Core 1 Basic Algebra Answers

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

3(a)(i)	$(x-2)^2$ $+ 5$	B1 B1	 2	$p = 2$ $q = 5$
(ii)	Minimum point (2, 5) or $x = 2$, $y = 5$	B2√	2	B1 for each coordinate correct or ft **Alt method** M1, A1 sketch, differentiation

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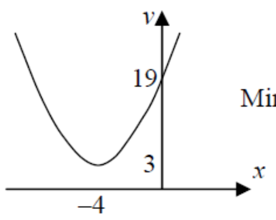
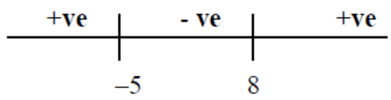
4(a)	$(m+4)^2 = m^2 + 8m + 16$ $b^2 - 4ac = (m+4)^2 - 4(4m+1) = 0$ $m^2 + 8m + 16 - 16m - 4 = 0$ $\Rightarrow m^2 - 8m + 12 = 0$	B1 M1 A1	 3	Condone $4m + 4m$ $b^2 - 4ac$ (attempted and involving m's and no x's) or $b^2 - 4ac = 0$ stated **AG** (be convinced – all working correct- $= 0$ appearing more than right at the end)
(b)	$(m-2)(m-6) = 0$ $m = 2$, $m = 6$	M1 A1	 2	Attempt at factors or quadratic formula **SC B1** for 2 or 6 only without working
	Total		**5**	

2(a)	$(x+4)^2$ $+3$	B1 B1	 2	$p = 4$ $q = 3$
(b)	$(x+4)^2 = -3$ or "their" $(x+p)^2 = -q$ No real square root of –3	M1 A1	 2	Or discriminant = 64 –76 Disc < 0 so no real roots (all correct figs)
(c)	 Minimum (– 4, 3) graph	B1√ B1 B1	 3	ft their $-p$ and q (or correct) Parabola (vertex roughly as shown) Crossing at $y = 19$ marked or (0, 19) stated
(d)	Translation (and no additional transf'n) through $\begin{bmatrix} -4 \\ 3 \end{bmatrix}$	E1 M1 A1	 3	Not shift, move, transformation, etc One component correct eg 3 units up All correct – if not vector – must say 4 units in negative x- direction, to left etc
	Total		**10**	

4(a)	$4\left(\sqrt{5}\right)^2 + 12\sqrt{5} - \sqrt{5} - 3$	M1		Multiplied out 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**	

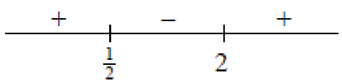
(ii)	$4(k+1)^2 - 4(2k^2 - 7)$	M1		"$b^2 - 4ac$" in terms of k (either term correct)
	$4k^2 - 8k - 32 = 0$ or $k^2 - 2k - 8 = 0$	A1		$b^2 - 4ac = 0$ correct quadratic equation in k
	$(k-4)(k+2) = 0$	m1		Attempt to factorise, solve equation
	$k = -2$, $k = 4$	A1	4	SC B1, B1 for –2 , 4 (if M0 scored)

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**	

7(a)	$b^2 - 4ac \;=\; 144 - 4(k+1)(k-4)$	M1		Clear attempt at $b^2 - 4ac$ Condone slip in one term of expression
	Real roots when $b^2 - 4ac \geqslant 0$	B1		Not just a statement, must involve k
	$36 - (k^2 - 3k - 4) \geqslant 0$ $\Rightarrow k^2 - 3k - 40 \leqslant 0$	A1	3	**AG** (watch signs carefully)
(b)	$(k-8)(k+5)$	M1		Factors attempt or formula
	Critical points 8 and -5	A1		
	Sketch or sign diagram **correct,** must have 8 and -5	M1		
	$-5 \leqslant k \leqslant 8$	A1	4	
	A0 for $-5 < k < 8$ or two separate inequalities unless word AND used			
	Total		7	

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	

3(a)(i)	$(x+5)^2$	B1		$p=5$
	-6	B1	2	$q=-6$
(ii)	$x_{\text{vertex}} = -5$ (or their $-p$) $y_{\text{vertex}} = -6$ (or their q)	B1√ B1√	2	may differentiate but must have $x=-5$ and $y=-6$. Vertex $(-5,-6)$
(iii)	$x = -5$	B1	1	
(iv)	Translation (not shift, move etc)	E1		and NO other transformation stated
	through $\begin{bmatrix} -5 \\ -6 \end{bmatrix}$ (or 5 left, 6 down)	M1 A1	3	either component correct M1, A1 independent of E mark
(b)	$x+11 = x^2+10x+19$			quadratic with all terms on one side of equation
	$\Rightarrow x^2+9x+8=0$ or $y^2-13y+30=0$	M1		
	$(x+8)(x+1)=0$ or $(y-3)(y-10)=0$	m1		attempt at formula (1 slip) or to factorise
	$\left.\begin{array}{l} x=-1 \\ y=10 \end{array}\right\}$ or $\left.\begin{array}{l} x=-8 \\ y=3 \end{array}\right\}$	A1 A1	4	both x values correct both y values correct and linked
				SC $(-1,10)$ B2, $(-8,3)$ B2 no working
	Total		**12**	

7(a)	$b^2-4ac = 4-4(k-1)(2k-3)$	M1		(or seen in formula) condone one slip
	Real roots when $b^2-4ac \geqslant 0$	E1		must involve $f(k) \geqslant 0$ (usually M1 must be earned)
	$4-4\left(2k^2-5k+3\right) \geqslant 0$			
	$\Rightarrow -2k^2+5k-3+1 \geqslant 0$			at least one step of working justifying $\leqslant 0$
	$\Rightarrow 2k^2-5k+2 \leqslant 0$	A1	3	AG
(b)(i)	$(2k-1)(k-2)$	B1	1	
(ii)	(Critical values) $\frac{1}{2}$ and 2	B1√		ft their factors or correct values seen on diagram, sketch or inequality or stated
		M1		use of sketch / sign diagram
	$\Rightarrow 0.5 \leqslant k \leqslant 2$	A1	3	M1A0 for $0.5<k<2$ or $k \geqslant 0.5$, $k \leqslant 2$
	Total		**7**	