

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

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

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

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

(i). 2.6×10^3
 $= 2600$ (Answer)

(ii). 8.794×10^{-4}
 $= 0.0008794$ (Answer)

(iii). 6×10^{-6}
 $= 0.000006$ (Answer)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$= \log \frac{64^2}{32}$$

$$= \log 2 \quad (\text{Answer})$$

$$= \log_5 2^{3 \times \frac{1}{2}} + \log_5 3^{3 \times \frac{1}{2}} - \log_5 3$$

$$= \log_5 2 + \log_5 3 - \log_5 3$$

$$= \log_5 2 \quad (\text{Answer})$$

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

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

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

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

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

(Answer)

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

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

$$= \log (2x)^{3/2}$$

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

$$= \frac{3}{2} (\log 2 + \log x) \quad (\text{Answer})$$

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

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

$$\log x = \frac{1}{3} \log 68.24$$

$$\log x = \frac{1}{3} (1.8340)$$

$$\log x = 0.6113$$

Taking 'antilog' on both sides

$$\cancel{\text{antilog}} \times \cancel{\log} x = \text{antilog} 0.6113$$

$$x = 4.086 \quad (\text{Answer})$$

(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

$$\log x = \log \left[\frac{36.12 \times 750.9}{113.2 \times 9.98} \right]$$

$$\log x = \log 36.12 + \log 750.9 - \log 113.2 - \log 9.98$$

$$\log x = 1.5577 + 2.8756 - 2.0538 - 0.9991$$

$$\log x = 1.3804$$

Taking 'antilog' on both sides

$$\cancel{\text{antilog}} \times \cancel{\log} x = \text{antilog} 1.3804$$

$$x = 24.01 \quad (\text{Answer})$$

(ii). 319.8×3.543

Let,

$$x = 319.8 \times 3.543$$

Taking 'log' on both sides

$$\log x = \log (319.8 \times 3.543)$$

$$\log x = \log 319.8 + \log 3.543$$

$$\log x = 2.5049 + 0.5494$$

$$\log x = 3.0543$$

Taking 'antilog' on both sides

$$\cancel{\text{antilog}} \times \cancel{\log} x = \text{antilog} 3.0543$$

$$x = 1133.182 \quad (\text{Answer})$$

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.

$$\text{Population} = p(t) = 35 \text{ millions}$$

$$\text{Time} = t \text{ (Years)} = ?$$

$$\because p(t) = 22(1.025)^t$$

$$35 = 22(1.025)^t$$

taking 'log' on both sides

$$\log 35 = \log [22(1.025)^t]$$

$$\log 35 = \log 22 + t \log 1.025$$

$$1.5441 = 1.3424 + t(0.0107)$$

$$1.5441 - 1.3424 = t(0.0107)$$

$$\frac{0.2017}{0.0107} = t$$

$$t = 18.85 \approx 19 \text{ years}$$

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