UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

4024 MATHEMATICS (SYLLABUS D)

4024/22   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

SECTION A

Qu.	Answers	Mark	Comments
1	**(a) (i)** $\dfrac{1}{10x}$ cao	1	
	(ii) $\dfrac{11x-12}{x(x-3)}$ final answer	2	M1 for $\dfrac{4(x-3)+7x}{x(x-3)}$
	(b) (i) ¼ or 0.25	1	
	(ii) $c = 2$ cao $d = 1.5$ oe	2	If 0, B1 for $\left(f^{-1}(x)=\right)\dfrac{4x+3}{2}$
	(iii) $g = $ ½ or 0.5	2	M1 for $\dfrac{2g-3}{4} = -g$
2	**(a) (i)** $c = \dfrac{2A}{h} - d$ or $\dfrac{2A-hd}{h}$ final answer	2	M1 for $c+d = \dfrac{2A}{h}$ or $\dfrac{1}{2}hc = A - \dfrac{1}{2}hd$ oe or SC1 for $c = \dfrac{A}{\frac{1}{2}h} - d$
	(ii) 3	1	
	(b) (i) 102	2	M1 for 31.5 and 19.5 used
	(ii) 322	3	M2 for $(32.5 \times 20.5)–(25.5 \times 13.5)$ or M1 for (32.5×20.5) or (25.5×13.5)
3	**(a)** $\dfrac{1}{3}$	1	
	(b) (i) $\dfrac{1}{20}$	2	M1 for $\dfrac{1}{6} \times \dfrac{3}{5} \times \dfrac{2}{4}$ seen
	(ii) $\dfrac{3}{20}$	2	SC1 for $\dfrac{5}{36}$ M1 for $\left(\dfrac{3}{6} \times \dfrac{2}{5} \times \dfrac{1}{4}\right) + \left(\dfrac{3}{6} \times \dfrac{2}{5} \times \dfrac{2}{4}\right)$ seen

4	**(a)**	**(i)**	$(u_n) = 3n + 1$ oe	1	
		(ii)	61	1ft	ft their u_n with $n = 20$
	(b)	**(i)**	$(v_n) = 17 - 2n$ oe	1	
		(ii)	$(k =) 49$ cao	1	
5	**(a)**		11 30 cao	1	
	(b)		39 minutes	1	
	(c)		8 km	1	
	(d)		24 km/h	1	
	(e)		park and shopping centre	1	
	(f)		Salim and 9 minutes	2	B1 for 12 27 or 1 hour 12 minutes seen or 1.2 hours or 72 minutes or for line from (11.15,0) to (12.15,15)
6	**(a)**		(£)1350	1	
	(b)		(£)225	1ft	ft their **(a)** $\div$ 6
	(c)		108°	1ft	ft $\dfrac{405}{their(\mathbf{a})} \times 360$ or $\dfrac{405}{their(\mathbf{b})} \times 60$
	(d)		(£)300	2	SC1 for 120° or £450 seen.
	(e)		(£)199.80	2	B1 for (£)70.20 or M1 for $(1 - 0.26) \times 270$ oe
	(f)		9(%)	3	M2 for figs $\dfrac{3645}{405}$ or $\dfrac{11745}{405}$ or $\dfrac{28755}{405}$ seen SC1 for 81 or 324 seen
	(g)		(£)250	2	M1 for 108 % $\div$ 270 soi
7	**(a)**	**(i)**	2	1	
		(ii)	**(a)** $\mathbf{q} - \mathbf{r}$ **(b)** $2\mathbf{p} - \mathbf{q} - \mathbf{r}$ **(c)** $1\frac{1}{2}\mathbf{p} - \mathbf{r}$ **(d)** $\frac{1}{2}\mathbf{p} - \mathbf{q} + \frac{1}{2}\mathbf{r}$	1 1 1 1	
	(b)	**(i)**	45°	1	
		(ii)	95°	1ft	ft 140 – their **(b)(i)**
		(iii)	80°	1ft	ft 125 – their **(b)(i)**

