CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2014 series

4024 MATHEMATICS (SYLLABUS D)

4024/22 Paper 2, maximum raw mark 100

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Question	Answers	Mark	Part marks
1 (a)	138 to 140	1	
(b)	*D* marked at intersection of correct arcs	2	**B1** for a correctly positioned *D* with one correct construction arc or no correct arcs Or, provided *D* to the west of *AB* **B1** for *D* on one correct arc or radii 5 cm and 6 cm reversed with arcs Or, provided *D* to the east of *AB* **B1** for *D* on intersection of two correct construction arcs
(c)	103°	1	Tolerance ± 2°
(d) (i)	*P* and *Q* marked at intersection of perpendicular bisector and circle	3	**B1** for perpendicular bisector of *AC* minimum 3 cm long **B1** for arcs radius 4.5 cm centre *B*, minimum 3 cm long cumulatively **B1** for *P* and *Q* at correct positions
(ii)	249°	1	Tolerance ± 2°
2 (a) (i)	97	1	
(ii)	$(c = \pm)\sqrt{\frac{4f + d}{6}}$	2	**M1** for $4f = 6c^2 - d$ or better
(b)	$x \geq 2$ cao	2	**B1** for final answer {+ or –} x * {+ or –} 2, where * can be wrong inequality or equals
(c)	$(3 + 5x)(3 - 5x)$ oe	1	Must be integers
(d)	$(8p - 3q)(x - 2y)$ oe seen isw	2	**M1** for $x(8p - 3q)$ oe or $-2y(8p - 3q)$ oe Or $8p(x - 2y)$ oe or $-3q(x - 2y)$ oe

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Question	Answers	Mark	Part marks
(e)	1.12 and –2.32 **final answer**	4	**B3** for one correct solution or x = 1.1 to 1.121 **and** -2.321 to -2.3 If in the form $\frac{p \pm (or + or-)\sqrt{q}}{r}$ **B1** for $p = -6$ and $r = 10$ And **B1** for $q = 296$ or $\sqrt{q} = 17.2...$
3 (a) (i)	533.9(0) to 534	2	**M1** for $32 \times 5.20 + 0.15 \times 2450$
(ii)	1760	3	**M1** for $409.6 - 28 \times 5.20$ [= 264] **M1** for '*their* 264' ÷ 0.15
(b) (i)	3.75	2	**SC1** for an answer of 28.75, 28.7, 28.8, 15, 3.7, 3.8 or 0.0375
(ii)	402.5[0] or 403 or 402	2	**M1** for $\frac{920}{(4+5+7)} \times 7$
4 (a) (i)	$\frac{1}{3}$	1	
(ii)	$\frac{2}{3}$	1	After 0+0 allow **B1** for 2/6 **and** 4/6 Or 0.33 **and** 0.66 or better
(b) (i)	25 numbers completed correctly	1	
(ii)	**(a)** $\frac{18}{30}$ oe isw	1	
	(b) $\frac{8}{30}$ oe isw	1	After 0+0+0 for **(b)**, If all 36 used **B1** for 18/36 **and** 10/36 If 35 used, **B1** for 18/35 **and** 9/35
5 (a)	78.1 to 78.13	2	**M1** for $\cos 35 = \frac{64}{AB}$ or better
(b)	127.9 to 128	3	**M1** for $64^2 + 80^2 + or - (2) \times 64 \times 80 \cos 125$ **M1** for $AD^2 = 64^2 + 80^2 - 2 \times 64 \times 80 \cos 125$
(c)	24.1 to 24.2°	3	**M1** for $\frac{\sin ADC}{64} = \frac{\sin 125}{their 128}$ oe **M1** for $\sin ADC = \frac{64 \times \sin 125}{their 128}$
(d)	2900	2	**M1** for $0.5 \times (80 + 65) \times 40$

