NCERT Solutions for Class 9 Maths

Chapter 1 – Number System

Exercise 1.5

1. Compute the value of each of the following expressions: Find:

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

Ans: The given number is $64^{\frac{1}{2}}$.

By the laws of indices,

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

Therefore,

$64^{\frac{1}{2}} = \sqrt[2]{64}$

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

$= 8$

Hence, the value of $64^{\frac{1}{2}}$ is 8.

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

Ans: The given number is $32^{\frac{1}{5}}$.

By the laws of indices,

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

$32^{\frac{1}{5}} = \sqrt[5]{32}$

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

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

$= 2$

Alternative Method:

By the law of indices $\left(a^m\right)^n = a^{mn}$, then it gives

$= 32^{\frac{1}{5}} = (2 \times 2 \times 2 \times 2 \times 2)^{\frac{1}{5}}$

$= (2^5)^{\frac{1}{5}}$

$= 2^{\frac{5}{5}}$

$= 2$

Hence, the value of the expression $32^{\frac{1}{5}}$ is 2.

(iii) $125^{\frac{1}{5}}$

Ans: The given number is $125^{\frac{1}{3}}$.

By the laws of indices

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

Therefore,

$125^{\frac{1}{3}} = \sqrt[3]{125}$

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

$= 5$

Hence, the value of the expression $125^{\frac{1}{3}}$ is 5.

2. Compute the value of each of the following expressions: Find:

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

Ans: The given number is $9^{\frac{3}{2}}$.

By the laws of indices,

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

Therefore,

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

$= \sqrt[2]{9 \times 9 \times 9}$

$= \sqrt[2]{3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= 3 \times 3 \times 3$

$= 27$

Alternative Method:

By the laws of indices, $\left(a^m\right)^n = a^{mn}$, then it gives

$9^{\frac{3}{2}} = (3 \times 3)^{\frac{3}{2}}$

$= (3^2)^{\frac{3}{2}}$

$= 3^{2 \times \frac{3}{2}}$

$= 3^3$

That is,

$9^{\frac{3}{2}} = 27$.

Hence, the value of the expression $9^{\frac{3}{2}}$ is 27.

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

Ans: We know that $a^{\frac{m}{n}} = \sqrt[n]{a^m}$ where $a > 0$.

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

$\sqrt[5]{(32)^2} = \sqrt[5]{(2\times2\times2\times2\times2)\times(2\times2\times2\times2\times2)}$

$= 2\times2$

$= 4$

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

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

Ans: The given number is $16^{\frac{3}{4}}$.

By the laws of indices,

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

Therefore,

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

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

$= 2\times2\times2$

$= 8$

Hence, the value of the expression $16^{\frac{3}{4}}$ is 8.

Alternative Method:

By the laws of indices,

$(a^m)^n = a^{mn}$, where $a > 0$.

Therefore,

$16^{\frac{3}{4}} = (4 \times 4)^{\frac{3}{4}}$

$= (4^2)^{\frac{3}{4}}$

$= (4)^{2 \times \frac{3}{4}}$

$= (2^2)^{2 \times \frac{3}{4}}$

$= 2^{2 \times 2 \times \frac{3}{4}}$

$= 2^3$

$= 8$

Hence, the value of the expression is $16^{\frac{3}{4}} = 8$.

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

Ans: The given number is $125^{-\frac{1}{3}}$.

By the laws of indices, it is known that

$a^{-n} = \frac{1}{a^n}$, where $a > 0$.

.Therefore,

$125^{-\frac{1}{3}} = \frac{1}{125^{\frac{1}{3}}}$

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

$\sqrt[3]{(\frac{1}{125})}$

$\sqrt[3]{(\frac{1}{5} \times \frac{1}{5} \times \frac{1}{5})}$

$= \frac{1}{5}$

Hence, the value of the expression $125^{-\frac{1}{3}}$ is $\frac{1}{5}$.

3. Simplify and evaluate each of the expressions:

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

Ans: The given expression is $2^{\frac{2}{3}}.2^{\frac{1}{5}}$.

By the laws of indices, it is known that

$a^m \cdot a^n = a^{m+n}$, where $a > 0$.

Therefore,

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

$= (2)^{\frac{10+3}{15}}$

$= 2^{\frac{13}{15}}$

Hence, the value of the expression $2^{\frac{2}{3}}.2^{\frac{1}{5}}$ is $2^{\frac{13}{15}}$.

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

Ans: The given expression is $\left(\frac{1}{3^3}\right)^7$.

It is known by the laws of indices that,

$(a^m)^n = a^{mn}$, where $a > 0$.

Therefore,

$\left(\frac{1}{3^3}\right)^7 = \left(\frac{1}{3^{21}}\right)$

Hence, the value of the expression $\left(\frac{1}{3^3}\right)^7$ is $\left(\frac{1}{3^{21}}\right)$

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

Ans: The given number is $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$.

It is known by the Laws of Indices that

$\frac{a^m}{a^n} = a^{m-n}$, where $a > 0$.

Therefore,

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

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

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

Hence, the value of the expression $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$ is $11^{\frac{1}{4}}$.

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

Ans: The given expression is $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$.

It is known by the Laws of Indices that

$a^m \cdot b^m = (a \cdot b)^m$, where $a > 0$.

Therefore,

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

$= 56^{\frac{1}{2}}$

Hence, the value of the expression $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$ is $(56)^{\frac{1}{2}}$.