Surds and Indices – Exam style Questions – www.m4ths.com – Steve Blades

(1) Show that each can be written as either an integer or rational fraction, stating its value. Please use the rules of surds rather than getting crazy big numbers. Simplify each surd and use the rules you (hopefully) know. 😊

$\sqrt{5} \times \sqrt{5}$ $\qquad$ $2\sqrt{3} \times 4\sqrt{3}$ $\qquad$ $\sqrt{20} \times \sqrt{1\frac{1}{4}}$ $\qquad$ $3\sqrt{40} \times \sqrt{90}$ $\qquad$ $\sqrt{8} - \sqrt{18} + \sqrt{2}$ $\qquad$ $\frac{\sqrt{8}}{6} \div \frac{3}{\sqrt{2}}$

(2) Express each as a power of 3. Again, no crazy numbers like 6561 please, just use the rules of indices.

$3^x \times 9^4$ $\qquad$ $27 \div 81^x$ $\qquad$ $243 \times \frac{1}{9^x}$ $\qquad$ $\frac{1}{3} \times 9^{x+4}$ $\qquad$ $\frac{1}{27^{1-x}} \times \sqrt{3}$ $\qquad$ 729^{4-5x}

(3) Write each as a power of x. Simplify anything where appropriate.

$\sqrt{x}$ $\qquad$ $\frac{1}{x\sqrt{x}}$ $\qquad$ $\sqrt[8]{x^7}$ $\qquad$ $\frac{3}{\sqrt[3]{x^9}}$ $\qquad$ $\frac{\sqrt[5]{x}}{\sqrt[4]{x^{11}}}$ $\qquad$ $\sqrt[3]{x}\left(\sqrt[5]{x^{11}}\right)$

(4) Solve each equation leaving any non-integers as exact simplified fractions.

$2^{x+6} = 4^x$ $\qquad$ $25^{x-3} = 125^{x+1}$ $\qquad$ $81^{5-x} = 27^x$ $\qquad$ $8^{3+2x} = \frac{1}{32^{2+3x}}$ $\qquad$ $2 \times 8^x = \frac{4}{128^x}$

(5) Express each in the form $a\sqrt{b}$ or $a + b\sqrt{c}$ or even $a\sqrt{b} + c\sqrt{d}$. This is a fancy way of saying 'rationalise' the surd.

$\frac{3}{\sqrt{7}}$ $\qquad$ $\frac{1+\sqrt{3}}{\sqrt{6}}$ $\qquad$ $\frac{2}{3+\sqrt{2}}$ $\qquad$ $\frac{\sqrt{6}}{\sqrt{3}-1}$ $\qquad$ $\frac{1+\sqrt{2}}{1-\sqrt{2}}$ $\qquad$ $\frac{\sqrt{a}+\sqrt{b}}{\sqrt{b}+\sqrt{c}}$