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Question	Answers	Mark	Part marks
6 (a)	$23 - 6n$ cao	2	**B1** for $-6n$ soi
(b) (i)	4, 10, 18, 28	2	**B1** for 3 correct terms seen
(ii)	3 and 24	4	**M1** for $\frac{n^2+3n}{5n-12}=6$ or better **M1** for $n^2 - 27n + 72 = 0$ **B1** for either 3 or 24
7 (a) (i)	9600 cao	2	**M1** for $\frac{360}{60}\times 1600$ oe
(ii)	$\frac{11}{60}$ cao	1	
(iii)	1440 cao	2	**M1** for $\frac{(144-90)}{360}\times$ *their* 9600 oe
(b) (i)	40.1	3	**M1** for $12 \times 17.5 + 36 \times 25 + 45 \times 35 + 33 \times 50 + 24 \times 70$ **M1** for division by *their* $(12 + 36 + \ldots + 24)$
(ii)	Correct histogram	3	**B1** for 5 bars correct width and position **B1** for at least 3 correct heights $k \times$ (2.4, 3.6, 4.5, 1.65, 1.2) **B1** for 5 correct heights
(iii)	38 or 39 or 40 or 41	1	
8 (a) (i)	$\begin{pmatrix} 4 \\ -5 \end{pmatrix}$	1	
(ii)	6.4(0) to 6.41 or $\sqrt{41}$ cao	1	
(iii)	$y = -1.25x + 7$ oe	2	**B1** for gradient = –1.25 or y-intercept = +7 soi in a final equation
(iv)	(12, –8)	2	**B1** for one value correct
(b) (i)	**(a)** $\mathbf{b} - \mathbf{a}$	1	
	(b) $3\mathbf{a}$ cao	1	
	(c) $4(\mathbf{b} - \mathbf{a})$	2	**B1** for correct unsimplified $\overrightarrow{CD}$ or for $3(\mathbf{b} - \mathbf{a})$
(ii)	**(a)** 1 : 4	1	
	(b) 1 : 15	1	

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9 (a)	$\sqrt{15^2 + 6^2} = 16.15(5...)$	1	Must be shown to at least 2 d.p.
(b)	417 to 419	3	**M1** for $\pi \times 6 \times 16.2$ soi by 305.4 **M1** for $\pi \times 6^2$ soi by 113.1
(c)	565 to 566	2	**M1** for $\frac{1}{3} \times \pi \times 6^2 \times 15$ or better
(d)	316 to 317	2FT	FT *their* (c) × 0.56 evaluated **B1** for figs 316(…) or 317(…) or *their* (c) × figs 56 evaluated
(e) (i)	18.89 to 18.9	2	**M1** for $\sqrt[3]{2}$ or 1.25… seen oe
(ii)	662 to 665	2	**M1** for $\left(\sqrt[3]{2}\right)^2$ or 1.58… seen oe
10 (a)	$[L =] \quad 2(x + \frac{50}{x})$ or $2x + 2\frac{50}{x}$ or $x + x + \frac{50}{x} + \frac{50}{x}$	2	**B1** for $\frac{50}{x}$ seen
(b)	41.5 to 41.6, 45	2	**B1** for one correct
(c)	Correct smooth curve through the eight given points correctly plotted on correctly scaled axes	3	± half a small square **B2** for seven or eight of the given points correctly plotted on *their* axes or **B1** for six of the given points correctly plotted on *their* axes
(d)	2.8 to 3.2 < x < 16.8 to 17.2	B1 B1	**M1** for attempt to read off two x values at $y = 40$
(e) (i)	27.5 < answer < 28.5	1	
(ii)	7, 7 cao	1	
(f)	10, 10 cao	1	

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Question	Answers	Mark	Part marks
11 (a) (i)	$EC = BE$ or $AC = FE$ **and** $\angle AEC = \angle FBE$ or $\angle ECA = \angle BEF$	B1	
	Two correct reasons for their choices	B1	Statements and reasons: $EC = BE$; radii $AC = FE$; diameters $\angle AEC = \angle FBE$ [= 90°]; angle in semicircle $\angle ECA = \angle BEF$ [= 60°]; equilateral triangle
	Third statement, leading to correct congruence condition i.e. RHS, SAS, SSA	B1	
(ii)	BFD	1	
(iii)	$\angle EBF = \angle DFB = 90°$	1	Both 90° could be marked on diagram
	Cointerior/interior/supplementary/allied angles [sum to 180]	1dep	
	OR	OR	
	$\angle BEF = \angle EFD = 60°$	1	Both 60° could be marked on diagram
	Alternate angles [are equal]	1dep	
(iv)	120°	1	120° could be marked on diagram
(b) (i)	6.126 to 6.13	2	**M1** for $\frac{1}{2} \times 4 \times 4 \times \sin 130$ Or $\frac{1}{2}PQ \times$ perpendicular height (numerical)
(ii)	38.2 to 38.3	3	**M1** for $\frac{(360-130)}{360} \times \pi \times 4^2$ soi by 32.11 or $\frac{130}{360} \times \pi \times 4^2$ soi by 18.15 And **M1** for '*their* major sector area' + '*their* triangle area' Or for '*their* circle area' – '*their* minor sector area' + '*their* triangle area'

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