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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

• CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



		www.dynamicpa	pers.com
Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2010	4024	22

### Section A

Qu	Answers	Mark	Comments
1	(a) (i) $p = 7, q = 2.9(0)$	B1	
	$r = 0.25 \text{ or } \frac{1}{4}$	B1	
	<b>(ii)</b> \$7.75	B1	
	<b>(b)</b> $0.2 \times 980 \ (= 196) \ and 24 \times 36 \ (= 864) \ soi$	M1	Correct method for both parts
	\$80	A1	
	(c) 3.5%	B3 [8]	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	B1	
	( <b>ii)</b> 10	B1ft	$120 - \text{their}(\mathbf{a})(\mathbf{i}) (provided answer > 0)$
	<b>(b)</b> (i) $x + 2x - 70 + \text{their } 10 = 180 \text{ oe}$	M2	Allow M2 for $2x - y = 70$ and $x + y = 170$
	x + 2x + their  110 + 70 + 120 = 540  oe		where $y = EDA$ If M0, SC1 for 3x soi
	80	A1	NB: 80 from wrong working is M0
	<b>(ii)</b> 90	B1ft	180 - their  (a)(ii) - their  (b)(i)
		[6]	(provided answer > 0)
3	(a) Mercury, Mars, Venus, Earth	B1	
	<b>(b)</b> 3000 or $3 \times 10^3$ cao	B1	
	(c) $5.5(12) \times 10^{24}$ isw	B1	
	(d) $\frac{4}{3}\pi (6.4 \times 10^3)^3$	M1	
	1.09 to $1.1(0) \times 10^{12}$ isw	A1 [5]	
4	(a) $y < 12$ y and 2x seen in an equality or an	B1 M1	Condone $4 < y < 12$ and $y \le 12$ SC1 for $y \ge r$
	inequality	1011	Set for $y = x$
	y > 2x oe	A1	
	<b>(b) (i)</b> 16	B1	
	(ii) $d = 9$ or $(3, 9)$	B1 [5]	

	V	/ww.dynamicpa	pers.com
Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2010	4024	22

5	(a)	(i) $\begin{pmatrix} 930\\ 1235 \end{pmatrix}$ final answer	B2	
		After B0, column matrix with one correct or row matrix with both correct B1		
		<ul><li>(ii) Top value – cost of fruit in week 1</li><li>Bottom value – cost of fruit in week 2</li></ul>	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>(b)</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 $32 \times 8$ : Commention 1 at the 1
		n = 8	BI	Accept $\frac{1}{4}$ or $\frac{1}{1}$ if correctly plotted
	(b)	5 correct central points	Р2	<ul> <li>1 for each wrong plot</li> <li>1 wrong scale</li> </ul>
		Smooth curve through 5 correct central plots	C1	-2 non-uniform scale Lost for ruled or thick lines
	(c)	(i) $3.5 - 3.7$ ft from $y = 3$	B1	Do not accept embedded answers unless clearly
		(ii) $2.5 - 2.7$ ft from $y = 1.5$	B1	justified on graph
	(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

						WW	w.dynamicpap	pers.com
	Pag	e 4	Mark Schem	Mark Scheme: Teachers' version		Syllabus	Paper	
			GCE O LEV	/EL – May	/Jur	e 2010	4024	22
	-							
7	(a)	(i)	$184 (cm^2)$	B1				
		(ii)	Tan $P\widehat{SR} = \frac{8}{12}$	M1				
			$P\hat{S}R = 33.69 \text{ to } 33.7$	A1				
	(b)	(i)	$\frac{KM}{LM} = \frac{KL}{LN}  \text{oe}$	M1		$\frac{KM}{18} = \frac{15}{10}$ oe		
			27 (cm)	A1				
		(ii)	KN = 15  cm	B2		After B0, $NM = 2$	12 seen B1	
		(iii)	$\frac{16}{65}$ cao	B2	[9]	B1 for unsimplif	ied equivalents or	0.246

		ww	w.dynamicpa	pers.com
Page 5	Mark Scheme: Teachers' version		Syllabus	Paper
	GCE O LEVEL – May/June 2010		4024	22

#### Section **B**

Qu		Answers	Mark	Comments
8	(a)	$\frac{10}{x}$	B1	
	(b)	$\frac{15}{x+0.5}$	B1	
	(c) oe	their $\frac{10}{x} + 2 + \text{their } \frac{15}{x+0.5} = 7$	B1	
		$5x (x + 0.5) = 10x + 5 + 15x$ $2x^{2} - 9x - 2 (= 0)$	M1 A1	Correct removal of the denominators $x$ and $x + 0.5$ 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	
		$q = 97 \text{ or } \sqrt{q} = 9.848$	B1	
		4.71	B1	SC1 for 4.7 to 4.72 and -0.2 to -0.22
		-0.21	BI	wwmax 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	M1	
		$\frac{15}{\text{their } 4.71 + 0.5}$		
		$0.75 \le t \le 0.8$	A1 [12]	
9	(a)	305° cao	B1	
	(b)	$20^{2} + 17^{2} \pm (2) \times 20 \times 17 \cos 50^{\circ}$ $QL^{2} = 20^{2} + 17^{2} - 2 \times 20 \times 17 \cos 50$ 15.87 - 15.9	M1 M1 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
		$P\hat{I}O = 74.48 \text{ to } 74.9$	Δ1ft	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]	

www.dynamicpapers.com

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2010	4024	22

10	(a)	<i>n</i> =	4 22, 20, 42	B2	After B0, 4 correct values SC1
		<i>n</i> =	5 26, 30, 56		
	(b)	(i)	4n + 6	B1	Accept $2(2n+3)$ or $4 \times n + 6$
		(ii)	$n^2 + n$	B1	Accept $n(n+1)$ or $n \times n + n$
		2			
	(c)	$n^2$ +	-5n+6 -2)(n+2)	M1	Adds their expressions for (b)(i) and (b)(ii)
		(11-1	2)(n + 3)	AI	NB: Alternative complete methods can score M1A1
	(d)	156		B1	1
	(u)	100		21	
	(e)	(i)	((k+2)(k+3) = 306)	M1	
			$k^2 + 5k + 6 = 306$		
			$k^2 + 5k - 300 = 0$	Al	
		(ii)	15	B1	SC1 for 15 and 20
		<b></b>	-20		SC1 for $-13$ and 20
		(111)	66	BIft[12]	Their positive integer k substituted into their (b)(1)
11	(a)	(i)	Correct scales <u>and</u> Correct widths (2, 2, 5, 5, 10)	SW1	
			Correct heights (6, 9, 8.4, 5.6, 4)	H2	3 or 4 correct heights H1
		(ii)	21 or 20	B1	C C
			5		
		(iii)	$\frac{3}{7}$ cao	B1	
			122  22k		132 114
		(iv)	$\frac{132}{870}, \frac{22k}{145k}$	B2	SC1 for $\frac{132}{900}$ , $\frac{11k}{75k}$ or 0.147
			or $0.15(0)$ to $0.152$		$12 \times 11$ 132
					or $\frac{1}{30 \times 29}$ or $\frac{1}{870}$ seen
			7	D1	
	(b)	(1)	$\overline{60}$ cao	RI	
		(ii)	60	B2	After B0, 35% = 21 seen SC1
		(iii)	8	B2	SC1 for either 15,21 and 7 seen
				[12]	or $48^{\circ}$ or $13\frac{1}{3}\%$ seen

		•
\ <b>//</b> \/\/	d١	namicpapers com
** ** ** .	<b>u</b>	

Page 7	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2010	4024	22

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