UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

4024 MATHEMATICS (SYLLABUS D)

4024/22 Paper 22, maximum raw mark 100

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UNIVERSITY of CAMBRIDGE
International Examinations

Section A

Qu	Answers	Mark	Comments
1	**(a)** **(i)** $p = 7$, $q = 2.9(0)$ $r = 0.25$ or $\frac{1}{4}$ **(ii)** \$7.75 **(b)** 0.2×980 (= 196) and 24×36 (= 864) soi \$80 **(c)** 3.5%	B1 B1 B1 M1 A1 B3 [8]	Correct method for both parts SC2 for answer of 23.5 or 17.5 SC1 for answer of 117.5 or 763.75 – 650 soi by 113.75 or 22.75
2	**(a)** **(i)** 110 **(ii)** 10 **(b)** **(i)** $x + 2x - 70$ + their 10 = 180 oe or $x + 2x$ + their 110 + 70 + 120 = 540 oe 80 **(ii)** 90	B1 B1ft M2 A1 B1ft [6]	120 – their **(a)(i)** (provided answer > 0) Allow M2 for $2x - y = 70$ and $x + y = 170$ where $y = E\hat{D}A$ If M0, SC1 for $3x$ soi NB: 80 from wrong working is M0 180 – their **(a)(ii)** – their **(b)(i)** Or 2 × their **(b)(i)** – 70 (provided answer > 0)
3	**(a)** Mercury, Mars, Venus, Earth **(b)** 3000 or 3×10^3 cao **(c)** $5.5(12) \times 10^{24}$ isw **(d)** $\frac{4}{3}\pi (6.4 \times 10^3)^3$ 1.09 to $1.1(0) \times 10^{12}$ isw	B1 B1 B1 M1 A1 [5]	
4	**(a)** $y < 12$ y and $2x$ seen in an equality or an inequality $y > 2x$ oe **(b)** **(i)** 16 **(ii)** $d = 9$ or (3, 9)	B1 M1 A1 B1 B1 [5]	Condone $4 < y < 12$ and $y \leqslant 12$ SC1 for $y > x$

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5	**(a)** **(i)** $\begin{pmatrix}930\\1235\end{pmatrix}$ final answer After B0, column matrix with one correct or row matrix with both correct B1	B2	
	(ii) Top value – cost of fruit in week 1 Bottom value – cost of fruit in week 2	B1	
	(iii) \$21.65	B1ft	Sum of their two values divided by 100
	(b) M = $\begin{pmatrix}-6 & 0\\2 & -4\end{pmatrix}$ oe without fractions	B2	SC1 for either +4M or –4M or + or – $\begin{pmatrix}24 & 0\\-8 & 16\end{pmatrix}$
	(c) **(i)** **(a)** 7	B1	
	(b) {10, 14, 16}	B1	
	(ii) $\frac{3}{16}$	B2 [10]	SC1 for $(A \cap B =)$ {3, 6, 12} Or n$(A \cap B)$ = 3
6	**(a)** $m = \frac{1}{8}$	B1	Accept 0.12 or 0.13
	$n = 8$	B1	Accept $\frac{32}{4}$ or $\frac{8}{1}$ if correctly plotted
	(b) 5 correct central points	P2	–1 for each wrong plot –1 wrong scale –2 non-uniform scale
	Smooth curve through 5 correct central plots	C1	Lost for ruled or thick lines
	(c) **(i)** 3.5 – 3.7 ft from $y = 3$	B1	Do not accept embedded answers unless clearly justified on graph
	(ii) 2.5 – 2.7 ft from $y = 1.5$	B1	
	(d) **(i)** $t = x - 2$	B1	
	(ii) $x = \frac{5}{4}$ or 1.25 final answer	B1 [9]	Follow through their expression provided it is linear

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7	**(a)** **(i)**	184 (cm^2)	B1	
	(ii)	Tan $P\hat{S}R = \frac{8}{12}$	M1	
		$P\hat{S}R$ = 33.69 to 33.7	A1	
	(b) **(i)**	$\frac{KM}{LM} = \frac{KL}{LN}$ oe	M1	$\frac{KM}{18} = \frac{15}{10}$ oe
		27 (cm)	A1	
	(ii)	KN = 15 cm	B2	After B0, NM = 12 seen B1
	(iii)	$\frac{16}{65}$ cao	B2 [9]	B1 for unsimplified equivalents or 0.246...

