

## Exponents of Real Numbers Ex 2.1 Q3

## Answer:

(i) We have to prove that 
$$\frac{\sqrt{3 \times 5^{-3}}}{\sqrt[3]{3^{-1}\sqrt{5}}} \times \sqrt[6]{3 \times 5^6} = \frac{3}{5}$$

By using rational exponent  $a^{-n} = \frac{1}{a^n}$  we get,

$$\frac{\sqrt{3 \times 5^{-3}}}{\sqrt[3]{3^{-1}}\sqrt{5}} \times \sqrt[6]{3 \times 5^{6}} = \frac{\sqrt{3 \times \frac{1}{5^{3}}}}{\sqrt[3]{\frac{1}{3}}\sqrt{5}} \times \sqrt[6]{3 \times 5^{6}}$$

$$\Rightarrow \frac{\sqrt{3 \times 5^{-3}}}{\sqrt[3]{3^{-1}}\sqrt{5}} \times \sqrt[6]{3 \times 5^{6}} = \frac{3^{\frac{1}{2}} \times \frac{1}{5^{3 \times \frac{1}{2}}}}{\frac{1}{3^{\frac{1}{3}}} \times 5^{\frac{1}{2}}} \times 3^{\frac{1}{6}} \times 5^{6 \times \frac{1}{6}}$$

$$\frac{\sqrt{3 \times 5^{-3}}}{\sqrt[3]{3^{-1}\sqrt{5}}} \times \sqrt[6]{3 \times 5^{6}} = \frac{3^{\frac{1}{2}} \times \frac{1}{5^{\frac{3}{2}}}}{\frac{1}{3^{\frac{1}{3}}} \times 5^{\frac{1}{6}}} \times 3^{\frac{1}{6}} \times 5^{\frac{6}{6} \times \frac{1}{6}}$$

$$=\frac{\frac{3^{\frac{1}{2}}}{5^{\frac{3}{2}}} \times 3^{\frac{1}{6}} \times 5^{1}}{\frac{5^{\frac{1}{2}}}{3^{\frac{1}{3}}}}$$

$$=\frac{3^{\frac{1}{2}}}{\frac{3}{2}} \times \frac{3^{\frac{1}{3}}}{5^{\frac{1}{2}}} \times 3^{\frac{1}{6}} \times 5^{1}$$

$$=\frac{3^{\frac{1}{2}} \times 3^{\frac{1}{3}} \times 3^{\frac{1}{6}} \times 5^{1}}{5^{\frac{1}{2}}}$$

$$=\frac{3^{\frac{1}{2} + \frac{1}{3} + \frac{1}{6}}}{5^{\frac{1}{2}} \times 3^{\frac{1}{3}} \times 5^{-\frac{3}{2}}} \times 5^{-\frac{1}{2}} \times 3^{\frac{1}{6}} \times 5^{1}$$

$$=3^{\frac{1}{2} + \frac{1}{3} + \frac{1}{6}} \times 5^{-\frac{3}{2} + \frac{1}{2} + 1}$$

$$=3^{\frac{1}{2} + \frac{1}{3} + \frac{1}{6}} \times 5^{-\frac{3}{2} + \frac{1}{2} + 1}$$

$$=3^{\frac{3+2+1}{6}} \times 5^{-\frac{3-1+2}{2}}$$

$$\Rightarrow \frac{\sqrt{3 \times 5^{-3}}}{\sqrt[3]{3^{-1}} \sqrt{5}} \times \sqrt[6]{3 \times 5^{6}} 3^{\frac{6}{6}} \times 5^{-\frac{2}{2}} = 3^{1} \times 5^{-1} = \frac{3}{5}$$
Hence, 
$$\frac{\sqrt{3 \times 5^{-3}}}{\sqrt[3]{3^{-1}} \sqrt{5}} \times \sqrt[6]{3 \times 5^{-6}} \times \sqrt[6]{3 \times 5^{-6}} = \frac{3}{5}$$

(ii) We have to prove that 
$$9^{\frac{3}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 15$$
. So,

$$9^{\frac{3}{2}} - 3 \times 5^{0} - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 3^{2 \times \frac{3}{2}} - 3 \times 5^{0} - \frac{1}{81^{-\frac{1}{2}}}$$
$$= 3^{2 \times \frac{3}{2}} - 3 \times 1 - \frac{1}{\frac{1}{\sqrt{81}}}$$

$$9^{\frac{3}{2}} - 3 \times 5^{0} - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 3^{3} - 3 - \frac{1}{\frac{1}{2\sqrt{9 \times 9}}}$$
$$= 27 - 3 - \frac{1}{\frac{1}{9}}$$
$$= 27 - 3 - 1 \times \frac{9}{1}$$
$$= 27 - 12 = 15$$

Hence, 
$$9^{\frac{3}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 15$$

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