$\log x = \log \frac{1.23 \times 0.6975}{0.0075 \times 1278}$

$= \log(1.23 \times 0.6975) - \log(0.0075 \times 1278)$

$= \log 1.23 + \log 0.6975 - (\log 0.0075 + \log 1278)$

$= \log 1.23 + \log 0.6975 - \log 0.0075 - \log 1278$

$= 0.0899 + \bar{1}.8435 - \bar{3}.8751 - 3.1065$

$= 0.8999 + (-1 + 0.8435) - (-3 + 0.8751) + 3.1065$

$= -1.0482$

$\log x = -2 + 2 - 1.0482$

$\log x = 02 + 0.9515$

$\log x = \bar{2}.9518$

**To find antilog**

$x$ = antilog $\bar{2}.9518$

Ch = $\bar{2}$

$x = 8950$

$= 0.08950$ **Ans**

**(vi)** $\sqrt[3]{\frac{0.7214 \times 20.37}{60.8}}$

**Solution:** $\sqrt[3]{\frac{0.7214 \times 20.37}{60.8}}$

Let $x = \left[\frac{0.7214 \times 20.37}{60.8}\right]^{\frac{1}{3}}$

Taking log on both sides

$\log x = \log\left(\frac{0.7214 \times 20.37}{60.8}\right)^{\frac{1}{3}}$

3rd of logarithm

$\log x = \frac{1}{3}\log\left[\frac{0.7214 \times 20.37}{60.8}\right]$

According to first and 2nd law

$\log x = \frac{1}{3}[\log 0.7214 + \log 37 - \log 60.8]$

$\log x = \frac{1}{3}[\bar{1}.8582 + 1.3089 - 1.7839]$

$\frac{1}{3}[-1 + 0.8582 + 1.3089 - 1.7839]$

$= \frac{1}{3}(-0.6168)$

$= -0.2056$

$\log x$ is in negative, so

$\log x = -1 + 1 - 0.2056$

$= -1 + 79144$

$= \bar{1}.7944$

To find antilog

$x$ = antilog $\bar{1}.7944$

Ch = $\bar{1}$

$x = 6229$

Reference point

0.6229 **Ans**

**(vii)** $\frac{83 \times \sqrt[3]{92}}{127 \times \sqrt[5]{246}}$

**Solution:** $\frac{83 \times \sqrt[3]{92}}{127 \times \sqrt[5]{246}}$

Suppose: $x = \frac{83 \times \sqrt[3]{92}}{127 \times \sqrt[5]{246}}$

$$x=\frac{83\times(92)^{\frac{1}{3}}}{127\times(246)^{\frac{1}{5}}}$$

Taking on both side

$$\log x=\log\frac{83\times(92)^{\frac{1}{3}}}{127\times(246)^{\frac{1}{5}}}$$

According to 1st and 2nd law of log

$$\log x=\log 83+\log(92)^{\frac{1}{3}}-\log 127-\log(246)^{\frac{1}{5}}$$

According to third law of log

$$\log x=\log 83+\frac{1}{3}\log 92-\log 27-\frac{1}{5}\log 246$$

$$\log x=(1.9191)+\frac{1}{3}(1.9638)-(2.1038)$$

$$-\frac{1}{5}(2.3909)$$

$= 1.9191 + 0.65460 - 2.1038 - 0.47818$

$=1.9191+0.6546-2.1038-0.47818$

$=-0.0083$

$\log x$ is in negative, so

$\log x=-1+1-0.0083$

$=-1+0.9917$

$=\bar{1}.9917$

To find antilog

$x=$ antilog $\bar{1}.9917$

Ch = $\bar{1}$

$x=9.811$

Reference point

$x=0.9811$ **Ans**

**(viii)** $\dfrac{(438)^3\sqrt{0.056}}{(388)^4}$

**Solution:** $\dfrac{(438)^3\sqrt{0.056}}{(388)^4}$

Suppose: $x=\dfrac{(438)^3\sqrt{0.056}}{(388)^4}$

$$x=\frac{(438)^3(0.056)^{\frac{1}{2}}}{(388)^4}$$

$$x=\frac{(438)^3(0.056)^{\frac{1}{2}}}{(388)^4}$$

Taking log on both side

$$\log x=\log\left(\frac{(438)^3(0.056)^{\frac{1}{2}}}{(388)^4}\right)$$

According to 1st and 2nd law

