

**MARK SCHEME for the May/June 2012 question paper
for the guidance of teachers**

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2012	4024	22

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
soi	seen or implied

SECTION A

Qu	Answers	Mark	Part marks
1 (a)	pentagon	1	After 0 + 0, C1 for $x \dots 5$ oe and $x + y \dots 6$ oe with incorrect (in)equalities for "...".
(b)	$x \leq 5$ oe $x + y \leq 6$ oe	1 1	
(c)	line passing through (5, 0) and (8, 3)	1	
(d)	-1 cao	1	
2 (a)	$x = \frac{3}{5}$ oe	2	M1 for $14x + 2 - 4x - 8 (= 0)$ or better B1 for $p = -24$ and $r = 8$ (or 2×4) B1 for $q = 24^2 - 4 \times 4 \times (-133)$, or 2704 or $\sqrt{q} = 52$ Using factors B2 for $(2h - 7)(2h + 19) (= 0)$ or B1 for $(2h \dots 7)(2h \dots 19) (= 0)$ where ... are not both the correct signs
(b)	$y = \pm 9$	1	
(c) (i)	$h(h + 6) = 33.25$ Rearranging correctly to give $4h^2 + 24h - 133 = 0$	M1 A1	
(ii)	$h = 3.5$ oe and -9.5 oe	3	
(iii)	9.5 cm or <i>their</i> (positive h) + 6	1 ft	

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2012	4024	22

3	(a)	36 minutes cao	1	M1 for 85% = 4.42 oe
	(b)	5 km/h cao	1	
	(c)	\$5.2(0)	2	
	(d)	Horizontal line from (1800, 4) to (2000, 4)	1	
		Line from (2000, 4) to (2030, 2.5) or ft from (<i>their</i> 2000, 4) to ((<i>their</i> 2000) + 30, 2.5)	1 ft	
	(e)	20 30 or (<i>their</i> 2000) + 30	1 ft	
4	(a)	279° to 283°	1	M1 for correctly positioned <i>Y</i> with one correct construction arc, or with no construction arcs or M1 for <i>Y</i> above <i>WX</i> and two correct construction arcs
	(b)	<i>Y</i> correctly positioned with two correct construction arcs	2	
	(c)	<i>Z</i> on a bearing of 072° from <i>W</i> <i>Z</i> is due North of <i>X</i> 27 to 29 km	1 1 1	
5	(a) (i)	25, 9	1	M1 for 7.75 to 7.85 and 6.55 to 6.65 seen B1 for 22 seen or C1 for $\frac{38}{60}$ oe M1 for $3.5 \times 4 + 4.5 \times 15 + 5.5 \times 20 + 6.5 \times 13 + 7.5 \times 5 + 8.5 \times 3$ i.e. $14 + 67.5 + 110 + 84.5 + 37.5 + 25.5$ (= 339) M1 for $\div 60$ (or $4 + \dots$) B1 for 65%, or for 21 seen
	(ii)	7.15 to 7.25	1	
	(iii)	1.1 to 1.3	2	
	(iv)	$\frac{22}{60}$ oe, or 0.36 to 0.37, or 36 to 37%	2	
	(b) (i)	5.65 cm	3	
	(ii)	35%	2	
6	(a) (i)	4, 8, 10, 14	1	B1 for Venn Diagram and 17 in $(G \cup S)'$
	(ii)	1	1	
	(iii)	3 out of {2, 5, 7, 11, 13}	1	
	(b)	Correct shading	1	
	(c)	16	2	

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2012	4024	22

7	(a) (i)	b – a	1	
	(ii)	$\frac{1}{2}(\mathbf{b} + \mathbf{c})$	1	
	(iii)	$\frac{1}{4}\mathbf{b} + \frac{1}{2}\mathbf{c}$ or <i>their</i> (aii) $-\frac{1}{4}\mathbf{b}$	2 ft	B1 for one correct term or for $-\frac{1}{4}\mathbf{b} - \frac{1}{2}\mathbf{c}$
	(b) (i)	$\frac{2}{5}\mathbf{b} - \frac{2}{5}\mathbf{a}$	1	
	(ii)	2 : 3 oe	1	
	(iii)	$\frac{3}{5}\mathbf{a} - \frac{7}{20}\mathbf{b} - \mathbf{c}$	2	B1 for one correct term, or for $\mathbf{c} + \frac{7}{20}\mathbf{b} - \frac{3}{5}\mathbf{a}$

