OCR FINAL MARK SCHEME 4751 MEI PURE MATHS C1 JUNE 2007

Section A

1	$x > -0.6$ o.e. eg $-3/5 < x$ isw	3	M2 for $-3 < 5x$ or $x > \frac{3}{-5}$ or M1 for $-5x < 3$ or $k < 5x$ or $-3 < kx$ [condone $\leq$ for Ms]; if 0, allow SC1 for -0.6 found	3
2	$t = [\pm]\sqrt{\frac{2s}{a}}$ o.e.	3	B2 for t omitted or $t = \sqrt{\frac{s}{\frac{1}{2}a}}$ o.e. M1 for correct constructive first step in rearrangement and M1 (indep) for finding sq rt of their t^2	3
3	'If $2n$ is an even integer, then n is an odd integer' showing wrong eg 'if n is an even integer, $2n$ is an even integer'	1 1	or: $2n$ an even integer $\Rightarrow$ n an odd integer or counterexample eg $n = 2$ and $2n = 4$ seen [in either order]	2
4	$c = 6$ $k = -7$	1 2	M1 for f(2) = 0 used or for long division as far as $x^3 - 2x^2$ in working	3
5	(i) $4x^4y$ (ii) 32	2 2	M1 for two elements correct; condone y^1 M1 for $\left(\frac{2}{1}\right)^5$ or 2^5 soi or $\left(\frac{1}{32}\right)^{-1}$ or $\frac{1}{\frac{1}{32}}$	4
6	-720 [x^3]	4	B3 for 720; M1 for each of 3^2 and $\pm 2^3$ or $(-2x)^3$ or $(2x)^3$, and M1 for 10 or $(5\times4\times3)/(3\times2\times1)$ or for 1 5 10 10 5 1 seen but not for ${}^5C_3$	4
7	$\frac{-5}{10}$ o.e. isw	3	M1 for $4x + 5 = 2x \times -3$ and M1 for $10x = -5$ o.e. or M1 for $2 + \frac{5}{2x} = -3$ and M1 for $\frac{5}{2x} = -5$ o.e.	3
8	(i) $2\sqrt{2}$ or $\sqrt{8}$ (ii) $30 - 12\sqrt{5}$	2 3	M1 for $7\sqrt{2}$ or $5\sqrt{2}$ seen M1 for attempt to multiply num. and denom. by $2 - \sqrt{5}$ and M1 (dep) for denom -1 or $4 - 5$ soi or for numerator $12\sqrt{5} - 30$	5
9	(i) ± 5 (ii) $y = (x - 2)^2 - 4$ or $y = x^2 - 4x$ o.e. isw	2 2	B1 for one soln M1 if y omitted or for $y = (x + 2)^2 - 4$ or $y = x^2 + 4x$ o.e.	4
10	(i) $\frac{1}{2}\times(x + 1)(2x - 3) = 9$ o.e. $2x^2 - x - 3 = 18$ or $x^2 - \frac{1}{2}x - 3/2 = 9$ (ii) $(2x - 7)(x + 3)$ -3 and $7/2$ o.e. or ft their factors base 4, height 4.5 o.e. cao	M1 A1 B1 B1 B1	for clear algebraic use of $\frac{1}{2}bh$; condone $(x + 1)(2x - 3) = 18$ allow x terms uncollected. NB ans $2x^2 - x - 21 = 0$ given NB B0 for formula or comp. sq. if factors seen, allow omission of -3 B0 if also give $b = -9$, $h = -2$	5

Section B

11	**i**	grad AC = $\frac{7-3}{3-1}$ or 4/2 o.e.[= 2]	M1	not from using − ½	
		so grad AT = – ½	M1	or ft their grad AC [for use of $m_1m_2 = -1$]	
		eqn of AT is $y - 7 = -\frac{1}{2}(x - 3)$	M1	or subst (3, 7) in $y = -\frac{1}{2}x + c$ or in $2y + x = 17$; allow ft from their grad of AT, except 2 (may be AC not AT)	
		one correct constructive step towards $x + 2y = 17$ [ans given]	M1	or working back from given line to $y = -\frac{1}{2}x + 8.5$ o.e.	4
	ii	$x + 2(2x - 9) = 17$	M1	attempt at subst for x or y or elimination	
		$5x - 18 = 17$ or $5x = 35$ o.e.	A1	allow $2.5x = 17.5$ etc	
		$x = 7$ and $y = 5$ [so (7, 5)]	B1	graphically: allow M2 for both lines correct or showing (7, 5) fits both lines	3
	iii	$(x - 1)^2 + (2x - 12)^2 = 20$	M1	subst $2x - 9$ for y [oe for x]	
		$5x^2 - 50x + 125$[= 0]	M1	rearranging to 0; condone one error	
		$(x - 5)^2 = 0$	A1	showing 5 is root and only root	
		equal roots so tangent	B1	explicit statement of condition needed (may be obtained earlier in part) or showing line is perp. to radius at point of contact	
		(5, 1)	B1	condone $x = 5$, $y = 1$	
		or			
		$y - 3 = -\frac{1}{2}(x - 1)$ o.e. seen	M1	or if $y = 2x - 9$ is tgt then line through C with gradient −½ is radius	
		subst or elim. with $y = 2x - 9$	M1		
		$x = 5$	A1		
		(5,1)	B1		
		showing (5, 1) on circle	B1	or showing distance between (1, 3) and (5, 1) = $\sqrt{20}$	5

12	**i**	$4(x-3)^2-9$	4	1 for $a=4$, 1 for $b=3$, 2 for $c=-9$ or M1 for $27-4\times3^2$ or $\frac{27}{4}-3^2[=-\frac{9}{4}]$	4
	ii	min at (3, –9) or ft from (i)	B2	1 for each coord [e.g. may start again and use calculus to obtain $x=3$]	2
	iii	$(2x-3)(2x-9)$	M1	attempt at factorising or formula or use of their (i) to sq rt stage	
		$x=1.5$ or 4.5 o.e.	A2	A1 for 1 correct; accept fractional equivs eg 36/8 and 12/8	3
	iv	sketch of quadratic the right way up	M1		
		crosses x axis at 1.5 and 4.5 or ft	A1	allow unsimplified	
		crosses y axis at 27	B1	shown on graph or in table etc; condone not extending to negative x	3
13	**i**	$2x^3+5x^2+4x-6x^2-15x-12$	1	for correct interim step; allow correct long division of f(x) by ($x-3$) to obtain $2x^2+5x+4$ with no remainder	
		3 is root	B1	allow f(3) = 0 shown	
		use of b^2-4ac	M1	or equivalents for M1 and A1 using	
		$5^2-4\times2\times4$ or -7 and [negative] implies no real root	A1	formula or completing square	4
	ii	divn of f(x) + 22 by $x-2$ as far as $2x^3-4x^2$ used	M1	or inspection eg $(x-2)(2x^2\ldots..-5)$	
		$2x^2+3x-5$ obtained	A1		
		$(2x+5)(x-1)$	M1	attempt at factorising/quad. formula/	
		1 and −2.5 o.e.	A1 +A1	compl. sq.	
		<u>or</u>			
		$2\times2^3-2^2-11\times2-12$	M1	<u>or</u> equivs using f(x) + 22	
		$16-4-22-12$	A1		
		$x=1$ is a root obtained by factor thm	B1	not just stated	
		$x=-2.5$ obtained as root	B2		5
	iii	cubic right way up	G1	must have turning points	
		crossing x axis only once	G1	must have max and min below x axis	
		(3, 0) and (0, −12) shown	G1	at intns with axes or in working (indep of cubic shape); ignore other intns	3