CHAPTER 1 NUMBER SYSTEMS

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Question 1. Find :

(i) $64^{\frac{1}{2}}$

(ii) $32^{\frac{1}{5}}$

(iii) $125^{\frac{1}{3}}$

Solution :

(i) $64^{\frac{1}{2}}$

We know that

$a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We conclude that $64^{\frac{1}{2}}$ can also be written as

$\sqrt[2]{64} = \sqrt[2]{8 \times 8}$

$\sqrt[2]{64} = \sqrt[2]{8 \times 8} = 8.$

Therefore, the value of $64^{\frac{1}{2}}$ will be 8.

(ii) $32^{\frac{1}{5}}$

We know that

$a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We conclude that $32^{\frac{1}{5}}$ can also be written as

$\sqrt[5]{32} = \sqrt[2]{2 \times 2 \times 2 \times 2 \times 2}$

$\sqrt[5]{32} = \sqrt[2]{2 \times 2 \times 2 \times 2 \times 2} = 2$

Therefore, the value of $32^{\frac{1}{5}}$ will be 2.

(iii) $125^{\frac{1}{3}}$

We know that

$a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We conclude that $125^{\frac{1}{3}}$ can also be written as

$\sqrt[3]{125} = \sqrt[3]{5 \times 5 \times 5}$

$\sqrt[3]{125} = \sqrt[3]{5 \times 5 \times 5} = 5$

Therefore, the value of $125^{\frac{1}{3}}$ will be 5.

Question 2. Find:

(i) $9^{\frac{3}{2}}$

(ii) $32^{\frac{2}{5}}$

(iii) $16^{\frac{3}{4}}$

(iv) $125^{\frac{-1}{3}}$

Solution :

(i) $9^{\frac{3}{2}}$

We know that

$a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We conclude that $9^{\frac{3}{2}}$ can also be written as

$\sqrt[2]{(9)^3} = \sqrt[2]{9\times9\times9} = \sqrt[2]{3\times3\times3\times3\times3\times3}$

$\sqrt[2]{(9)^3} = \sqrt[2]{3\times3\times3\times3\times3\times3}$

$= 3\times3\times3$

=27

Therefore, the value of $9^{\frac{3}{2}}$ will be 27.

(ii) $32^{\frac{2}{5}}$

We know that

$a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We conclude that $32^{\frac{2}{5}}$ can also be written as

$\sqrt[5]{(32)^2}$

$= \sqrt[5]{(2\times2\times2\times2\times2)(2\times2\times2\times2\times2)}$

$= 2\times2$

= 4

Therefore, the value of $32^{\frac{2}{5}}$ will be 4.

(iii) $16^{\frac{3}{4}}$

We know that

$a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We conclude that $16^{\frac{3}{4}}$ can also be written as

$\sqrt[4]{(16)^3}$

$= \sqrt[4]{(2\times2\times2\times2)(2\times2\times2\times2)(2\times2\times2\times2)}$

$= 2\times2\times2$

= 8

Therefore, the value of $16^{\frac{3}{4}}$ will be 8.

(iv) $125^{\frac{-1}{3}}$

We know that

$a^{-n} = \frac{1}{a^n}$

We conclude that $125^{\frac{-1}{3}}$ can also be written as $\frac{1}{125^{\frac{1}{3}}}$, or $\left(\frac{1}{125}\right)^{\frac{1}{3}}$.

We know that

$a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We know that $\left(\frac{1}{125}\right)^{\frac{1}{3}}$ can also be written as

$\sqrt[3]{\left(\frac{1}{125}\right)} = \sqrt[3]{\left(\frac{1}{5}\times\frac{1}{5}\times\frac{1}{5}\right)}$

$= \frac{1}{5}$.

Therefore, the value of $125^{\frac{-1}{3}}$ will be $\frac{1}{5}$.

Question 3. Simplify :

(i) $2^{\frac{2}{3}} \cdot 2^{\frac{1}{5}}$

(ii) $\left(3^{\frac{1}{3}}\right)^{7}$

(iii) $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$

(iv) $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$

Solution :

(i) $2^{\frac{2}{3}} \cdot 2^{\frac{1}{5}}$

We know that

$a^{m} \cdot a^{n} = a^{(m+n)}$.

We can conclude that

$2^{\frac{2}{3}} \cdot 2^{\frac{1}{5}} = (2)^{\frac{2}{3}+\frac{1}{5}}$.

$2^{\frac{2}{3}} \cdot 2^{\frac{1}{5}} = (2)^{\frac{10+3}{15}} \quad = (2)^{\frac{13}{15}}$

Therefore, the value of $2^{\frac{2}{3}} \cdot 2^{\frac{1}{5}}$ will be $(2)^{\frac{13}{15}}$.

(ii) $\left(3^{\frac{1}{3}}\right)^{7}$

We know that $a^{m} \times a^{n} = a^{m+n}$

We conclude that $\left(3^{\frac{1}{3}}\right)^{7}$ can also be written as $\left(3^{\frac{7}{3}}\right)$.

(iii) $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$

We know that

$$\frac{a^m}{a^n} = a^{m-n}$$

We conclude that

$$\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}} = 11^{\frac{1}{2}-\frac{1}{4}}.$$

$$\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}} = 11^{\frac{1}{2}-\frac{1}{4}} = 11^{\frac{2-1}{4}}$$

$$\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$$

Therefore, the value of $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$ will be $11^{\frac{1}{4}}$.

(iv) $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$

We know that

$$a^m \cdot b^m = (a \times b)^m.$$

We can conclude that

$$7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}} = (7 \times 8)^{\frac{1}{2}}.$$

$$7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}} = (7 \times 8)^{\frac{1}{2}} = (56)^{\frac{1}{2}}$$

Therefore, the value of $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$ will be $(56)^{\frac{1}{2}}$.