Exercise 1.3

Question 10:

Rationalise the denominator of the following:

(i) $\frac{2}{3\sqrt{3}}$ **(ii)** $\frac{\sqrt{40}}{\sqrt{3}}$ **(iii)** $\frac{3+\sqrt{2}}{4\sqrt{2}}$

(iv) $\frac{16}{\sqrt{41}-5}$ **(v)** $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ **(vi)** $\frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}}$

(vii) $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ **(viii)** $\frac{3\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ **(ix)** $\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$

Answer 10:

(i) $\frac{2}{3\sqrt{3}}$

$$= \frac{2}{3\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{9}$$

(ii) $\frac{\sqrt{40}}{\sqrt{3}}$

$$= \frac{\sqrt{40}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{120}}{3} = \frac{\sqrt{2 \times 2 \times 30}}{3} = \frac{2\sqrt{30}}{3}$$

(iii) $\frac{3+\sqrt{2}}{4\sqrt{2}}$

$$= \frac{3+\sqrt{2}}{4\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}+2}{8}$$

(iv) $\frac{16}{\sqrt{41}-5}$

$$= \frac{16}{\sqrt{41}-5} \times \frac{\sqrt{41}+5}{\sqrt{41}+5} = \frac{16(\sqrt{41}+5)}{41-25} = \frac{16(\sqrt{41}+5)}{16} = (\sqrt{41}+5)$$

(v) $\frac{2+\sqrt{3}}{2-\sqrt{3}}$

$$= \frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{(2+\sqrt{3})^2}{4-3} = (2+\sqrt{3})^2 = 4+3+4\sqrt{3} = 7+4\sqrt{3}$$

(vi) $\frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}}$

$$= \frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}} \times \frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}-\sqrt{3}} = \frac{\sqrt{12}-\sqrt{18}}{2-3}$$

$$= \frac{\sqrt{2\times 2\times 3}-\sqrt{2\times 3\times 3}}{-1} = \frac{2\sqrt{3}-3\sqrt{2}}{-1} = 3\sqrt{2}-2\sqrt{3}$$

(vii) $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

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

$$= (\sqrt{3}+\sqrt{2})^2 = 3+2+2\sqrt{6} = 5+2\sqrt{6}$$

(viii) $\frac{3\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$$= \frac{3\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}} = \frac{15+3\sqrt{15}+\sqrt{15}+3}{5-3} = \frac{18+4\sqrt{15}}{2} = 9+2\sqrt{15}$$

(ix) $\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$

$$= \frac{4\sqrt{3}+5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}} \times \frac{4\sqrt{3}-3\sqrt{2}}{4\sqrt{3}-3\sqrt{2}} = \frac{16\times 3-12\sqrt{6}+20\sqrt{6}-15\times 2}{16\times 3-9\times 2}$$

$$= \frac{48+8\sqrt{6}-30}{48-18} = \frac{18+8\sqrt{6}}{30} = \frac{9+4\sqrt{6}}{15}$$