SECTION B

8	(a) (i)	128 to 128.4	3	M2 for $\cos B = \frac{20^2 + 2^2 - 21.3^2}{2 \times 20 \times 2}$ or M1 for $21.3^2 = 20^2 + 2^2 - 2 \times 20 \times 2 \times \cos B$
	(ii)	14.3 to 14.5	3	M2 for $\sin((\text{their}(ai) - 90) = \frac{x}{20}$ oe (12.4)
	(b) (i)	29°	1	
	(ii)	9.6 to 9.7	3	M2 for $CE = \frac{8.6 \times \sin 33}{\sin(\text{their}(bi))}$ or M1 for $\frac{CE}{\sin 33} = \frac{8.6}{\sin(\text{their}(bi))}$ oe
	(iii)	11.6 to 11.7	2	C1 for 78.3 to 78.4 or B1 for 11.6 to 11.7 or 78.3 to 78.4 seen in working

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2012	4024	22

9	(a) (i)	$\begin{pmatrix} -5 & 0 \\ 1 & 2 \end{pmatrix}$	1	
	(ii)	$\begin{pmatrix} 0 & -\frac{1}{3} \\ \frac{1}{2} & \frac{1}{6} \end{pmatrix}$ or $\frac{1}{6}\begin{pmatrix} 0 & -2 \\ 3 & 1 \end{pmatrix}$ seen	2	M1 for $\begin{pmatrix} 0 & -2 \\ 3 & 1 \end{pmatrix}$ seen, or for attempting to multiply $\frac{1}{6}$ by a 2×2 matrix
	(b) (i)	$\begin{pmatrix} 974 \\ 328 \end{pmatrix}$	2	B1 for one correct value, or for (974 328)
	(ii)	Mention of cost and (both carpet and underlay)	1	
	(c) (i)	<i>F</i> correctly positioned	2	M1 for 2 correct vertices plotted or C1 for correct reflection in $y = x$
	(ii)	<i>G</i> correctly positioned	2	M1 for 2 correct vertices plotted or for 3 correct coordinates calculated
	(iii) (a)	4; or -4	1	
	(iii) (b)	$m = 1, n = \text{their(c)(iii)(a)}$	1 ft strict	
10	(a) (i)	686 to 687 cm ²	4	M1 for using $\frac{300}{360}$ oe M1 for using $\pi \times 15^2$ M1 for $\frac{1}{2} \times 15^2 \times \sin 60$ oe (= 97.4278 ...)
	(ii)	93.5 to 93.6 cm	2	M1 for $\frac{300}{360} \times 2 \times \pi \times 15$ (= 78.5398...)
	(b)	12.4 cao	2	B1 for $\frac{1}{2}(15 + 25)h = 248$ oe
	(c) (i)	3	1	
	(ii)	37.36 to 37.4 cm ²	3	M1 for 248 + <i>their(a)(i)</i> M1 for division by 5 ² soi (indep)

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – May/June 2012	4024	22

11	(a) (i)	56°	1	B1 for $\hat{ACD} = 28^\circ$ seen B1 for seeing $\hat{DAC} = 42^\circ$; or $\hat{ABC} = 70^\circ$; or $\hat{ABO} = 8^\circ$ If $0 + 0$, then C1 for both 32° and 116°
	(ii)	34° or $90 - \text{their(a)(i)}$	1 ft	
	(iii)	62° or $(180 - \text{their(a)(i)})/2$	1 ft	
	(iv)	42°	2	
	(v)	110°	2	
	(b) (i) (a)	32° alternate (to $\hat{PQT}$)	1	
	(i) (b)	116° $\hat{SPQ}$ and $\hat{PQR}$ are allied, interior, adjacent	1	
	(ii)	Full line parallel to PS , 4 cm away Full arc, centre R , radius 5 cm	1 1	
	(iii)	Correct region shaded	1 ft	
12	(a)	Convincing reason. e.g. The height of the cuboid would then be -2 cm	1	 B2 for 6 or 7 correct (ft) plots or B1 for 4 or 5 correct (ft) plots B1 for 4.5 to 4.7 seen B1 for $(y=) 27x$ seen or implied M1 for attempt at drawing correct line
	(b)	$x^2(8-x)$ and $\frac{4}{3} \times 3 \times (\frac{x}{2})^3$ Correct expansion and simplification to $8x^2 - \frac{x^3}{2}$	M1 A1	
	(c) (i)	58.5	1	
	(ii)	7 correct plots and a smooth curve	3	
	(iii)	3.3 to 3.5	2	
	(d)	$4.7 \leq x < 5$ (dep on M1)	3	