Oxford Cambridge and RSA Examinations

Advanced Subsidiary General Certificate of Education
Advanced General Certificate of Education

MEI STRUCTURED MATHEMATICS

INTRODUCTION TO ADVANCED MATHEMATICS, C1

4751

MARK SCHEME

Qu	Answer	Mark	Comment
Section A			
1(i)	$x = 81$	B1 **[1]**	
1(ii)	$x = 2$	B1 **[1]**	
1(iii)	$x = 2$	B1 **[1]**	
2	$ax^2 + x^2 = d - b$	M1	
	$x^2 = \dfrac{d-b}{a+1}$	A1	
	$x = \pm\sqrt{\dfrac{d-b}{a+1}}$	A1 **[3]**	cao including ±
3	$2x^2 - 5x - 3 = 0$	B1	May be implied
	$(2x+1)(x-3) = 0$	M1	
	$\Rightarrow x = -0.5$ or 3	A1 **[3]**	cao
4	${}^5C_3 \times (-2)^3$	M1 B1	Binomial coefficient cao
	$= -80$ Or use of Pascal's triangle	A1 **[3]**	
5(i)	Good reasons: The model curve passes through (0, 0) (or (4, 0)) The model curve passes through (2, 2) The model curve is flat in the middle The model curve is symmetrical	B1,B1	Any two good reasons
5(ii)	Reasons why not: The point (1, 1.5) is on the model curve but below the bridge	B1	
6	Find equation of *l* using $y - y_1 = m(x - x_1)$	M1	
	$y = 3x + 5$	A1	
	Substituting $x = -100$ in line *l* gives (-100, -295) (-100, -294) is above *l*	M1 A1 **[4]**	

Qu	Answer	Mark	Comment
Section A (continued)			
7	Gradient of AB = gradient of DC = ½ Gradient of BC = gradient of AD = 1 $\therefore$ABCD is a parallelogram AB = √20, BC = √18 so AB ≠ BC $\therefore$ADCD is not a rhombus	M1 E1 M1 E1 **[4]**	
8	$(x+3)^2 = 0$ $p = 9$ $x = -3$	M1,A1 B1 B1 **[4]**	Or use of discriminant
9(i)	1	B1 **[1]**	
9(ii)	$\frac{\sqrt{2}}{\sqrt{2}+1} \times \frac{\sqrt{2}-1}{\sqrt{2}-1} = 2-\sqrt{2}$ a = 2, b = –1	M1,A1 A1 **[3]**	 cao
10	$x^2 - 4x + 1 = 2x + 2$ $x^2 - 6x - 1 = 0$ $x = \frac{6 \pm \sqrt{36+4}}{2}$ $x = 3+\sqrt{10}$ or $3-\sqrt{10}$ Substitute in $y = 2x+2$ $y = 8+2\sqrt{10}$ or $y = 8-2\sqrt{10}$ respectively	M1 M1 A1 M1 A1 **[5]**	
			Section A Total: 36
Section B			
11(i)	Mid point of AB is (7, 6) Perpendicular bisector: x = 7 Mid point of OA is (1, 3) Gradient of OA is 3 Gradient of perpendicular is $-\frac{1}{3}$ $\Rightarrow y = -\frac{1}{3}x + \frac{10}{3}$ Intersects x = 7 at (7, 1)	B1 B1 M1 M1 A1 E1 **[6]**	

Qu	Answer	Mark	Comment
Section B (continued)			
11(ii)	Show that CO = CA = CB All are $\sqrt{50}$ $(x-7)^2+(y-1)^2=50$ Cuts y-axis at (0, 2)	M1 A1 B1,B1 M1,A1 **[6]**	 Radius, centre
12(i)	Show $\mathrm{f}(1)=0$	B1 **[1]**	
12(ii)	$\mathrm{f}(x)=(x-1)(x-4)(x+2)$ Shape of sketch. Points of intersection with x-axis. Point of intersection with y-axis.	M1 M1 A1 B1,B1 B1 B1 **[7]**	Take out $(x-1)$ Factorise quotient
12(iii)	Recognition that this is $y=-\mathrm{f}(x)$ Curve consistent with answer to **12(ii)**	M1 A1 **[2]**	May be implied
12(iv)	Their curve moved 2 to left Points of intersection with x-axis	B1 B1 **[2]**	
13(i)	$(x-3)^2+1$ $a=-3$ and $b=1$ $(x-3)^2\geq 0$ for all x and $+1>0$	B1,B1 M1,E1 **[4]**	
13(ii)	U-shaped curve Line of symmetry $x=3$ Lowest point (3, 1)	B1 B1 B1 **[3]**	
13(iii)	Correct straight line No solution/no real roots The line and the curve do not intersect	B1 B1 B1 **[3]**	
13(iv)	$2<x<4$	M1 A1 **[2]**	Solving $x^2-6x+8=0$ or verifying roots read from graph
			Section B Total: 36
			Total: 72

AO	**Range**	**Total**	**Question Number**												
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1	28-36	34	3	1	-	2	-	2	-	1	3	3	6	7	6
2	28-36	33	-	2	3	1	-	2	3	3	1	2	5	5	6
3	0-8	3	-	-	-	-	3	-	-	-	-	-	-	-	-
4	0-8	2	-	-	-	-	-	-	1	-	-	-	1	-	-
5	0-4	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Totals	**72**	3	3	3	3	3	4	4	4	4	5	12	12	12