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Section B

Qu	Answers	Mark	Comments
8	**(a)** $\frac{10}{x}$	B1	
	(b) $\frac{15}{x+0.5}$	B1	
	(c) their $\frac{10}{x}$ $+2+$ their $\frac{15}{x+0.5}=7$ oe	B1	
	$5x(x+0.5)=10x+5+15x$	M1	Correct removal of the denominators x and $x+0.5$
	$2x^2-9x-2\ (=0)$	A1	All correct – Answer given Must see at least 2 steps from previous line
	(d) For numerical $\frac{p\pm(\text{or}+\text{or}-)\sqrt{q}}{r}$		
	$p=9$ and $r=4$	B1	
	$q=97$ or $\sqrt{q}=9.848...$	B1	
	4.71	B1	SC1 for 4.7 to 4.72 <u>and</u> –0.2 to –0.22
	–0.21	B1	ww...max 2 marks
	(e) **(i)** 5.2(1)	B1ft	Their $x+0.5$ (provided $x>0$) If 2 positive values allow ft on either
	(ii) $\frac{10}{\text{their } 4.71}$ and $\frac{15}{\text{their } 4.71+0.5}$	M1	
	$0.75 \leqslant t \leqslant 0.8$	A1 [12]	
9	**(a)** 305° cao	B1	
	(b) $20^2+17^2\pm(2)\times 20\times 17\cos 50°$	M1	
	$QL^2=20^2+17^2-2\times 20\times 17\cos 50$	M1	
	15.87 – 15.9	A2	After A0, 251.9, 252 SC1
	(c) **(i)** $\frac{\sin P\hat{L}Q}{20}=\frac{\sin 50}{\text{their } 15.9}$	M1	
	$\sin P\hat{L}Q=\frac{20\sin 50}{\text{their } 15.9}$ (= 0.9653)	M1	Dep on first M1
	$P\hat{L}Q$ = 74.48 to 74.9	A1ft	ww 2 marks
	(ii) (0)19.48 to (0)20	B1ft	Their **(c)(i)** – 55
	(d) **(i)** 2130 or 9 30pm	B1	Not 09 30 (pm)
	(ii) $\sin 50=\frac{x}{17}$ or $\sin Q=\frac{x}{QL}$	M1	
	x = 12.9 to 13.1 (km)	A1 [12]	

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10	**(a)** $n = 4$ 22, 20, 42 $n = 5$ 26, 30, 56	B2	After B0, 4 correct values SC1
	(b) **(i)** $4n + 6$	B1	Accept $2(2n + 3)$ or $4 \times n + 6$
	(ii) $n^2 + n$	B1	Accept $n(n + 1)$ or $n \times n + n$
	(c) $n^2 + 5n + 6$ $(n + 2)(n + 3)$	M1 A1	Adds their expressions for **(b)(i)** and **(b)(ii)** Factorises – answer given NB: Alternative complete methods can score M1A1
	(d) 156	B1	
	(e) **(i)** $((k + 2)(k + 3) = 306)$ $k^2 + 5k + 6 = 306$ $k^2 + 5k - 300 = 0$	M1 A1	
	(ii) 15 –20	B1 B1	SC1 for –15 and 20
	(iii) 66	B1ft[12]	Their positive integer k substituted into their **(b)(i)**
11	**(a)** **(i)** Correct scales and Correct widths (2, 2, 5, 5, 10) Correct heights (6, 9, 8.4, 5.6, 4)	SW1 H2	 3 or 4 correct heights H1
	(ii) 21 or 20	B1	
	(iii) $\frac{5}{7}$ cao	B1	
	(iv) $\frac{132}{870}, \frac{22k}{145k}$ or 0.15(0) to 0.152	B2	SC1 for $\frac{132}{900}, \frac{11k}{75k}$ or 0.147 or $\frac{12 \times 11}{30 \times 29}$ or $\frac{132}{870}$ seen
	(b) **(i)** $\frac{7}{60}$ cao	B1	
	(ii) 60	B2	After B0, 35% = 21 seen SC1
	(iii) 8	B2 [12]	SC1 for either 15,21 and 7 seen or 48° or 13 ⅓ % seen

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12	**(a)** **(i)** 15	P2	After P0, $\sqrt{9^2+12^2}$ P1
	(ii) 678 – 679 (cm^2)	S2	After S0, $\pi \times 9 \times$ their $15 + \pi \times 9^2$ S1
	(iii) 1017 – 1020 (cm^3)	V2	After V0, $\frac{1}{3} \times \pi \times 9^2 \times 12$ V1
	(b) **(i)** 4 cm	B1	
	(ii) 10 cm	B1	
	(iii) 18.8 – 18.9 (cm)	C2	After C0, $\pi \times 3 \times 2$ C1
	(iv) 979 – 983 (cm^3)	W2	After W0, $\frac{26}{27}$ × their 1018 or
		[12]	their $1018 - \frac{1}{3}\pi 3^2 \times$ their 4 W1

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