RECOGNISING ACHIEVEMENT

GCE

Mathematics (MEI)

Advanced GCE **4752**

Concepts for Advanced Mathematics (C2)

Mark Scheme for June 2010

Oxford Cambridge and RSA Examinations

SECTION A

1	[1], $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$	**2**	**B1** for [1], $\frac{1}{2}, \frac{1}{3}$
2 (i)	$2\frac{1}{12}$ or $\frac{25}{12}$ or 2.08(3…)	**2**	**M1** for $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}$
2 (ii)	$\sum_{r=2}^{6} r(r+1)$ o.e.	**2**	**M1** for [f(r) =] $r(r + 1)$ o.e. **M1** for [a =] 6
3 (i)	$3x^2 - 12x - 15$	**2**	**M1** if one term incorrect or an extra term is included.
3 (ii)	Their $\frac{dy}{dx}$ = 0 s.o.i. $x = 5$ $x = -1$	**M1** **B1** **B1**	
4	crossing x-axis at 0 and 2.5 min at (1.25, −6.25) crossing x-axis at 0 and 5 min at (2.5, −18.75)	**1** **1** **1** **1**	
5	$x - \frac{6x^{-2}}{-2}$ o.e. their [5 + $\frac{3}{25}$] – [2 + $\frac{3}{4}$] = 2.37 o.e. c.a.o.	**2** **M1** **A1**	M1 for 1 term correct Dependent on at least **M1** already earned i.s.w.
6	attempt to integrate $6x^2 + 12x^{\frac{1}{2}}$ [y =] $2x^3 + 8x^{1.5}$ + c Substitution of (4, 10) [y =] $2x^3 + 8a^{1.5}$ –182 or c = –182	**M1** **A2** **M1** **A1**	accept un-simplified; **A1** for 2 terms correct dependent on attempted integral with + c term
7	3.5 $\log_a x$ or k = 3.5	**2**	**B1** for 3 $\log_a x$ or ½ $\log_a x$ or $\log_a x^{3½}$ seen

8	Subst. of $1-\cos^2\theta$ or $1-\sin^2\theta$ $5\cos^2\theta = 1$ or $5\sin^2\theta = 4$ $\cos\theta = \pm\sqrt{\text{their}\ \frac{1}{5}}$ or $\sin\theta = \pm\sqrt{\text{their}\ \frac{4}{5}}$ o.e. 63.4, 116.6, 243.4, 296.6	**M1** **A1** **M1** **B2**	 Accept to nearest degree or better; **B1** for 2 correct (ignore any extra values in range).
9	log 18 = log a + n log 3 <u>and</u> log 6 = log a + n log 2 log 18 − log 6 = n (log 3 − log 2) n = 2.71 to 2 d.p. c.a.o. log 6 = log a + 2.70951…log 2 o.e. a = 0.92 to 2 d.p. c.a.o.	 **M1*** **DM1** **A1** **M1** **A1**	or $18 = a \times 3^n$ <u>and</u> $6 = a \times 2^n$ $3 = \left(\frac{3}{2}\right)^n$ $n = \frac{\log 3}{\log 1.5} = 2.71$ c.a.o. $6 = a \times 2^{2.70951}$ o.e. = 0.92 c.a.o.

Section A Total: 36

SECTION B

10 (i)	$\frac{dy}{dx} = 4x^3$ when $x = 2$, $\frac{dy}{dx} = 32$ s.o.i. when $x = 2$, $y = 16$ s.o.i. $y = 32x - 48$ c.a.o.	**M1** **A1** **B1** **A1**	 i.s.w.
10 (ii)	34.481	**2**	**M1** for $\frac{2.1^4 - 2^4}{0.1}$
10 (iii) (*A*)	$16 + 32h + 24h^2 + 8h^3 + h^4$ c.a.o.	**3**	**B2** for 4 terms correct **B1** for 3 terms correct
10 (iii) (*B*)	$32 + 24h + 8h^2 + h^3$ or ft	**2**	**B1** if one error
10 (iii) (*C*)	as $h \to 0$, result $\to$ their 32 from (iii) (B) gradient of tangent is limit of gradient of chord	**1** **1**	

11	(a)	$10.6^2 + 9.2^2 - 2\times10.6\times9.2\times\cos68°$ o.e. QR = 11.1(3…) $\frac{\sin 68}{\text{their QR}} = \frac{\sin Q}{9.2}$ or $\frac{\sin R}{10.6}$ o.e. Q = 50.01..° or R = 61.98..° bearing = 174.9 to 175°	**M1** **A1** **M1** **A1** **B1**	 Or correct use of Cosine Rule 2 s.f. or better
11	(b) (i)	(A) $\frac{1}{2} \times 80^2 \times \frac{2\pi}{3}$ $= \frac{6400\pi}{3}$	**M1** **A1**	 6702.(…) to 2 s.f. or more
11	(b) (ii)	DC = $80\sin(\frac{\pi}{3}) = 80\frac{\sqrt{3}}{2}$ Area = ½×their DA×$40\sqrt{3}$ or ½×$40\sqrt{3}$×80×sin(their DCA) o.e. area of triangle = $800\sqrt{3}$ or 1385.64… to 3s.f. or more	**B1** **M1** **A1**	both steps required s.o.i.
11	(b) (iii)	area of ¼ circle = $\frac{1}{2} \times \frac{\pi}{2} \times (40\sqrt{3})^2$ o.e. "6702" + "1385.6" – "3769.9" = 4300 to 4320	**M1** **M1** **A1**	[=3769.9…] i.e. their(b) (i) + their (b) (ii) – their ¼ circle o.e. $933\frac{1}{3}\pi + 800\sqrt{3}$

12	**(i) (*A*)**	1024	**2**	**M1** for number of buds = 2^{10} s.o.i.
12	**(i) (*B*)**	2047	**2**	**M1** for 1+2+4+…2^{10} or for $2^{11} - 1$ or (their 1024) + 512 + 256 +…+ 1
12	**(ii) (*A*)**	no. of nodes = 1 + 2 +..+ 2^{n-1} s.o.i. $\frac{7\times(2^n-1)}{2-1}$	**1** **1**	no. of leaves = 7 + 14 +…+ $7\times2^{n-1}$
12	**(ii) (*B*)**	$7(2^n - 1) > 200\,000$ $2^n > \frac{200\,000}{7} + 1$ or $\frac{200\,007}{7}$ $n \log 2 > \log\left(\frac{200\,007}{7}\right)$ and completion to given ans [n =] 15 c.a.o.	**M1** **M1** **M1** **B1**	 or $\log7 + \log2^n > \log200\,007$

Section B Total: 36