RECOGNISING ACHIEVEMENT

Oxford Cambridge and RSA Examinations

Advanced Subsidiary General Certificate of Education
Advanced General Certificate of Education

MEI STRUCTURED MATHEMATICS
CONCEPTS FOR ADVANCED MATHEMATICS, C2

4752

MARK SCHEME

Qu	Answer	Mark	Comment
Section A			
1	$\tan x = 2$ $\arctan 2 = 63.4°$ $x = 63.4°$ or $243.4°$	M1 A1 B1 **[3]**	Use of tan 180° + previous answer if acute
2	Arc length = $15 \times 0.6 = 9$ Perimeter = $2 \times 15 + 9 = 39$ cm Area $= 0.5 \times 15^2 \times 0.6 = 67.5\,\text{cm}^2$	M1 A1 M1,A1 **[4]**	Correct use of formula + radians Correct use of formula + radians
3	$12x + \frac{1}{2\sqrt{x}}$	M1 M1,A1 A1 **[4]**	Differentiating Handling the $\sqrt{}$ No extra terms
4(i)	$6144 \times (0.25)^9$ 0.0234 $\frac{a(1-r^n)}{(1-r)} = \frac{6144(1-0.25^{10})}{(1-0.25)}$ 8191.9922	M1 A1 M1 A1 **[4]**	Attempt to use correct formula for M1 Use of correct formula
4(ii)	$\frac{a}{1-r} = \frac{6144}{1-0.25} = 8192$	B1 **[1]**	
5(i)	**x** **f(x)** 0 **1** 0.2 0.96154 0.4 0.86207 0.6 **0.73529** 0.8 0.60976 1.0 **0.5**	B1 **[1]**	All 3 missing values
5(ii)	$\frac{1}{2} \times 0.2 \times [(1+0.5) + 2 \times (0.96154 + ...)]$ 0.78373	M1 A1 A1 A1 **[4]**	 Interval and end values 2 x Sum of middle values cao

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Section A (continued)			
6	$y = 2x^3 + \frac{5}{x} + c$	B1 B1 B1	$2x^3$ $\frac{5}{x}$ c
	$c = 10$	M1 A1 **[5]**	Substitution ft
7	$\int_0^2 (2x - x^2)\mathrm{d}x = \left\| x^2 - \frac{x^3}{3} \right\|_0^2$ $= 1\frac{1}{3}$ sq. units	M1 A1 A1 M1 A1 **[5]**	Use of integral for area Correct integration Correct limits Use of limits
8	$\cos E = \frac{4.7^2 + 6.4^2 - 4.1^2}{2 \times 4.7 \times 6.4}$	M1 A1,A1	Cosine rule Top line, bottom line
	$E = 39.8°$ so $40°$ Angle with vertical is $90° - 40° = 50°$	A1 A1 **[5]**	cao ft
			Section A Total: 36
Section B			
9(i)	$2b + 2(b+2) + 2(b+4) = 6b + 12 = 6(b+2)$	B1 **[1]**	
9(ii)	AP with first term $2b$, common difference 4 Sum to n terms is: $\frac{1}{2}n(2a + (n-1)d) = 2n(b + n - 1)$	M1 A1 M1,A1 **[4]**	Recognition of AP First term and common difference Use of appropriate formula
9(iii)	$2n(5 + n - 1) = 570$ $n^2 + 4n - 285 = 0$ $(n - 15)(n + 19) = 0$ 15 skittles	M1 A1 A1 **[3]**	Forming an equation
9(iv)	$2n(b + n - 1) = 1000$ $n(b + n - 1) = 500$ n is a factor of 500 and only 25 works, giving $b = 16$	M1 M1 A1 **[3]**	Equation involving n and b Correct reasoning cao

Qu	Answer	Mark	Comment
Section B (continued)			
10(i)	x 1 2 3 4 5 $\log_{10} y$ **2.38 2.18 1.98 1.76 1.58**	B1 **[1]**	All correct
10(ii)	Straight line graph	B1,B1 **[2]**	
10(iii)	$y = pq^x \Rightarrow \log y = \log p + x \log q$ Plotting log y against x should give a straight line and it does	M1 E1 **[2]**	Taking logarithms
10(iv)	log 20 = 1.30 From graph this will be in week 7 It involves extrapolation	M1 A1 B1 **[3]**	Using logarithms
10(v)	Gradient of graph is:		
	$\log q \approx \frac{1.58 - 2.38}{5 - 1} = -0.2$	M1	Use of gradient
	$q = 10^{-0.2} = 0.63$	A1	ft
	Intercept is $\log p = 2.58$		
	$p = 380$	B1	
	$y = 380 \times 0.63^3 = 95.0$	M1	
	Agrees with data	A1 **[5]**	
11(i)	$\frac{dy}{dx} = 4x^3 - 16x$	M1,A1	Differentiation
	$\frac{dy}{dx} = 0 \Rightarrow x = -2, 2$ or 0	M1 A1	Setting = 0
	$x = 2 \Rightarrow y = 2^4 - 8 \times 2^2 + 7 = -9$	E1	For verification for $x = z$
	(-2, -9) and (0, 7)	B1,B1 **[7]**	
11(ii)	Sketch with coordinates of all 3 turning points.	B1 B1 **[2]**	
11(iii)	$y = -12x + 12$ cuts x-axis at $x = 1$	B1	
	(1, 0) lies on the curve	B1	
	When $x = 1, \frac{dy}{dx} = -12$	B1 **[3]**	
			Section B Total: 36
			Total: 72

AO	Range	Total	Question Number										
			1	2	3	4	5	6	7	8	9	10	11
1	21-29	28	1	2	2	2	3	2	2	-	3	5	6
2	21-29	28	1	2	2	-	-	3	3	2	6	3	6
3	0-8	3	-	-	-	-	-	-	-	1	1	1	-
4	0-8	3	-	-	-	-	-	-	-	1	1	1	-
5	7-15	10	1	-	-	3	2	-	-	1	-	3	-
Totals		**72**	3	4	4	5	5	5	5	5	11	13	12