



## Rationalisation Ex 3.2 Q5

**Answer :**

(i) We know that rationalization factor for  $3\sqrt{2} + 2\sqrt{3}$  and  $\sqrt{3} - \sqrt{2}$  are  $3\sqrt{2} - 2\sqrt{3}$  and  $\sqrt{3} + \sqrt{2}$  respectively. We will multiply numerator and denominator of the given expression  $\frac{3\sqrt{2} - 2\sqrt{3}}{3\sqrt{2} + 2\sqrt{3}}$  and

$\frac{\sqrt{12}}{\sqrt{3} - \sqrt{2}}$  by  $3\sqrt{2} - 2\sqrt{3}$  and  $\sqrt{3} + \sqrt{2}$  respectively, to get

$$\begin{aligned} \frac{3\sqrt{2} - 2\sqrt{3}}{3\sqrt{2} + 2\sqrt{3}} \times \frac{3\sqrt{2} - 2\sqrt{3}}{3\sqrt{2} - 2\sqrt{3}} + \frac{\sqrt{12}}{\sqrt{3} - \sqrt{2}} \times \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} + \sqrt{2}} &= \frac{(3\sqrt{2})^2 + (2\sqrt{3})^2 - 2 \times 3\sqrt{2} \times 2\sqrt{3}}{(3\sqrt{2})^2 - (2\sqrt{3})^2} + \frac{\sqrt{36} + \sqrt{24}}{(\sqrt{3})^2 - (\sqrt{2})^2} \\ &= \frac{18 + 12 - 12\sqrt{6}}{18 - 12} + \frac{6 + \sqrt{24}}{3 - 2} \\ &= \frac{30 - 12\sqrt{6} + 36 + 12\sqrt{6}}{6} \\ &= \frac{66}{6} \\ &= 11 \end{aligned}$$

Hence the given expression is simplified to  $\boxed{11}$ .

(ii) We know that rationalization factor for  $\sqrt{5} - \sqrt{3}$  and  $\sqrt{5} + \sqrt{3}$  are  $\sqrt{5} + \sqrt{3}$  and  $\sqrt{5} - \sqrt{3}$  respectively. We will multiply numerator and denominator of the given expression  $\frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} - \sqrt{3}}$  and

$\frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}}$  by  $\sqrt{5} + \sqrt{3}$  and  $\sqrt{5} - \sqrt{3}$  respectively, to get

$$\begin{aligned} \frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} - \sqrt{3}} \times \frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} + \sqrt{3}} + \frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}} \times \frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} - \sqrt{3}} &= \frac{(\sqrt{5})^2 + (\sqrt{3})^2 + 2 \times \sqrt{5} \times \sqrt{3}}{(\sqrt{5})^2 - (\sqrt{3})^2} + \frac{(\sqrt{5})^2 + (\sqrt{3})^2 - 2 \times \sqrt{5} \times \sqrt{3}}{(\sqrt{5})^2 - (\sqrt{3})^2} \\ &= \frac{5 + 3 + 2\sqrt{15}}{5 - 3} + \frac{5 + 3 - 2\sqrt{15}}{5 - 3} \\ &= \frac{5 + 3 + 2\sqrt{15} + 5 + 3 - 2\sqrt{15}}{2} \\ &= \frac{16}{2} \\ &= 8 \end{aligned}$$

Hence the given expression is simplified to  $\boxed{8}$ .

(iii) We know that rationalization factor for  $3 + \sqrt{5}$  and  $3 - \sqrt{5}$  are  $3 - \sqrt{5}$  and  $3 + \sqrt{5}$  respectively. We will multiply numerator and denominator of the given expression  $\frac{7 + 3\sqrt{5}}{3 + \sqrt{5}}$  and  $\frac{7 - 3\sqrt{5}}{3 - \sqrt{5}}$  by  $3 - \sqrt{5}$  and  $3 + \sqrt{5}$  respectively, to get

