SURDS : 4 : SOLUTIONS

1) $\dfrac{(9+4\sqrt{2})}{(5+3\sqrt{2})} \times \dfrac{(5-3\sqrt{2})}{(5-3\sqrt{2})}$

$= \dfrac{45 - 27\sqrt{2} + 20\sqrt{2} - 24}{25 - 15\sqrt{2} + 15\sqrt{2} - 18}$

$= \dfrac{21 - 7\sqrt{2}}{7}$

$= 3 - \sqrt{2}$

2) $\dfrac{9}{(\sqrt{3}-1)} \times \dfrac{(\sqrt{3}+1)}{(\sqrt{3}+1)} + \dfrac{7}{(\sqrt{3}+1)} \times \dfrac{(\sqrt{3}-1)}{(\sqrt{3}-1)}$

$= \dfrac{9\sqrt{3}+9}{3+\sqrt{3}-\sqrt{3}-1} + \dfrac{7\sqrt{3}-7}{3-\sqrt{3}+\sqrt{3}-1}$

$= \dfrac{9\sqrt{3}+9}{2} + \dfrac{7\sqrt{3}-7}{2}$

$= \dfrac{9\sqrt{3}+9+7\sqrt{3}-7}{2}$

$= \dfrac{16\sqrt{3}+2}{2}$

$= 8\sqrt{3} + 1$

3) $(\sqrt{8} \times \sqrt{10}) + \dfrac{\sqrt{90}}{\sqrt{2}} - \dfrac{30}{\sqrt{5}}$

$= \sqrt{80} + \sqrt{45} - \dfrac{30\sqrt{5}}{5}$

$= \sqrt{16}\sqrt{5} + 3\sqrt{5} - 6\sqrt{5}$

$= 4\sqrt{5} + 3\sqrt{5} - 6\sqrt{5}$

$= \sqrt{5}$

You can only get this last term in terms of $\sqrt{5}$, so don't use $\sqrt{2}$!!

4) $\frac{10}{(7+2\sqrt{11})} \times \frac{(7-2\sqrt{11})}{(7-2\sqrt{11})}$

$= \frac{70-20\sqrt{11}}{49-14\sqrt{11}+14\sqrt{11}-44}$

$= \frac{70-20\sqrt{11}}{5}$

$= 14-4\sqrt{11}$

5) $(4\sqrt{3})^2 - (\sqrt{8}\times\sqrt{50}) - \frac{5\sqrt{63}}{\sqrt{7}}$

$= 48 - \sqrt{400} - \frac{5\sqrt{9}\sqrt{7}}{\sqrt{7}}$

$= 48 - 20 - 15$

$= 13$

6) $\frac{(6\sqrt{7}-11\sqrt{2})}{(\sqrt{7}-\sqrt{2})} \times \frac{(\sqrt{7}+\sqrt{2})}{(\sqrt{7}+\sqrt{2})}$

$= \frac{42+6\sqrt{14}-11\sqrt{14}-22}{7+\sqrt{14}-\sqrt{14}-2}$

$= \frac{20-5\sqrt{14}}{5}$

$= 4-\sqrt{14}$

7) $\frac{3}{2\sqrt{6}} + \left(\frac{\sqrt{6}}{2}\right)^3$

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

$= \frac{\sqrt{6}}{4} + \frac{6\sqrt{6}}{8}$

$= \frac{2\sqrt{6}}{8} + \frac{6\sqrt{6}}{8}$

$= \frac{8\sqrt{6}}{8}$

$= \sqrt{6}$

8) $\frac{4}{(\sqrt{5}+1)} \times \frac{(\sqrt{5}-1)}{(\sqrt{5}-1)} + \frac{1}{(\sqrt{5}-1)} \times \frac{(\sqrt{5}+1)}{(\sqrt{5}+1)}$

$= \frac{4\sqrt{5}-4}{5-\sqrt{5}+\sqrt{5}-1} + \frac{\sqrt{5}+1}{5+\sqrt{5}-\sqrt{5}-1}$

$= \frac{4\sqrt{5}-4}{4} + \frac{\sqrt{5}+1}{4}$

$= \frac{5\sqrt{5}-3}{4}$

9) $\frac{(2\sqrt{3}-6)}{(2\sqrt{3}+3)} \times \frac{(2\sqrt{3}-3)}{(2\sqrt{3}-3)}$

$= \frac{12-6\sqrt{3}-12\sqrt{3}+18}{12-6\sqrt{3}+6\sqrt{3}-9}$

$= \frac{30-18\sqrt{3}}{3}$

$= 10-6\sqrt{3}$

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

$= \frac{10-2\sqrt{10}-\sqrt{10}+2}{5-\sqrt{10}+\sqrt{10}-2}$

$= \frac{12-3\sqrt{10}}{3}$

$= 4-\sqrt{10}$

11) $(\sqrt{3}-\sqrt{2})^3$

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

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

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

$= 5\sqrt{3}-5\sqrt{2}-2\sqrt{18}+2\sqrt{12}$

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

$= 5\sqrt{3}-5\sqrt{2}-6\sqrt{2}+4\sqrt{3}$

$= 9\sqrt{3}-11\sqrt{2}$