

Ex 2.7

Q1

- (i)  $\sqrt{8} = \sqrt{4 \times 2} = 2\sqrt{2}$
- (ii)  $\sqrt{27} = \sqrt{9 \times 3} = 3\sqrt{3}$
- (iii)  $\sqrt{45} = \sqrt{9 \times 5} = 3\sqrt{5}$
- (iv)  $\sqrt{200} = \sqrt{100 \times 2} = 10\sqrt{2}$
- (v)  $3\sqrt{18} = 3\sqrt{9 \times 2} = 9\sqrt{2}$

Q2

- (i)  $2\sqrt{2} + 6\sqrt{2} - 3\sqrt{2} = 5\sqrt{2}$
- (ii)  $2\sqrt{2} + \sqrt{18} = 2\sqrt{2} + 3\sqrt{2} = 5\sqrt{2}$
- (iii)  $\sqrt{32} + \sqrt{18} = 4\sqrt{2} + 3\sqrt{2} = 7\sqrt{2}$
- (iv)  $\sqrt{27} + \sqrt{48} - 2\sqrt{3} = 3\sqrt{3} + 4\sqrt{3} - 2\sqrt{3} = 5\sqrt{3}$
- (v)  $\sqrt{8} + \sqrt{200} - \sqrt{18} = 2\sqrt{2} + 10\sqrt{2} - 3\sqrt{2} = 9\sqrt{2}$
- (vi)  $7\sqrt{5} + 2\sqrt{20} - \sqrt{80} = 7\sqrt{5} + 4\sqrt{5} - 4\sqrt{5} = 7\sqrt{5}$

Q3

- (i)  $\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

- (ii)  $\frac{2}{\sqrt{8}} = \frac{2}{2\sqrt{2}} \times \frac{2\sqrt{2}}{2\sqrt{2}} = \frac{4\sqrt{2}}{8} = \frac{\sqrt{2}}{2}$

- (iii)  $\frac{2}{5\sqrt{2}} \times \frac{5\sqrt{2}}{5\sqrt{2}} = \frac{10\sqrt{2}}{50} = \frac{\sqrt{2}}{5}$

- (iv)  $\frac{20}{\sqrt{50}} \times \frac{\sqrt{50}}{\sqrt{50}} = \frac{20\sqrt{25 \times 2}}{50} = \frac{100\sqrt{2}}{50} = 2\sqrt{2}$

- (v)  $\frac{8}{\sqrt{128}} \times \frac{\sqrt{128}}{\sqrt{128}} = \frac{8\sqrt{64 \times 2}}{128} = \frac{64\sqrt{2}}{128} = \frac{\sqrt{2}}{2}$

Q4

$$(i) \sqrt{8} \times \sqrt{12} = \sqrt{96} = \sqrt{16 \times 6} = 4\sqrt{6}$$

$$(ii) 3\sqrt{2} \times 5\sqrt{2} = 15\sqrt{4} = 30$$

$$(iii) \sqrt{2}(\sqrt{6} + 3\sqrt{2}) = \sqrt{12} + 3\sqrt{4} = 2\sqrt{3} + 6 = 6 + 2\sqrt{3}$$

$$(iv) (5 - \sqrt{3})(5 + \sqrt{3}) = 25 + 5\sqrt{3} - 5\sqrt{3} - \sqrt{9} = 25 - 3 = 22$$

$$(v) (\sqrt{7} + \sqrt{5})(\sqrt{7} - \sqrt{5}) = 7 + \sqrt{35} + \sqrt{35} - 5 = 7 - 5 = 2$$

$$(vi) (a + 2\sqrt{b})(a - 2\sqrt{b}) = a^2 - 2a\sqrt{b} + 2a\sqrt{b} - 4\sqrt{b}^2 = a^2 - 4b$$

$$Q5 (i) \frac{4}{\sqrt{5}+1} \times \frac{\sqrt{5}-1}{\sqrt{5}-1} = \frac{4\sqrt{5}-4}{5-1} = \frac{4\sqrt{5}-4}{4} = -1 + \sqrt{5}$$

$$(ii) \frac{12}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{36+12\sqrt{2}}{9-2} = \frac{12(3+\sqrt{2})}{7}$$

$$(iii) \frac{2-\sqrt{5}}{2+\sqrt{5}} \times \frac{2-\sqrt{5}}{2-\sqrt{5}} = \frac{4-2\sqrt{5}-2\sqrt{5}+5}{4-5} = \frac{9-4\sqrt{5}}{-1}$$

$$= -9 + 4\sqrt{5}$$

$$(iv) \frac{1}{\sqrt{8}-\sqrt{2}} \times \frac{\sqrt{8}+\sqrt{2}}{\sqrt{8}+\sqrt{2}} = \frac{\sqrt{8}+\sqrt{2}}{8-2} = \frac{3\sqrt{2}}{6} = \frac{\sqrt{2}}{2}$$