$$\begin{aligned} \frac{7 + 3\sqrt{5}}{3 + \sqrt{5}} \times \frac{3 - \sqrt{5}}{3 - \sqrt{5}} - \frac{7 - 3\sqrt{5}}{3 - \sqrt{5}} \times \frac{3 + \sqrt{5}}{3 + \sqrt{5}} &= \frac{7 \times 3 - 7 \times \sqrt{5} + 9 \times \sqrt{5} - 3 \times (\sqrt{5})^2}{(3)^2 - (\sqrt{5})^2} - \frac{7 \times 3 + 7 \times \sqrt{5} - 9 \times \sqrt{5} - 3 \times (\sqrt{5})^2}{(3)^2 - (\sqrt{5})^2} \\ &= \frac{21 - 7\sqrt{5} + 9\sqrt{5} - 3 \times 5}{9 - 5} - \frac{21 + 7\sqrt{5} - 9\sqrt{5} - 3 \times 5}{9 - 5} \\ &= \frac{21 + 2\sqrt{5} - 15}{4} - \frac{21 - 2\sqrt{5} - 15}{4} \\ &= \frac{6 + 2\sqrt{5} - 6 + 2\sqrt{5}}{4} \\ &= \frac{4\sqrt{5}}{4} \\ &= \sqrt{5} \end{aligned}$$

Hence the given expression is simplified to  $\boxed{\sqrt{5}}$ .

(iv) We know that rationalization factor for  $2 + \sqrt{3}$ ,  $\sqrt{5} - \sqrt{3}$ , and  $2 - \sqrt{5}$  are  $2 - \sqrt{3}$ ,  $\sqrt{5} + \sqrt{3}$ , and  $2 + \sqrt{5}$  respectively. We will multiply numerator and denominator of the given expression

$$\begin{aligned} \frac{1}{2+\sqrt{3}}, \frac{2}{\sqrt{5}-\sqrt{3}} \text{ and } \frac{1}{2-\sqrt{5}} \text{ by } 2-\sqrt{3}, \sqrt{5}+\sqrt{3}, \text{ and } 2+\sqrt{5} \text{ respectively, to get} \\ \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} + \frac{2}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}} + \frac{1}{2-\sqrt{5}} \times \frac{2+\sqrt{5}}{2+\sqrt{5}} = \frac{2-\sqrt{3}}{(2)^2 - (\sqrt{3})^2} + \frac{2\sqrt{5}+2\sqrt{3}}{(\sqrt{5})^2 - (\sqrt{3})^2} + \frac{2-\sqrt{5}}{(2)^2 - (\sqrt{5})^2} \\ = \frac{2-\sqrt{3}}{1} + \frac{2\sqrt{5}+2\sqrt{3}}{5-3} + \frac{2+\sqrt{5}}{4-5} \\ = \frac{2-\sqrt{3}}{1} + \frac{2\sqrt{5}+2\sqrt{3}}{2} + \frac{2+\sqrt{5}}{-1} \\ = 2 - \sqrt{3} + \sqrt{5} + \sqrt{3} - \sqrt{5} - 2 \\ = 0 \end{aligned}$$

Hence the given expression is simplified to  $\boxed{0}$ .

(v) We know that rationalization factor for  $\sqrt{5} + \sqrt{3}$ ,  $\sqrt{3} + \sqrt{2}$ , and  $\sqrt{5} + \sqrt{2}$  are  $\sqrt{5} - \sqrt{3}$ ,  $\sqrt{3} - \sqrt{2}$ , and  $\sqrt{5} - \sqrt{2}$  respectively. We will multiply numerator and denominator of the given expression

$$\begin{aligned} \frac{2}{\sqrt{5}+\sqrt{3}}, \frac{1}{\sqrt{3}+\sqrt{2}} \text{ and } \frac{3}{\sqrt{5}+\sqrt{2}} \text{ by } 2-\sqrt{3}, \sqrt{5}+\sqrt{3}, \text{ and } 2+\sqrt{5} \text{ respectively, to get} \\ \frac{2}{\sqrt{5}+\sqrt{3}} \times \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} - \frac{3}{\sqrt{5}+\sqrt{2}} \times \frac{\sqrt{5}-\sqrt{2}}{\sqrt{5}-\sqrt{2}} = \frac{2\sqrt{5}-2\sqrt{3}}{5-3} + \frac{\sqrt{3}-\sqrt{2}}{3-2} - \frac{3\sqrt{5}-3\sqrt{2}}{5-2} \\ = \frac{2\sqrt{5}-2\sqrt{3}}{2} + \frac{\sqrt{3}-\sqrt{2}}{1} - \frac{3\sqrt{5}-3\sqrt{2}}{3} \\ = \sqrt{5} - \sqrt{3} + \sqrt{3} - \sqrt{2} - \sqrt{5} + \sqrt{2} \\ = 0 \end{aligned}$$

Hence the given expression is simplified to  $\boxed{0}$ .

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