UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

4024 MATHEMATICS (SYLLABUS D)

4024/21 Paper 2, maximum raw mark 100

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UNIVERSITY of CAMBRIDGE
International Examinations

Abbreviations

cao correct answer only
cso correct solution only
dep dependent
ft follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
www without wrong working
soi seen or implied

SECTION A

Qu.	Answers	Mark	Part Marks
1 (a) (i)	11	1	
(ii) (a)	4, 8, 12, 16	1	
(ii) (b)	x is a multiple of 4	1	
(b)	21	2	**M1** for $n(P \cup F)' = 12$
2 (a)	Option 2 by \$9	2	**M1** for $48 \times 2 + 13 \times 6$ or $48 + 13 \times 9$
(b)	\$2700	2	**M1** for 2781 is 103%
3 (a)	$(3x - 8y)(3x + 8y)$	1	
(b)	$x = 2\frac{1}{2}$ or $-5\frac{1}{2}$	3	**M1** for $4 \times x \times (x + 3) = 55$ or better **M1** for $4x^2 + 12x - 55$ (=0) After **M0**, **SC1** for one solution
(c) (i)	$(x - 1)(x + 2) - 15 = 3(x + 2)$	**M1**	
	Correct expansion leading to $x^2 - 2x - 23 = 0$	**A1**	
(ii)	$x = 5.9$ or -3.9	3	If $\frac{p + \sqrt{q}}{r}$ **B1** for $p = 2$, $r = 2$ and **B1** for $q = 96$ **B2** for one correct solution or $x = 5.8989\ldots$ and $-3.8989\ldots$ rounded or truncated to 2 or more dp
4 (a)	1660	3	**M1** for $\frac{1}{2} \times 10 \times (50 + 35)$ **M1** for 81×10
(b)	24.7	3	**M1** for $1206 = \pi r^2 - \pi \times 15^2$ **M1** for $r^2 = \frac{1206 + \pi \times 15^2}{\pi}$ (= 608.9)
(c) (i)	$33\frac{1}{3}$, 33.3	1	
(ii)	$\frac{4}{9}$	2	**B1** for $\left(\frac{10}{15}\right)^2$ oe seen or $\frac{9}{4}$ seen

5	**(a)**	32^o	1	
	(b)	$D\hat{C}B$ is alternate to $F\hat{D}C$	1	
		$58–32 = 26$	1	
	(c) (i)	94^o	1	
	(ii)	28^o	1ft	ft $122 –$ *their* 94
	(iii)	56^o	1	
	(iv)	60^o	1	
6	**(a)**	$\frac{1}{2}$	1	
	(b)	$y \geqslant -1$	1	
		$y \leqslant \frac{1}{2}x$	1	If 0 scored, **SC1** for both correct, any symbol
	(c)	Correct triangle drawn	2	**M1** for two correct vertices or reflection in $y = 2$ or $x = -2$
	(d) (i)	2	1	
	(ii)	$(8 , -1)$	1	
	(iii)	12	2ft	**M1** for area of $R = 6$ used
7	**(a) (i)**	60^o	1	
	(ii)	*AOB* and *OBC* are equilateral triangles oe	1	
	(b) (i)	$\mathbf{b} - \mathbf{a}$	1	
	(ii)	$2\mathbf{b} - \mathbf{a}$	1ft	ft $\mathbf{b}$ + *their* $(\mathbf{b} - \mathbf{a})$ but not $k\mathbf{a}$ or $k\mathbf{b}$
	(iii)	$\frac{3}{4}\mathbf{a} + \frac{1}{4}\mathbf{b}$	2	**M1** for $\frac{1}{4}\overrightarrow{AB}$ or $\frac{3}{4}\overrightarrow{BA}$
	(iv)	$\mathbf{b} - \frac{1}{2}\mathbf{a}$	1	
	(v)	$\frac{3}{4}\mathbf{b} - \frac{5}{4}\mathbf{a}$	2	**SC1** for $\frac{5}{4}\mathbf{a} - \frac{3}{4}\mathbf{b}$

SECTION B

8 **(a)** **(i)**	307^o	1	
(ii)	*B* correctly positioned *C* correctly positioned, with 2 arcs	1 2	**M1** for *C* correctly positioned
(iii)	$074^o \pm 3^o$	1	
(b) **(i)**	30.8	2	**M1** for $\frac{72}{360} \times \pi \times 7^2$
(ii)	22.8	2	**M1** for 8.79(64..) or 8.8 or *their* arc length + 14
(iii)	Line parallel to *JM* 5 cm away Angle bisector of $J\hat{K}L$	1 1	
(iv)	Correct shading	1	
9 **(a)**	54.5 www	3	**M1** for $6 \times 10 + 15 \times 30 + 29 \times 50 + 18 \times 70 + 9 \times 90 + 3 \times 110$ **B1** for ÷ by 80
(b)	50, 68, 77	1	
(c)	7 correct points plotted and smooth curve	3	**B2** for 7 or 6 correct plots or **B1** for 5 or 4 correct plots
(d) **(i)**	50 to 55	1	
(ii)	68 to 72 and 38 to 40 28 to 34	**M1** **A1**	
(iii)	(16 to 17) / 80 oe	2	**M1** for 15 to 17 seen
10 **(a)**	$x(10 - x)^2$ Correct expansion leading to $x^3 - 20x^2 + 100x$	**M1** **A1**	
(b) **(i)**	63, 32	1	
(ii)	Correct 9 points drawn joined with a smooth curve	3	**B2** for 7, 8 or 9 correct points plotted **B1** for 5 or 6 correct points plotted
(c) **(i)**	147.1 to 150	1	
(ii)	1.7 – 1.9 5.1 – 5.3	1 1	
(d)	$y = \frac{\pi x^3}{6}$ seen or implied Attempt at correct curve $5.6 < x < 6$	**M1** **A1** **A1**	

11	**(a) (i)**	18.6 to 18.61	2	**M1** for $(AE^2) = 15^2 + 11^2$
	(ii)	11.17 to 11.2	4	**M2** for $\cos D = \frac{60.5^2 + 50^2 - 15^2}{2 \times 60.5 \times 50}$ **M1** for implicit form **A1** for $\cos D = 0.981\ldots$
	(b) (i)	50^o	1	
	(ii)	11.76 to 11.8	3ft	**M2** for $FB = \frac{11 \sin 55}{their \sin 50}$ **M1** for implicit form
	(iii)	51.8 – 51.9 www cao	2	**M1** for $\tan \theta = \frac{15}{their 11.8}$ seen
12	**(a) (i)**	$\begin{pmatrix} -5 & 6 \\ 0 & -2 \end{pmatrix}$	1	
	(ii)	$\frac{1}{6}\begin{pmatrix} 2 & -6 \\ 2 & -3 \end{pmatrix}$ oe isw	2	**M1** for $\frac{1}{6}$ × (2 by 2 matrix) or $\begin{pmatrix} 2 & -6 \\ 2 & -3 \end{pmatrix}$
	(b) (i)	$m = 1.5$ and $n = 2$	1	
	(ii)	$\begin{pmatrix} 112 \\ 115 \end{pmatrix}$	2	**B1** for 1 element correct in a 2 by 1 or both elements seen
	(iii)	3 Difference in training distance of Mark and Luke	1ft 1	ft difference between their 2 values
	(c) (i)	138	1	
	(ii)	44	1	
	(iii)	28	1	
	(iv)	football stadium and cafe	1	