

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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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) $0.2 \times 980 (= 196)$ and $24 \times 36 (= 864)$ 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) $x + 2x - 70 + \text{their } 10 = 180$ oe or $x + 2x + \text{their } 110 + 70 + 120 = 540$ oe 80 (ii) 90	B1 B1ft M2 A1 B1ft [6]	120 – their (a)(i) (<u>provided</u> answer > 0) Allow M2 for $2x - y = 70$ and $x + y = 170$ where $y = \widehat{EDA}$ If M0, SC1 for $3x$ soi NB: 80 from wrong working is M0 180 – their (a)(ii) – their (b)(i) Or $2 \times \text{their (b)(i)} - 70$ (<u>provided</u> 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 $y \leq 12$ 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 (b) {10, 14, 16}	B1 B1	
	(ii) $\frac{3}{16}$	B2 [10]	SC1 for $(A \cap B) = \{3, 6, 12\}$ Or $n(A \cap B) = 3$
6	(a) $m = \frac{1}{8}$ $n = 8$	B1 B1	Accept 0.12 or 0.13 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)	$\tan \widehat{PSR} = \frac{8}{12}$	M1	
		$\widehat{PSR} = 33.69 \text{ to } 33.7$	A1	
	(b) (i)	$\frac{KM}{LM} = \frac{KL}{LN}$ oe	M1	$\frac{KM}{18} = \frac{15}{10}$ oe
		27 (cm)	A1	
	(ii)	$KN = 15 \text{ cm}$	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	Correct removal of the denominators x and $x + 0.5$ All correct – Answer given Must see at least 2 steps from previous line SC1 for 4.7 to 4.72 <u>and</u> -0.2 to -0.22 ww...max 2 marks Their $x + 0.5$ (provided $x > 0$) If 2 positive values allow ft on either
	(b) $\frac{15}{x + 0.5}$	B1	
	(c) their $\frac{10}{x} + 2 +$ their $\frac{15}{x + 0.5} = 7$ oe	B1	
	$5x(x + 0.5) = 10x + 5 + 15x$ $2x^2 - 9x - 2 (= 0)$	M1 A1	
	(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	
	-0.21	B1	
	(e) (i) 5.2(1)	B1ft	
9	(ii) $\frac{10}{\text{their } 4.71}$ and $\frac{15}{\text{their } 4.71 + 0.5}$ $0.75 \leq t \leq 0.8$	M1 A1 [12]	After A0, 251.9, 252 SC1 Dep on first M1 ww 2 marks Their (c)(i) – 55 Not 09 30 (pm)
	(a) 305° cao	B1	
	(b) $20^2 + 17^2 \pm (2) \times 20 \times 17 \cos 50^\circ$ $QL^2 = 20^2 + 17^2 - 2 \times 20 \times 17 \cos 50^\circ$ $15.87 - 15.9$	M1 M1 A2	
	(c) (i) $\frac{\sin \widehat{PLQ}}{20} = \frac{\sin 50}{\text{their } 15.9}$	M1	
	$\sin \widehat{PLQ} = \frac{20 \sin 50}{\text{their } 15.9}$ (= 0.9653)	M1	
	$\widehat{PLQ} = 74.48$ to 74.9	A1ft	
	(ii) (0)19.48 to (0)20	B1ft	
	(d) (i) 2130 or 9 30pm	B1	
	(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 $\frac{1}{3}$ % 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, $\frac{26}{27} \times$ their 1018 or
		[12]	their 1018 – $\frac{1}{3} \pi 3^2 \times$ their 4 W1