Exercise 3.4

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

(i) 0.8176×13.64

Solution: 0.8176×13.64

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) $\frac{0.678 \times 9.01}{0.0234}$

Solution: $\frac{0.678 \times 9.01}{0.0234}$

Suppose

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

Taking log on both sides

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

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) $\frac{1.23\times0.6975}{0.0075\times1278}$

Solution: $\frac{1.23\times0.6975}{0.0075\times1278}$

Suppose

$x=\frac{1.23\times0.6975}{0.0075\times1278}$

$\log x=\log\frac{1.23\times0.6975}{0.0075\times1278}$

$=\log(1.23\times0.6975)-\log(0.0075\times1278)$

$=\log1.23+\log0.6975-(\log0.0075+\log1278)$

$=\log1.23+\log0.6975-\log0.0075-\log1278$

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

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

$=-1.0482$

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

$\log x=02+0.9515$

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

To find antilog

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

Ch = $\bar{2}$

$x=8950$

$=0.08950$ **Ans**

(vi) $\sqrt[3]{\frac{0.7214\times20.37}{60.8}}$

Solution: $\sqrt[3]{\frac{0.7214\times20.37}{60.8}}$

Let $x=\left[\frac{0.7214\times20.37}{60.8}\right]^{\frac{1}{3}}$

Taking log on both sides

$\log x=\log\left(\frac{0.7214\times20.37}{60.8}\right)^{\frac{1}{3}}$

3rd of logarithm

$\log x=\frac{1}{3}\log\left[\frac{0.7214\times20.37}{60.8}\right]$

According to first and 2nd law

$\log x=\frac{1}{3}[\log0.7214+\log37-\log60.8]$

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

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

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

$=-0.2056$

$\log x$ 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 πr^2
Log A=log π +log r^2
Log A=log π +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 πr^2 + log h
= 0-0.4771+ log π +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**

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Report any mistake at freeilm786@gmail.com