Chapter # 2

Logarithms

Review Exercise # 2

Question # 1: Four options are given against each statement. Encircle the correct option.

#	Answer	#	Answer
i	C	vi	C
ii	B	vii	D
iii	B	viii	C
iv	D	ix	D
v	A	x	C

Question # 2: Express the following numbers in scientific notation:

(i). $\mathbf{0.000567}$
$= 5.67 \times 10^{-4}$ (Answer)

(ii). $\mathbf{734}$
$= 7.34 \times 10^{2}$ (Answer)

(iii). $\mathbf{0.33 \times 10^{3}}$
$= 3.3 \times 10^{3-1}$
$= 3.3 \times 10^{2}$ (Answer)

Question # 3: Express the following numbers in ordinary notation:

(i). $\mathbf{2.6 \times 10^{3}}$
$= 2600$ (Answer)

(ii). $\mathbf{8.794 \times 10^{-4}}$
$= 0.0008794$ (Answer)

(iii). $\mathbf{6 \times 10^{-6}}$
$= 0.000006$ (Answer)

Question # 4: Express each of the following in logarithmic form:

(i). $\mathbf{3^{7} = 2187}$
$\log_3 2187 = 7$ (Answer)

(ii). $\mathbf{a^{b} = c}$
$\log_a c = b$ (Answer)

(iii). $\mathbf{(12)^{2} = 144}$
$\log_{12} 144 = 2$ (Answer)

Question # 5: Express each of the following in exponential form:

(i). $\mathbf{\log_4 8 = x}$
$4^{x} = 8$ (Answer)

(ii). $\mathbf{\log_9 729 = 3}$
$9^{3} = 729$ (Answer)

(iii). $\mathbf{\log_4 1024 = 5}$
$4^{5} = 1024$ (Answer)

Question # 6: Find the value of 'x' in the following:

(i). $\mathbf{\log_9 x = 0.5}$
$9^{0.5} = x$
$x = 9^{1/2}$
$x = (3^{2})^{1/2}$
$x = 3$ (Answer)

(ii). $\mathbf{\left(\frac{1}{9}\right)^{3x} = 27}$
$(9^{-1})^{3x} = 27$
$(3^{-2})^{3x} = 3^{3}$
$3^{-6x} = 3^{3}$
$-6x = 3$
$x = \frac{3}{-6}$
$x = -\frac{1}{2}$ (Answer)

3	27
3	9
3	3
	1

(iii). $\mathbf{\left(\frac{1}{32}\right)^{2x} = 64}$
$(32^{-1})^{2x} = 64$
$(2^{-5})^{2x} = 2^{6}$
$2^{-10x} = 2^{6}$
$-10x = 6$
$x = \frac{6}{-10}$
$x = -\frac{3}{5}$ (Answer)

2	64
2	32
2	16
2	8
2	4
2	2
	1

Question # 7: Write the following as a single logarithm:

(i). $\mathbf{7 \log x - 3 \log y^{2}}$
$= \log x^{7} - \log y^{6}$

(ii). $\mathbf{3 \log 4 - \log 32}$
$= \log 4^{3} - \log 32$
$= \log \frac{4^{3}}{32}$

(iii). $\mathbf{\frac{1}{3}(\log_5 8 + \log_5 27) - \log_5 3}$
$= \frac{1}{3}\log_5 2^{3} + \frac{1}{3}\log_5 3^{3} - \log_5 3$

$= \log \frac{x^7}{y^6}$ (Answer)

$= \log \frac{\cancel{64}^{2}}{\cancel{32}}$
$= \log 2$ (Answer)

$= \log_5 2^{\cancel{3}\times\frac{1}{\cancel{3}}} + \log_5 3^{\cancel{3}\times\frac{1}{\cancel{3}}} - \log_5 3$
$= \log_5 2 + \log_5 3 - \log_5 3$
$= \log_5 2$ (Answer)

Question # 8: Expand the following using laws of logarithms:

(i). $\log(xyz^6)$

$= \log x + \log y + \log z^6$
$= \log x + \log y + 6\log z$
(Answer)

(ii). $\log_3 \sqrt[6]{m^5n^3}$

$= \log_3 (m^5n^3)^{1/6}$
$= \frac{1}{6}(\log_3 m^5n^3)$
$= \frac{1}{6}(\log_3 m^5 + \log_3 n^3)$
$= \frac{1}{6}(5\log_3 m + 3\log_3 n)$
(Answer)

(iii). $\log\sqrt{8x^3}$

$= \log(2^3x^3)^{1/2}$
$= \log(2x)^{3/2}$
$= \frac{3}{2}\log 2x$
$= \frac{3}{2}(\log 2 + \log x)$ (Answer)

Question # 9: Find the values of the following with the help of logarithm table:

(i). $\sqrt[3]{68.24}$

Let,

$x = \log(68.24)^{1/3}$

Taking 'log' on both sides

$logx = log(68.24)^{1/3}$
$logx = \frac{1}{3}log68.24$
$logx = \frac{1}{3}(1.8340)$
$logx = 0.6113$

Taking '$antilog$' on both sides

$\cancel{antilog} \times \cancel{log}x = antilog 0.6113$
$x = 4.086$ (Answer)

(ii). 319.8×3.543

Let,

$x = 319.8 \times 3.543$

Taking 'log' on both sides

$logx = \log(319.8 \times 3.543)$
$logx = log319.8 + log3.543$
$logx = 2.5049 + 0.5494$
$logx = 3.0543$

Taking '$antilog$' on both sides

$\cancel{antiog} \times \cancel{log}x = antilog 3.0543$
$x = 1133.182$ (Answer)

(iii). $\frac{36.12 \times 750.9}{113.2 \times 9.98}$

Let,

$x = \frac{36.12 \times 750.9}{113.2 \times 9.98}$

Taking 'log' on both sides

$logx = log\left[\frac{36.12 \times 750.9}{113.2 \times 9.98}\right]$
$logx = log36.12 + log750.9 - log113.2 - log9.98$
$logx = 1.5577 + 2.8756 - 2.0538 - 0.9991$
$logx = 1.3804$

Taking '$antilog$' on both sides

$\cancel{antilog} \times \cancel{log}x = antilog 1.3804$
$x = 24.01$ (Answer)

Question # 10: In the year 2016, the population of a city was 22 million and was growing at a rate of 2.5% per year. The function $p(t) = 22(1.025)^t$ gives the population in million, t years after 2016. Use the model to determine in which year the population will reach 35 million. Round the answer to the nearest year.

$$\text{Population} = p(t) = 35\ millions$$
$$\text{Time} = t\ (Years) = ?$$
$$\because p(t) = 22(1.025)^t$$
$$35 = 22(1.025)^t$$

taking 'log' on both sides

$$log35 = log[22(1.025)^t]$$
$$log35 = log22 + tlog1.025$$
$$1.5441 = 1.3424 + t(0.0107)$$
$$1.5441 - 1.3424 = t(0.0107)$$
$$\frac{0.2017}{0.0107} = t$$
$$t = 18.85 \approx 19\ years$$

$$\text{Year when population will be 35 million} = 2016 + 19$$
$$= 2035$$