Q6 (i)  $\frac{1}{\sqrt{2}-1} - \frac{1}{\sqrt{2}+1}$

$$\frac{\sqrt{2}+1 - \sqrt{2}+1}{(\sqrt{2}-1)(\sqrt{2}+1)} = \frac{2}{2-1} = 2$$

(ii)  $\frac{1}{2+\sqrt{3}} + \frac{1}{2-\sqrt{3}}$

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

Q7 (i)  $(2\sqrt{3} - \sqrt{5})(2\sqrt{3} + \sqrt{5})$   
 $= 12 - 5 = 7$

(ii)  $\frac{4}{2-\sqrt{5}} + \frac{2}{2+\sqrt{5}}$

$$\frac{4(2+\sqrt{5}) + 2(2-\sqrt{5})}{(2-\sqrt{5})(2+\sqrt{5})}$$

$$\frac{8 + 4\sqrt{5} + 4 - 2\sqrt{5}}{4 - 5}$$

$$\frac{12 + 2\sqrt{5}}{-1} = -12 - 2\sqrt{5}$$

Q8  $X = \frac{4+\sqrt{3}}{\sqrt{2}}$   $Y = \frac{4-\sqrt{3}}{\sqrt{2}}$

(i)  $X + Y$

$$\frac{4+\sqrt{3}}{\sqrt{2}} + \frac{4-\sqrt{3}}{\sqrt{2}}$$

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

(ii)  $X - Y$

$$\frac{4+\sqrt{3}}{\sqrt{2}} - \frac{4-\sqrt{3}}{\sqrt{2}}$$

$$\frac{4+\sqrt{3}-4+\sqrt{3}}{\sqrt{2}} = \frac{2\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{6}}{2} = \sqrt{6}$$

(iii)  $XY$

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

(iv)  $\frac{X}{Y}$

$$\frac{4+\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{4-\sqrt{3}} = \frac{4\sqrt{2} + \sqrt{6}}{4\sqrt{2} - \sqrt{6}}$$

$$\frac{4\sqrt{2} + \sqrt{6}}{4\sqrt{2} - \sqrt{6}} \times \frac{4\sqrt{2} + \sqrt{6}}{4\sqrt{2} + \sqrt{6}} = \frac{32 + 4\sqrt{12} + 4\sqrt{12} + 6}{32 - 6}$$

$$\frac{38 + 8\sqrt{12}}{26} = \frac{38 + 16\sqrt{3}}{26} = \frac{19 + 8\sqrt{3}}{13}$$

$$\begin{aligned} \text{Q9} \quad & \frac{(2\sqrt{5}-3\sqrt{2})(2\sqrt{5}+3\sqrt{2})}{4\sqrt{25}+6\sqrt{10}-6\sqrt{10}-9\sqrt{4}} \\ & \frac{20-18}{2} = 2 \quad \text{True.} \end{aligned}$$

$$\begin{aligned} \text{Q10} \quad & \frac{9}{9+\sqrt{9}} \times \frac{9-\sqrt{9}}{9-\sqrt{9}} = \frac{81-9\sqrt{9}}{81-9} = \frac{81-27}{72} \\ & = \frac{54}{72} = \frac{3}{4} \end{aligned}$$

$$\text{Q11} \quad \frac{(2+\sqrt{2})(3+\sqrt{5})(\sqrt{5}-2)}{(\sqrt{5}-1)(1+\sqrt{2})}$$

$$\frac{(6+2\sqrt{5}+3\sqrt{2}+\sqrt{10})(\sqrt{5}-2)}{(\sqrt{5}-1)(1+\sqrt{2})}$$

$$\frac{6\sqrt{5}-12+10-4\sqrt{5}+3\sqrt{10}-6\sqrt{2}+\sqrt{50}-2\sqrt{10}}{(\sqrt{5}-1)(1+\sqrt{2})}$$

$$\frac{-2+2\sqrt{5}+\sqrt{10}-\sqrt{2}}{(\sqrt{5}-1)(1+\sqrt{2})}$$

$$\frac{2(-1+\sqrt{5})+\sqrt{2}(-1+\sqrt{5})}{(\sqrt{5}-1)(1+\sqrt{2})}$$

$$\frac{(2+\sqrt{2})(-1+\sqrt{5})}{(\sqrt{5}-1)(1+\sqrt{2})} = \frac{2+\sqrt{2}}{1+\sqrt{2}}$$

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

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