

# Mathematics

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(Chapter – 1) (Number Systems)(Exemplar Problems)

(Class – IX)

## Exercise 1.3

### Question 14:

Simplify:

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

(ii)  $\left(\frac{3}{5}\right)^4 \left(\frac{8}{5}\right)^{-12} \left(\frac{32}{5}\right)^6$

(iii)  $\left(\frac{1}{27}\right)^{-\frac{2}{3}}$

(iv)  $\left[\left\{\left(625\right)^{-\frac{1}{2}}\right\}^{\frac{-1}{4}}\right]^2$

(v)  $\frac{9^{\frac{1}{3}} \times 27^{-\frac{1}{2}}}{3^{\frac{1}{6}} \times 3^{-\frac{2}{3}}}$

(vi)  $64^{-\frac{1}{3}} \left[64^{\frac{1}{3}} - 64^{\frac{2}{3}}\right]$

(vii)  $\frac{8^{\frac{1}{3}} \times 16^{\frac{1}{3}}}{32^{-\frac{1}{3}}}$

### Answer 14:



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

$= (1 + 8 + 27)^{\frac{1}{2}}$

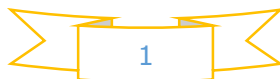
$= (36)^{\frac{1}{2}}$

$= (6^2)^{\frac{1}{2}}$

$= 6$

(ii)  $\left(\frac{3}{5}\right)^4 \left(\frac{8}{5}\right)^{-12} \left(\frac{32}{5}\right)^6$

$= \frac{3^4}{5^4} \times \frac{8^{-12}}{5^{-12}} \times \frac{32^6}{5^6}$



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(Class – IX)

$$\begin{aligned} &= \frac{3^4 \times 8^{-12} \times 32^6}{5^4 \times 5^{-12} \times 5^6} \\ &= \frac{3^4 \times (2^3)^{-12} \times (2^5)^6}{5^{4-12+6}} \\ &= \frac{3^4 \times 2^{-36} \times 2^{30}}{5^{-2}} \\ &= \frac{3^4 \times 5^2}{2^6} \\ &= \frac{81 \times 25}{64} \\ &= \frac{2025}{64} \end{aligned}$$

$$\begin{aligned} \text{(iii)} & \left(\frac{1}{27}\right)^{-\frac{2}{3}} \\ &= \left(\frac{1}{27}\right)^{\frac{-2}{3}} \\ &= \left[\left(\frac{1}{3}\right)^3\right]^{-\frac{2}{3}} \\ &= \left(\frac{1}{3}\right)^{3 \times \frac{-2}{3}} \\ &= \left(\frac{1}{3}\right)^{-2} \\ &= 3^2 \\ &= 9 \end{aligned}$$



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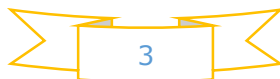
(Class – IX)

$$\begin{aligned} \text{(iv)} & \left[ \left\{ (625)^{-\frac{1}{2}} \right\}^{\frac{-1}{4}} \right]^2 \\ & = \left[ \left\{ (25^2)^{-\frac{1}{2}} \right\}^{\frac{-1}{4}} \right]^2 \\ & = \left[ \{25^{-1}\}^{\frac{-1}{4}} \right]^2 \\ & = \left[ 25^{\frac{1}{4}} \right]^2 \\ & = 25^{\frac{1}{2}} \\ & = 5^{2 \times \frac{1}{2}} \\ & = 5 \end{aligned}$$



$$\begin{aligned} \text{(v)} & \frac{9^{\frac{1}{3}} \times 27^{-\frac{1}{2}}}{36 \times 3^{-\frac{2}{3}}} \\ & = \frac{3^{2 \times \frac{1}{3}} \times 3^{3 \times \frac{1}{2}}}{3^{\frac{1}{6}} \times 3^{\frac{2}{3}}} = \frac{3^{\frac{2}{3}} \times 3^{\frac{3}{2}}}{3^{\frac{1}{6} + \frac{2}{3}}} = \frac{3^{\frac{2}{3} + \frac{3}{2}}}{3^{\frac{1}{2} + \frac{4}{6}}} = \frac{3^{\frac{4+9}{6}}}{3^{\frac{-3}{6}}} = 3^{\frac{-5+9}{6}} = 3^{\frac{4}{6}} = 3^{\frac{2}{3}} \end{aligned}$$

$$\begin{aligned} \text{(vi)} & 64^{-\frac{1}{3}} \left[ 64^{\frac{1}{3}} - 64^{\frac{2}{3}} \right] \\ & = 4^{3 \times -\frac{1}{3}} \left[ 4^{3 \times \frac{1}{3}} - 4^{3 \times \frac{2}{3}} \right] \\ & = 4^{-1} [4 - 4^2] \\ & = \frac{4 - 16}{4} \\ & = \frac{-12}{4} = -3 \end{aligned}$$



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$$\begin{aligned} \text{(vii)} \quad & \frac{8^{\frac{1}{3}} \times 16^{\frac{1}{3}}}{32^{-\frac{1}{3}}} \\ &= \frac{2^{3 \times \frac{1}{3}} \times 2^{4 \times \frac{1}{3}}}{2^{5 \times -\frac{1}{3}}} \\ &= \frac{2^{\frac{3}{3}} \times 2^{\frac{4}{3}}}{2^{-\frac{5}{3}}} \\ &= 2^{\frac{3}{3} + \frac{4}{3} + \frac{5}{3}} \\ &= 2^{\frac{12}{3}} \\ &= 2^4 \\ &= 16 \end{aligned}$$

