

8. Letting $X = \frac{4 + \sqrt{3}}{\sqrt{2}}$ and $Y = \frac{4 - \sqrt{3}}{\sqrt{2}}$, find in its simplest form:

- (i) $X + Y$ (ii) $X - Y$ (iii) XY (iv) $\frac{X}{Y}$

$$(i) \quad \frac{4 + \sqrt{3}}{\sqrt{2}} + \frac{4 - \sqrt{3}}{\sqrt{2}} = \frac{\cancel{4 + \sqrt{3}} + \cancel{4 - \sqrt{3}}}{\sqrt{2}} = \frac{8\sqrt{2}}{\sqrt{2}\sqrt{2}}$$

$$= \frac{8\sqrt{2}}{2} = 4\sqrt{2}$$

$$(ii) \quad \frac{4 + \sqrt{3} - (4 - \sqrt{3})}{\sqrt{2}} = \frac{\cancel{4 + \sqrt{3}} - \cancel{4 - \sqrt{3}}}{\sqrt{2}} = \frac{2\sqrt{3}\sqrt{2}}{\sqrt{2}\sqrt{2}}$$

$$= \frac{\cancel{2}\sqrt{6}}{\cancel{2}} = \sqrt{6}$$

8. Letting $X = \frac{4 + \sqrt{3}}{\sqrt{2}}$ and $Y = \frac{4 - \sqrt{3}}{\sqrt{2}}$, find in its simplest form:

- (i) $X + Y$ (ii) $X - Y$ (iii) XY (iv) $\frac{X}{Y}$

DOTS!

$$(iii) \quad \frac{(4 + \sqrt{3})(4 - \sqrt{3})}{(\sqrt{2})(\sqrt{2})} = \frac{16 - 3}{2} = \frac{13}{2}$$

Invert and multiply

$$(iv) \quad \frac{X}{Y} = \left(\frac{4 + \sqrt{3}}{\cancel{\sqrt{2}}} \right) \left(\frac{\cancel{\sqrt{2}}}{4 - \sqrt{3}} \right)$$

conjugate of denominator

$$= \frac{(4 + \sqrt{3})(4 + \sqrt{3})}{(4 - \sqrt{3})(4 + \sqrt{3})} = \frac{16 + 8\sqrt{3} + 3}{16 - 3}$$

$$= \frac{19 + 8\sqrt{3}}{13}$$