

Rationalisation Ex 3.2 Q4

Answer:

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

$$\frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}} \times \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} - \sqrt{2}} = \frac{\left(\sqrt{3}\right)^2 + \left(\sqrt{2}\right)^2 - 2 \times \sqrt{3} \times \sqrt{2}}{\left(\sqrt{3}\right)^2 - \left(\sqrt{2}\right)^2}$$
$$= \frac{3 + 2 - 2\sqrt{6}}{3 - 2}$$
$$= \frac{5 - 2\sqrt{6}}{1}$$
$$= 5 - 2\sqrt{6}$$

Hence the given expression is simplified to $5-2\sqrt{6}$

(ii) We know that rationalization factor for $7+4\sqrt{3}$ is $7-4\sqrt{3}$. We will multiply numerator and denominator of the given expression $\frac{5+2\sqrt{3}}{7+4\sqrt{3}}$ by $7-4\sqrt{3}$, to get

$$\frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}} = \frac{5\times7-5\times4\sqrt{3}+2\times7\times\sqrt{3}-2\times4\times\left(\sqrt{3}\right)^2}{\left(7\right)^2 - \left(4\sqrt{3}\right)^2}$$
$$= \frac{35-20\sqrt{3}+14\sqrt{3}-8\times3}{49-48}$$
$$= \frac{11-6\sqrt{3}}{1}$$
$$= 11-6\sqrt{3}$$

Hence the given expression is simplified to $11-6\sqrt{3}$

(iii) We know that rationalization factor for $3-2\sqrt{2}$ is $3+2\sqrt{2}$. We will multiply numerator and denominator of the given expression $\frac{1+\sqrt{2}}{3-2\sqrt{2}}$ by $3+2\sqrt{2}$, to get

$$\frac{1+\sqrt{2}}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}} = \frac{3+2\sqrt{2}+3\sqrt{2}+2\times\left(\sqrt{2}\right)^2}{\left(3\right)^2 - \left(2\sqrt{2}\right)^2}$$
$$= \frac{3+5\sqrt{2}+4}{9-4\times 2}$$
$$= \frac{7+5\sqrt{2}}{9-8}$$
$$= \frac{7+5\sqrt{2}}{1}$$
$$= 7+5\sqrt{2}$$

Hence the given expression is simplified to $7 + 5\sqrt{2}$

(iv) We know that rationalization factor for $3\sqrt{5}-2\sqrt{6}$ is $3\sqrt{5}+2\sqrt{6}$. We will multiply numerator and denominator of the given expression $\frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}}$ by $3\sqrt{5}+2\sqrt{6}$, to get

$$\begin{split} \frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}} \times & \frac{3\sqrt{5}+2\sqrt{6}}{3\sqrt{5}+2\sqrt{6}} = \frac{2\times3\times\sqrt{6}\times\sqrt{5}+\left(2\sqrt{6}\right)^2-3\times\left(\sqrt{5}\right)^2-2\times\sqrt{5}\times\sqrt{6}}{\left(3\sqrt{5}\right)^2-\left(2\sqrt{6}\right)^2} \\ & = \frac{6\sqrt{6\times5}+4\times6-3\times5-2\times\sqrt{5\times6}}{9\times5-4\times6} \\ & = \frac{6\sqrt{30}+24-15-2\sqrt{30}}{45-24} \\ & = \frac{9+4\sqrt{30}}{21} \end{split}$$

Hence the given expression is simplified to $\frac{9+4\sqrt{30}}{21}$

(v) We know that rationalization factor for $\sqrt{48}+\sqrt{18}~$ is $\sqrt{48}-\sqrt{18}~$. We will multiply numerator and denominator of the given expression $\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$ by $\sqrt{48}-\sqrt{18}$, to get

$$\frac{4\sqrt{3} + 5\sqrt{2}}{\sqrt{48} + \sqrt{18}} \times \frac{\sqrt{48} - \sqrt{18}}{\sqrt{48} - \sqrt{18}} = \frac{4 \times \sqrt{3} \times \sqrt{48} - 4 \times \sqrt{3} \times \sqrt{18} + 5 \times \sqrt{2} \times \sqrt{48} - 5 \times \sqrt{2} \times \sqrt{18}}{\left(\sqrt{48}\right)^2 - \left(\sqrt{18}\right)^2}$$

$$= \frac{4\sqrt{3} \times 48 - 4 \times \sqrt{3} \times 18 + 5 \times \sqrt{2} \times 48 - 5 \times \sqrt{2} \times 18}{48 - 18}$$

$$= \frac{4\sqrt{144} - 4\sqrt{54} + 5\sqrt{96} - 5\sqrt{36}}{30}$$

$$= \frac{4 \times 12 - 4 \times \sqrt{9} \times \sqrt{6} + 5 \times \sqrt{16} \times \sqrt{6} - 5\sqrt{36}}{30}$$

$$= \frac{48 - 4 \times 3 \times \sqrt{6} + 5 \times 4 \times \sqrt{6} - 5 \times 6}{30}$$

$$= \frac{48 - 12\sqrt{6} + 20\sqrt{6} - 30}{30}$$

$$= \frac{18 + 8\sqrt{6}}{30}$$

$$= \frac{9 + 4\sqrt{6}}{15}$$

Hence the given expression is simplified to $\frac{9+4\sqrt{6}}{15}$

(vi) We know that rationalization factor for $2\sqrt{2}+3\sqrt{3}$ is $2\sqrt{2}-3\sqrt{3}$. We will multiply numerator and

denominator of the given expression
$$\frac{2\sqrt{3} - \sqrt{5}}{2\sqrt{2} + 3\sqrt{3}} \text{ by } 2\sqrt{2} - 3\sqrt{3} \text{ , to get}$$

$$\frac{2\sqrt{3} - \sqrt{5}}{2\sqrt{2} + 3\sqrt{3}} \times \frac{2\sqrt{2} - 3\sqrt{3}}{2\sqrt{2} - 3\sqrt{3}} = \frac{2\times 2\times \sqrt{3}\times \sqrt{2} - 2\times 3\times \sqrt{3}\times \sqrt{3} - 2\times \sqrt{5}\times \sqrt{2} + 3\times \sqrt{5}\times \sqrt{3}}{\left(2\sqrt{2}\right)^2 - \left(3\sqrt{3}\right)^2}$$

$$= \frac{4\sqrt{3}\times 2 - 6\times \left(\sqrt{3}\right)^2 - 2\times \sqrt{5\times 2} + 3\times \sqrt{5\times 3}}{4\times 2 - 9\times 3}$$

$$= \frac{4\sqrt{6} - 6\times 3 - 2\sqrt{10} + 3\sqrt{15}}{8 - 27}$$

$$= \frac{4\sqrt{6} - 18 - 2\sqrt{10} + 3\sqrt{15}}{-19}$$

$$= \frac{18 + 2\sqrt{10} - 3\sqrt{15} - 4\sqrt{6}}{19}$$

Hence the given expression is simplified to $18 + 2\sqrt{10} - 3\sqrt{15} - 4\sqrt{6}$

******* END ******