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 $\boxed{5-2\sqrt{6}}$.

(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

$$\frac{5+2\sqrt{3}}{7+4\sqrt{3}}\times\frac{7-4\sqrt{3}}{7-4\sqrt{3}}=\frac{5\times7-5\times4\sqrt{3}+2\times7\times\sqrt{3}-2\times4\times\left(\sqrt{3}\right)^2}{(7)^2-\left(4\sqrt{3}\right)^2}$$

$$=\frac{35-20\sqrt{3}+14\sqrt{3}-8\times3}{49-48}$$

$$=\frac{11-6\sqrt{3}}{1}$$

$$=11-6\sqrt{3}$$

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

(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

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

$$=\frac{3+5\sqrt{2}+4}{9-4\times2}$$

$$=\frac{7+5\sqrt{2}}{9-8}$$

$$=\frac{7+5\sqrt{2}}{1}$$

$$=7+5\sqrt{2}$$

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

(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

$$\frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}}\times\frac{3\sqrt{5}+2\sqrt{6}}{3\sqrt{5}+2\sqrt{6}}=\frac{2\times3\times\sqrt{6}\times\sqrt{5}+\left(2\sqrt{6}\right)^2-3\times\left(\sqrt{5}\right)^2-2\times\sqrt{5}\times\sqrt{6}}{\left(3\sqrt{5}\right)^2-\left(2\sqrt{6}\right)^2}$$

$$=\frac{6\sqrt{6\times5}+4\times6-3\times5-2\times\sqrt{5\times6}}{9\times5-4\times6}$$

$$=\frac{6\sqrt{30}+24-15-2\sqrt{30}}{45-24}$$

$$=\frac{9+4\sqrt{30}}{21}$$

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

(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

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

$$=\frac{4\sqrt{3\times48}-4\times\sqrt{3\times18}+5\times\sqrt{2\times48}-5\times\sqrt{2\times18}}{48-18}$$

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

$$=\frac{4\times12-4\times\sqrt{9}\times\sqrt{6}+5\times\sqrt{16}\times\sqrt{6}-5\sqrt{36}}{30}$$

$$=\frac{48-4\times3\times\sqrt{6}+5\times4\times\sqrt{6}-5\times6}{30}$$

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

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

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

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

(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 $\frac{2\sqrt{3}-\sqrt{5}}{2\sqrt{2}+3\sqrt{3}}$ by $2\sqrt{2}-3\sqrt{3}$, to get

$$\frac{2\sqrt{3}-\sqrt{5}}{2\sqrt{2}+3\sqrt{3}}\times\frac{2\sqrt{2}-3\sqrt{3}}{2\sqrt{2}-3\sqrt{3}}=\frac{2\times2\times\sqrt{3}\times\sqrt{2}-2\times3\times\sqrt{3}\times\sqrt{3}-2\times\sqrt{5}\times\sqrt{2}+3\times\sqrt{5}\times\sqrt{3}}{\left(2\sqrt{2}\right)^2-\left(3\sqrt{3}\right)^2}$$

$$=\frac{4\sqrt{3\times2}-6\times\left(\sqrt{3}\right)^2-2\times\sqrt{5\times2}+3\times\sqrt{5\times3}}{4\times2-9\times3}$$

$$=\frac{4\sqrt{6}-6\times3-2\sqrt{10}+3\sqrt{15}}{8-27}$$

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

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

Hence the given expression is simplified to $\boxed{\frac{18+2\sqrt{10}-3\sqrt{15}-4\sqrt{6}}{19}}$.

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