

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)*

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

3 (a) Express $\frac{\sqrt{5} + 3}{\sqrt{5} - 2}$ 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)*

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

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

Basic Algebra Answers – Mainly Surds

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

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

3(a)	$\frac{\sqrt{5} + 3}{\sqrt{5} - 2} \times \frac{\sqrt{5} + 2}{\sqrt{5} + 2}$ Numerator = $5 + 3\sqrt{5} + 2\sqrt{5} + 6$ $= 5\sqrt{5} + 11$ Final answer = $5\sqrt{5} + 11$	M1		Multiplying top & bottom by $\pm(\sqrt{5} + 2)$
		M1		Multiplying out (condone one slip)
		A1		$\pm(\sqrt{5} + 3)(\sqrt{5} + 2)$
		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 $[x \cdot 2\sqrt{5} = 7\sqrt{5} - 3\sqrt{5}]$ or $x\sqrt{20} = 2\sqrt{20}$ $x = 2$	M1		Both sides
		A1		or $x = \sqrt{4}$
		A1	3	CSO
Total			8	

2(a)	$\frac{\sqrt{63}}{3} = \sqrt{7}$ or $\frac{3\sqrt{7}}{3}$	B1		or $\frac{(\sqrt{7}\sqrt{63} + 14 \times 3)}{3\sqrt{7}}$
	$\frac{14}{\sqrt{7}} = 2\sqrt{7}$ or $\frac{14\sqrt{7}}{7}$	B1		or $\frac{\sqrt{7}}{\sqrt{7}} ()$ M1
	$\Rightarrow \text{sum} = 3\sqrt{7}$	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 = $(\sqrt{7})^2 + \sqrt{7} + 2\sqrt{7} + 2$	m1		multiplied out (allow one slip) $9 + 3\sqrt{7}$
	Answer = $\sqrt{7} + 3$	A1	4	
Total		7		