Core 1 Basic Algebra Questions – Mainly Surds

1 (a) Simplify $(\sqrt{5}+2)(\sqrt{5}-2)$. *(2 marks)*

(b) Express $\sqrt{8}+\sqrt{18}$ in the form $n\sqrt{2}$, where n is an integer. *(2 marks)*

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4 (a) Express $(4\sqrt{5}-1)(\sqrt{5}+3)$ in the form $p+q\sqrt{5}$, where p and q are integers. *(3 marks)*

(b) Show that $\dfrac{\sqrt{75}-\sqrt{27}}{\sqrt{3}}$ is an integer and find its value. *(3 marks)*

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3 (a) Express $\dfrac{\sqrt{5}+3}{\sqrt{5}-2}$ in the form $p\sqrt{5}+q$, where p and q are integers. *(4 marks)*

(b) (i) Express $\sqrt{45}$ in the form $n\sqrt{5}$, where n is an integer. *(1 mark)*

(ii) Solve the equation

$$x\sqrt{20}=7\sqrt{5}-\sqrt{45}$$

giving your answer in its simplest form. *(3 marks)*

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2 (a) Express $\dfrac{\sqrt{63}}{3}+\dfrac{14}{\sqrt{7}}$ in the form $n\sqrt{7}$, where n is an integer. *(3 marks)*

(b) Express $\dfrac{\sqrt{7}+1}{\sqrt{7}-2}$ in the form $p\sqrt{7}+q$, where p and q are integers. *(4 marks)*

Core 1 Basic Algebra Answers – Mainly Surds

1(a)	$\left(\sqrt{5}\right)^2 + 2\sqrt{5} - 2\sqrt{5} - 4 = 1$	M1		Multiplying out or difference of two squares attempted
		A1	2	Full marks for correct answer /no working
(b)	$\sqrt{8} = 2\sqrt{2}$; $\sqrt{18} = 3\sqrt{2}$	M1		Either correct
	Answer $= 5\sqrt{2}$	A1	2	Full marks for correct answer /no working
	Total		**4**	

4(a)				Multiplied out
	$4\left(\sqrt{5}\right)^2 + 12\sqrt{5} - \sqrt{5} - 3$	M1		At least 3 terms with $\sqrt{5}$ term
	$4\left(\sqrt{5}\right)^2 = 4 \times 5 \quad (= 20)$	B1		
	Answer $= 17 + 11\sqrt{5}$	A1	3	
(b)	Either $\sqrt{75} = \sqrt{25}\sqrt{3}$ or $\sqrt{27} = \sqrt{9}\sqrt{3}$	M1		Or multiplying top and bottom by $\sqrt{3}$
	Expression $= \dfrac{5\sqrt{3} - 3\sqrt{3}}{\sqrt{3}}$	A1		or $\dfrac{\sqrt{225} - \sqrt{81}}{3}$ or $\sqrt{25} - \sqrt{9}$ or 5–3
	$= 2$	A1	3	CSO
	Total		**6**	

3(a)	$\dfrac{\sqrt{5}+3}{\sqrt{5}-2} \times \dfrac{\sqrt{5}+2}{\sqrt{5}+2}$	M1		Multiplying top & bottom by $\pm\left(\sqrt{5}+2\right)$
	Numerator $= 5 + 3\sqrt{5} + 2\sqrt{5} + 6$	M1		Multiplying out (condone one slip) $\pm\left(\sqrt{5+3}\right)\left(\sqrt{5+2}\right)$
	$= 5\sqrt{5} + 11$	A1		
	Final answer $= 5\sqrt{5} + 11$	A1	4	With clear evidence that denominator =1
(b)(i)	$\sqrt{45} = 3\sqrt{5}$	B1	1	
(ii)	$\sqrt{20} = \sqrt{4}\sqrt{5}$ or $4\sqrt{5} = \sqrt{4} \times \sqrt{20}$ or attempt to have equation with $\sqrt{5}$ or $\sqrt{20}$ only	M1		Both sides
	$\left[x\ 2\sqrt{5} = 7\sqrt{5} - 3\sqrt{5}\right]$ **or** $x\sqrt{20} = 2\sqrt{20}$	A1		or $x = \sqrt{4}$
	$x = 2$	A1	3	**CSO**
	Total		**8**	

2(a)	$\frac{\sqrt{63}}{3}=\sqrt{7}$ or $\frac{3\sqrt{7}}{3}$	B1		or $\frac{\left(\sqrt{7}\sqrt{63}+14\times 3\right)}{3\sqrt{7}}$
	$\frac{14}{\sqrt{7}}=2\sqrt{7}$ or $\frac{14\sqrt{7}}{7}$	B1		or $\frac{\sqrt{7}}{\sqrt{7}}(\quad)$ M1
	$\Rightarrow$ sum $=3\sqrt{7}$	B1	3	$\Rightarrow$ correct answer with all working correct A2
(b)	Multiply by $\frac{\sqrt{7}+2}{\sqrt{7}+2}$	M1		
	Denominator = 7 – 4 = 3	A1		
	Numerator $=\left(\sqrt{7}\right)^2+\sqrt{7}+2\sqrt{7}+2$	m1		multiplied out (allow one slip) $9+3\sqrt{7}$
	Answer $=\sqrt{7}+3$	A1	4	
	Total		**7**	