Mathematics-9
Exercise 2.3

RADICAL AND RADICANDS

Concept of Radicals and Radicands

(K.B)

If n is a positive integer greater than 1 and a is a real number, then any real number x such that $x^n = a$ is called the nth root of a, and in symbols is written as:

$x = \sqrt[n]{a}$ or $x = (a)^{1/n}$.

In the radical $\sqrt[n]{a}$, the symbol $\sqrt{\ }$ is called the **radical sign**, n is called the **index** of the radical and the real number a under the radical sign is called the **radicand** or **base**.

Note **(K.B)**

$\sqrt[2]{a}$ is usually written as $\sqrt{a}$

Difference between Radical form and Exponential form **(U.B)**

In radical form radical sign is used, $x = \sqrt[n]{a}$ is a radical form.

For example: $\sqrt[3]{x}, \sqrt[5]{x^2}$ etc.

In exponential form, exponent is used in place of radicals. $x = (a)^{1/n}$ is exponential form.

For example: $x^{3/2}, (z)^{2/7}$ etc.

Properties of Radicals **(U.B)**

Let $a, b \in R$ and m, n be positive integer. Then,

(i) $\sqrt[n]{ab} = \sqrt[n]{a}\,\sqrt[n]{b}$

(ii) $\sqrt[n]{\dfrac{a}{b}} = \dfrac{\sqrt[n]{a}}{\sqrt[n]{b}}$

(iii) $\sqrt[n]{\sqrt[m]{a}} = \sqrt[nm]{a}$

(iv) $\sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$

(v) $\sqrt[n]{a^n} = a$

(vi)

Exercise 2.3

Q.1 Write each radical expression in exponential notation and each exponential expression in radical notation. Do not simplify. (A.B)

(i) $\sqrt[3]{-64}$

$=(-64)^{\frac{1}{3}}$

(ii) $2^{\frac{3}{5}}$ **(A.B)**

$=\sqrt[5]{2^3}$

(iii) $-7^{\frac{1}{3}}$

$-\sqrt[3]{7}$

(iv) $y^{-\frac{2}{3}}$

$=\sqrt[3]{y^{-2}}$

Q.2 Tell whether the following statements are true or false?

(i) $5^{\frac{1}{5}}=\sqrt{5}$ **False**

(ii) $2^{\frac{2}{3}}=\sqrt[3]{4}$ **True**

(iii) $\sqrt{49}=\sqrt{7}$ **False**

(iv) $\sqrt[3]{x^{27}}=x^3$ **False**

Q.3 Simplify the following radical expression.

(i) $\sqrt[3]{-125}$

Solution: **(A.B)**

$=\sqrt[3]{-125}$

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

$=\sqrt[3]{(-5)^3} \quad \because a^m\times a^n=a^{mn}$

$=-5 \quad \because \sqrt[m]{(a)^m}=a$

$\Rightarrow \sqrt[3]{-125}=-5$

(ii) $\sqrt[4]{32}$ **(LHR 2018)** **(A.B)**

Solutions:

$\sqrt[4]{32}$

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

$=\sqrt[4]{2^4\times2}$

$=\sqrt[4]{2^4}\times\sqrt[4]{2} \quad \because \sqrt[n]{ab}=\sqrt[n]{a}\,\sqrt[n]{b}$

$=2\sqrt[4]{2} \quad \because \sqrt[m]{(a)^m}=a$

$\Rightarrow \sqrt[4]{32}=2\sqrt[4]{2}$

(iii) $\sqrt[5]{\frac{3}{32}}$ **(A.B)**

(LHR 2017, 21, GRW 2019, SWL 2018, 19, RWP 2019)

Solution:

$\sqrt[5]{\frac{3}{32}}$

$=\frac{\sqrt[5]{3}}{\sqrt[5]{32}} \quad \because \sqrt[n]{\frac{a}{b}}=\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

$=\frac{\sqrt[5]{3}}{\sqrt[5]{2\times2\times2\times2\times2}}$

$=\frac{\sqrt[5]{3}}{\sqrt[5]{(2)^5}}$

$=\frac{\sqrt[5]{3}}{2} \quad \because \sqrt[n]{a^n}=a$

$\Rightarrow \sqrt[5]{\frac{3}{32}}=\frac{\sqrt[5]{3}}{2}$

(iv) $\sqrt[3]{-\frac{8}{27}}$ **(A.B)**

Solution:

$\sqrt[3]{-\frac{8}{27}}$

$=\sqrt[3]{\left(-\frac{2}{3}\right)\left(-\frac{2}{3}\right)\left(-\frac{2}{3}\right)}$

$=\sqrt[3]{\left(-\frac{2}{3}\right)^3}$

$= -\frac{2}{3} \qquad \because \sqrt[n]{a^n} = a$

$\Rightarrow \sqrt[3]{-\frac{8}{27}} = -\frac{2}{3}$