$$\log x=\log(438)^3+\log(0.056)^{\frac{1}{2}}-\log(388)^4$$

According to third law

$$\log x=3\log(438)+\frac{1}{2}\log(0.056)-4\log(38)$$

$$\log x=3(2.6415)+\frac{1}{2}(\bar{2}.7482)-4(2.5888)$$

$$=7.9245+\frac{1}{2}(-2+0.7482)-10.3552$$

$$=7.9245+\frac{1}{2}(-1.2518)-10.3552$$

$=7.9245-0.6259-10.3552$

$=-3.0566$

log is in negative, so

$\log x=-4+4-3.0566$

$=-4+0.9434$

To find antilog

$x=$ antilog $\bar{4}.9434$

Ch = $\bar{4}$

$x=8778$

Reference point

$=0.0008778$ **Ans**

**Q.2 A gas is expanding according to the law $pv^n = C$ . Find C when p = 80, v = 3.1 and $n=\frac{5}{4}$.**

**Solution:** Given that $pv^n = C$

Taking log on both sides

Log $(pv^n)=\log C$

Log $P$+log $v^n$= log $C$

Log $C$ =log $P$+log $v^n$

Log $C$ =log $P$+$n$ log $v$

Putting P=80, v=3.1 and $n=\frac{5}{4}$

Log C = log 80+$\frac{5}{4}$ log 3.1

=1.9031+$\frac{5}{4}$(0.4914)

=1.9031+0.6143

Log C=2.5174

Taking antilog both sides

C=Antilog (2.5174)

C=329.2 **Ans:**

**Q.3 The formula $p= 90 (5)^{-q/10}$ applies to the demand of a product, where q is the number of units and p is the price of one unit. How many units will be demanded if the price is Rs 18.00?**

**Solution: Given that** $p=90(5)^{\frac{-q}{10}}$

Taking log on both sides

$Log\ p=\log\left(90(5)^{\frac{-q}{10}}\right)$

$Log\ p=\log 90+\log 5^{\frac{-q}{10}}$

Log P =log 90- $\frac{q}{10}$ log 5

Log 18= log 90- $\frac{q}{10}$ log 5

(P =18)

1.2553=1.9542- $\frac{q}{10}$ x 0.6990

1.2553-1.9542 =- $\frac{q}{10}$ x 0.6990

-0.6989 x 10 = - q x 0.6990

-6.989=-$q$ x 0.6996

6.989=$q$ x 0.6996

$\frac{6.989}{0.6990}=q$

$q$ =10 approximately

Hence 10 units will be demanded

**Q.4 If $A=\pi r^2$, find A, when $\pi=\frac{22}{7}$ and $r=15$ .**

**Solution:** Given that $A=\pi r^2$

Taking log on both sides

Log A=log $\pi r^2$

Log A=log $\pi$ +log $r^2$

Log A=log $\pi$ +2 log $r$

Putting $\pi=\frac{22}{7}$ and $r$ =15

Log A=log $\frac{22}{7}$ +2 log 15

=log 22-log 7+2 log 15

=1.3424-0.8451+2(1.1761)

=0.4973+2.3522

Log A=2.8495

Taking antilog on both sides

A=antilog 2.8495

A=707.1 **Ans**

**Q.5 If $V=\frac{1}{3}\pi r^2 h$, find V, when $\pi=\frac{22}{7}$ , $r=2.5$ and $h$=4.2.**

**Solution:** Given that $V=\frac{1}{3}\pi r^2 h$

Taking log on both sides

$Log V=\log\frac{1}{3}\pi r^2 h$

=log$\frac{1}{3}$ +log $\pi r^2 h$

=log 1-log 3+ log $\pi r^2$ + log h

= 0-0.4771+ log $\pi$ +log $r^2$+ log h

=-0.4771+ log $\frac{22}{7}$ +2 log $r$ + log h

$\left(\pi=\frac{22}{7}, r=2.5 \text{ and } h=4.2\right)$

$=-0.4771+\log 22-\log 7+2\log 2.5+\log 4.2$

$=-0.4771+1.3424-0.8450+2x0.3979+0.6232$

$=-0.4771+1.3424-0.8450+0.7959+0.6232$

Log V=1.4394

Taking antilog on both sides

V=antilog 1.4394

V=27.50 **Ans**