## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS GCE Ordinary Level

## MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

## **4024 MATHEMATICS (SYLLABUS D)**

**4024/22** Paper 2, 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.

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

Cambridge is publishing the mark schemes for the October/November 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.





Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	22

## **Abbreviations**

correct answer only cao correct solution only cso

dep dependent

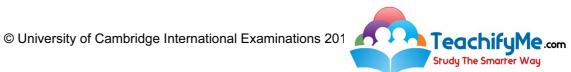
follow through after error ft isw ignore subsequent working

or equivalent oe SCSpecial Case

without wrong working www

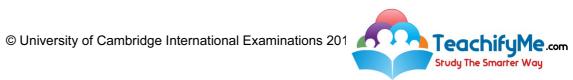
soi seen or implied

Qu	Answers	Mark	Part Marks
1	(a) $(m=)\frac{A-h^2}{4h}$ final ans	3	M1 for $A = 4hm + h^2$ or $\frac{A}{h} = 4m + h$ and (indep.) M1 for $4hm = A - h^2$ or $4m = \frac{A}{h} - h$ or for isolating the term in $m$ after the first M0.
	<b>(b)</b> $(x-2y)(3a+5b)$	2	M1 for $x(3a + 5b) - 2y(3a + 5b)$ or $3a(x - 2y) + 5b(x - 2y)$ or for correct extraction of one common factor at any stage.
	(c) 2 or – 1.6	3	C2 for one correct www or M2 for $5x - 1 = \pm 9$ or $5(5x + 8)(x - 2) = 0$ oe or M1 for $(5x - 1)^2 = 81$ soi or for $5x - 1 = 9$
2	<b>(a)</b> 43(.0)	2	<b>M1</b> for $\sin x = \frac{3.73}{5.47}$ (0.6819) oe
	<b>(b)</b> (±) 2.5(0)	4	M2 for $5.32^2 + 3.73^2 - 2 \times 5.32 \times 3.73 \times \cos 25$ or M1 for $\cos 25 = \frac{3.73^2 + 5.32^2 - x^2}{2 \times 3.73 \times 5.32}$ or for $5.32^2 + 3.73^2 + 2 \times 5.32 \times 3.73 \times \cos 25$ A1 for $6.246$ seen or $8.84$
	(c) (i) 245	1	
	(ii) 16.7	2	<b>B1</b> for tany = $\frac{30}{100}$ or $\frac{100}{30}$ (y = 73.3)
3	(a) (i) One line of symmetry	1	
	(ii) 10:1	3	<b>B1</b> for $\pi$ ( $r$ or $R$ ) <sup>2</sup> and a further <b>B1</b> for a valid attempt at an expression or equation involving $R$ and $r$



Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
GCE O LEVEL – October/November 20		4024	22

		_	
	(b) (i) Convincing explanation	2	<b>B1</b> for $AOB = 72$ soi or <b>B1</b> for $ACB = 108$ and conclusion involving 360
	( <b>ii)</b> 7(πr)	2	<b>M1</b> for $(5 \times) \frac{252}{360} \times 2\pi r$
4	(a) (i) (a) 20	1	
	<b>(b)</b> 25	2	M1 for figs $\frac{60 \times their12 - 540}{60 \times their12}$ oe
	(ii) 6.25	2	<b>B1</b> for ÷ by figs 16
	<b>(b) (i)</b> $63 \times 6 + 4x \le 500$ or $63 + x \le 100$ oe isw	1	
	(ii) 93	2	M1 for $63 \times 6 + 4x$ (<) 500 or better seen SC1 for answer 30.
	(c) (i) 435	1	
	(ii) 7.2(0)	2	<b>M1</b> for ÷ by figs 145
5	(a) $x = 5$ $y = 4$	2	<b>B1</b> for one correct www or <b>M1</b> for $\begin{pmatrix} 3x-11\\ x+y \end{pmatrix}$ soi
	<b>(b) (i) (a)</b> (a, c)	1	
	<b>(b)</b> (b, d)	1	
	(ii) $\begin{pmatrix} 1 & -3 \\ 3 & -2 \end{pmatrix}$	1	
	(iii) Reflection in x-axis	2	<b>B1</b> for Reflection only.
6	(a) $\begin{pmatrix} 6 \\ 2 \end{pmatrix}$	1	
	<b>(b)</b> $\frac{1}{3}$ oe isw	1	
	(c) $P = -3$ $Q = 21$	2	M1 for $7P + Q = 0$ or $9P + Q = -6$ or B1 for an equation with $m =$ their (b) or c = 7
	<b>(d) (i)</b> (18, -5)	1	
	(ii) (±) 13	1	
-			