SECTION B

8	(a)	(i)	$\begin{pmatrix} 3 & 2 \\ 1 & 4 \end{pmatrix}$	2	B1 for 3 correct terms
		(ii)	$\begin{pmatrix} -1 & -2 \\ 1.5 & 2.5 \end{pmatrix}$ or $\frac{1}{2}\begin{pmatrix} -2 & -4 \\ 3 & 5 \end{pmatrix}$	2	B1 for $k\begin{pmatrix} -2 & -4 \\ 3 & 5 \end{pmatrix}$ k ½ or ½ × (2 × 2 matrix)
	(b)	(i)	Reflection $y = 1$	1 1	
		(ii)	Enlargement Scale factor ½ Centre (–5,0)	1 1	
		(iii)	(–2 , 3) (–4 , 5) (–4 , 7)	2	B1 for 2 correct vertices or for $\begin{pmatrix} -2 & -4 & -4 \\ 3 & 5 & 7 \end{pmatrix}$
		(iv)	Rotation 90° anticlockwise about (0,0)	1 1	
9	(a)		–5, –6	1	
	(b)		All points plotted correctly <u>and</u> a smooth curve – generous quadratic	2ft	B1 for 5 or more points correct ft from their table
	(c)	(i)	$x = $ –2.2 to –2.35 and 1.65 to 1.85	1	
		(ii)	–6.4 $mv < $ –6.0	1	
		(iii)	8 to 10	2	M1 for tangent
	(d)	(i)	$2x^2 + 4x - 3x - 6 = 1 - 2x$ leading to $2x^2 + 3x - 7 = 0$	1	
		(ii)	$x = 1.27, -2.77$	4	B3 for one solution or $x = 1.26$ to 1.3 <u>and</u> –2.76 to –2.8 or if in form $\dfrac{p \pm (or + or -)\sqrt{q}}{r}$ B1 for $p = -3, r = 4$ B1 for $q = 65$ or $\sqrt{q} = 8.06$

10	(a)	(i)	$74.95 \to 75.05$	1	
		(ii)	$336.5 \to 337.5$	3	M1 for $250^2 + 300^2 \pm 2 \times 250 \times 300\cos75$ M1 for $\sqrt{152500 - 150000\cos75}\left(= \sqrt{113677}\right)$
		(iii)	$44.2 \to 44.3$	3	M2 for $\sin\theta = \dfrac{300\sin75}{\text{their}337}$ SC1 for $(C\hat{S}B =)\ 45.7 \to 45.8$ seen
	(b)	(i)	$241 \to 241.5$	2	M1 for $\cos15 = \dfrac{DB}{250}$ oe
		(ii)	$12050 - 12100$	2ft	B1 for $\frac{1}{2} \times 200 \times 241 \times \sin30$ ft $50 \times$ their **(b)(i)**
		(iii)	225	1	
11	(a)		$\dfrac{7\pi r^2 H}{9}$	3	B1 for $\dfrac{2\pi r^2 H}{3}$ and B1 for $\dfrac{\pi r^2 H}{9}$
	(b)	(i)	$\sqrt{15^2 + 10^2} = 18(.0)$	2	M1 for $15^2 + 10^2$
		(ii)	$62.8 \to 62.9$ or 20π	2	M1 for $2 \times \pi \times 10$
		(iii)	$\theta = \dfrac{62.8 \times 360}{36\pi} = 200^\circ$	2	M1 for $\dfrac{\theta}{360} \times \pi \times 18 \times 2$ = their **(ii)**
		(iv)	$2760 \to 2770$	3	M1 for $\dfrac{200}{360} \times \pi \times 18^2 (= 565.5)$ M1 for $30 \times$ their **(ii)** ($= 1884$)
12	(a)		220, 288, 312, 320	1	
	(b)	(i)	7 correct plots and smooth ogive	3	B2 for 5 or 6 correct plots and smooth ogive or B1 for 5 or 6 correct plots
		(ii) (a)	$83 \to 85$	1ft	ft from their graph
		(b)	$13.5 \to 16.5$	2	M1 for readings at 80 and 240 seen
		(c)	15 to 19%	2	SC1 for $48 \to 60$ or $81 \to 85$ seen
		(iii) (a)	76 cao	1	
		(b)	25% cao	1	
		(c)	More pupils took longer (so) previous test was probably harder	1	