Surds

1) *Simplify*:

a $\sqrt{121}$ **b** $\sqrt{\frac{1}{9}}$ **c** $\sqrt{\frac{16}{49}}$ **d** $\sqrt{0.01}$ **e** $\sqrt[3]{8}$

2) *Simplify and rationalise the denominator where appropriate*:

a $\sqrt{3} \times \sqrt{5}$ **b** $\sqrt{3} \times \sqrt{7}$ **c** $\frac{\sqrt{p}}{\sqrt{q}}$ **d** $\frac{1}{2\sqrt{q}}$ **e** $\frac{3\sqrt{a}}{\sqrt{2b}}$

3) *Express the questions where all terms are under a root, in terms of the simplest possible surds. Express the questions where the terms are mixed with surds and integers, as square roots of integers.*

a $\sqrt{8}$ **b** $\sqrt{12}$ **c** $3\sqrt{2}$ **d** $\sqrt{50}$ **e** $4\sqrt{5}$ **f** $3\sqrt{8}$ **g** $\sqrt{1210}$ **h** $6\sqrt{6}$ **i** $\sqrt{72}$ **j** $14\sqrt{2}$

4) *Simplify*

a $\sqrt{18} + \sqrt{32}$ **b** $\sqrt{48} - \sqrt{27}$ **c** $2\sqrt{8} + \sqrt{72}$ **d** $\sqrt{360} - 2\sqrt{40}$ **e** $2\sqrt{5} - \sqrt{45} + 3\sqrt{20}$ **f** $\sqrt{24} + \sqrt{150} - 2\sqrt{96}$

5) *Express in the form* $a + b\sqrt{c}$, *where* $a, b,$ *and* c *are rational numbers*

a $3(2 + \sqrt{3})$ **b** $4 - \sqrt{3} - 2(1 - \sqrt{3})$ **c** $(\sqrt{5} + 2)^2$ **d** $(1 + \sqrt{2})(3 - 2\sqrt{2})$ **e** $\sqrt{\frac{1}{2}} + \sqrt{\frac{1}{4}} + \sqrt{\frac{1}{8}}$

f $(3\sqrt{3} + 1)(2 - 5\sqrt{3})$ **g** $(5\sqrt{5} - 4)^2$ **h** $(3 - \sqrt{8})(4 + \sqrt{2})$

6) *Express each of the following as simply as possible, with a rational denominator.*

a $\frac{1}{\sqrt{5}}$ **b** $\frac{2}{\sqrt{3}}$ **c** $\frac{14}{\sqrt{7}}$ **d** $\frac{3\sqrt{2}}{\sqrt{3}}$ **e** $\frac{1}{2\sqrt{2}}$ **f** $\frac{-7}{2\sqrt{7}}$ **g** $\frac{9}{4\sqrt{6}}$ **h** $\frac{1}{\sqrt{2} + 1}$ **i** $\frac{1}{3 - \sqrt{5}}$ **j** $\frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$

k $\frac{\sqrt{5} + 1}{\sqrt{5} - \sqrt{3}}$ **l** $\frac{2\sqrt{2} - \sqrt{3}}{\sqrt{3} + \sqrt{2}}$ **m** $\frac{\sqrt{6} + \sqrt{3}}{\sqrt{6} - \sqrt{3}}$ **n** $\frac{\sqrt{10} + 2\sqrt{5}}{\sqrt{10} + \sqrt{5}}$