OCR
RECOGNISING ACHIEVEMENT

GCE

Mathematics (MEI)

Advanced GCE **4752**

Concepts for Advanced Mathematics (C2)

Mark Scheme for June 2010

Oxford Cambridge and RSA Examinations

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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	$\log 18 = \log a + n \log 3$ and $\log 6 = \log a + n \log 2$ $\log 18 - \log 6 = n(\log 3 - \log 2)$ $n = 2.71$ to 2 d.p. c.a.o. $\log 6 = \log a + 2.70951\ldots\log 2$ o.e. $a = 0.92$ to 2 d.p. c.a.o.	 **M1*** **DM1** **A1** **M1** **A1**	or $18 = a \times 3^n$ and $6 = a \times 2^n$ $3 = \left(\frac{3}{2}\right)^n$ $n = \frac{\log 3}{\log 1.5} = 2.71$ 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*) ½ × $80^2 \times \frac{2\pi}{3}$ = $\frac{6400\pi}{3}$	**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√3 or ½×40√3×80×sin(their DCA) o.e. area of triangle = 800√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 = ½ × $\frac{\pi}{2}$ × $(40\sqrt{3})^2$ 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. 933⅓π + 800√3

12	**(i) (*A*)**	1024	**2**	**M1** for number of buds = 2^{10} s.o.i.
12	**(i) (*B*)**	2047	**2**	**M1** for $1+2+4+\ldots 2^{10}$ 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 = $7 + 14 +\ldots+ 7\times2^{n-1}$
12	**(ii) (*B*)**	$7(2^n - 1) > 200\ 000$ $2^n > \frac{200\,000}{7} + 1$ or $\frac{200\,007}{7}$ $n \log 2 > \log (\frac{200\,007}{7})$ and completion to given ans $[n =]$ 15 c.a.o.	**M1** **M1** **M1** **B1**	or $\log7 + \log2^n > \log200\ 007$

Section B Total: 36

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553