Page 4	Mark Scheme: Teachers' version		Paper
	GCE O LEVEL – October/November 2011	4024	22

	(iii) (a) (12, 11)	2	<b>B1</b> for $(x =) 12$
	<b>(b)</b> $2\overrightarrow{AB}$	1	
7	(a) (i) 27.7	2	M1 for $\frac{1}{2} \times 8 \times 8 \times \sin(\text{their}60)$ oe
	(ii) Convincing explanation	1	
	(iii) 4.62	2	M1 for $\frac{AF}{\sin 30} = \frac{8}{\sin 120}$ oe such as
			$\frac{4}{AF} = \cos 30$
	<b>(b) (i)</b> 111	1ft	Accept 4 × their (a)(i) ft
	(ii) 60.3	3ft	M1 for $(VF^2 =) 8^2 - (\text{their } (\mathbf{a})(\mathbf{iii}))^2$ A1 for $(VF =) 6.53$ or ft soi
			SC1 for $\frac{1}{3}$ × their (a)(i) × their VF
	(c) (i) $2 \pm 0.01$	2	M1 for $\sqrt[3]{}$ of ratio of their volumes soi
	(ii) 8	1	
8	(a) (i) 1240	1	
	(ii) 11 correct plots (and smooth curve)	2	P1 for 7 correct plots (joined.)
	(iii) (4.6)	1ft	ft from their graph at $y = 42$
	<b>(b) (i)</b> 1100	1	
	(ii) Correct line, ruled	2	L1 for freehand line or line with intercept 25 or gradient 3.75
	(c) (4.8)	1ft	
	(d) (i) $6 \le \text{gradient} \le 7 (\$/\text{yr})$	2	M1 for correct tangent
	(ii) 3.75 (\$/yr)	1	
	(iii) (2)	1ft	
9	(a) Complete congruency case www	3	R1 for $A = B$ (= 90) S1 for $AP = BQ$ or $AB = BC$ stated
	<b>(b)</b> Convincing explanation www	2	C1 for stating $ABP = BCQ$
	(c) (i) Angle in a semicircle	1	
	(ii) B 2	1	

Page 5	Mark Scheme: Teachers' version		Paper
	GCE O LEVEL – October/November 2011	4024	22

	(iii)	(a) 6	1	
		<b>(b)</b> Convincing explanation www	1	
		(c) 12	1	
		<b>(d)</b> 45	2	<b>B1</b> for $\frac{1}{2} \times 6 \times$ their (c) or $\frac{1}{2} \times 6 \times 3$ seen
10	(a) (i)	3x seen	1	
	(ii)	7 - 2x oe seen	2	<b>M1</b> for $[28 - 2(x + \text{their} 3x)] \div 4$
	(b) (i)	$x^2 - 28x + 49 = 0$	2	AG so www M1 for $3x^2 = (7 - 2x)^2$
	(ii)	1.88 26.1	4	B3 One correct or both 1.875 and 26.12 seen or both 1.9 and 26.1 or better seen
				or <b>B1</b> for $p = 28$ and $r = 2$ and <b>B1</b> for $q = 588$ or $\sqrt{q} = 24.248$
				<b>B1</b> for $(x - 14)^{(2)}$ and <b>B1</b> for 147 or 12.12
	(iii)	1.88 with convincing reason (Accept the accuracy marked in (ii))	2	<b>B1</b> for 1.88 (or the accuracy marked in (ii))
	(iv)	10.6 or 10.5 cao	1	
11	(a) (i)	7 correct plots and smooth curve	3	P2 for 7 correct plots or P1 for 4 correct plots SC1 for ogive curve SC1 for all heights correct
	(ii)	(43)	1ft	ft's dependent on ogive curve
	(iii)	(18)	1ft	
	(iv)	(26)	1ft	

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	22

(b) (i) Completion of diagram	2	B1 for two correct probabilities
(ii) (a) $\frac{1}{11}$	1	
<b>(b)</b> $\frac{k10}{k11}$ isw	2	<b>B1</b> for two of the following products correct $\frac{8}{12} \times \frac{7}{11} + \frac{8}{12} \times \frac{4}{11} + \frac{4}{12} \times \frac{8}{11}$
(iii) $\frac{k}{55k}$ isw	1	