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

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 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

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 $0.5 \times (80 + 65) \times 40$

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	

Question	Answers	Mark	Part marks
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	

Question	Answers	Mark	Part marks
11 (a) (i)	$EC = BE$ or $AC = FE$ **and** $\angle AEC = \angle FBE$ or $\angle ECA = \angle BEF$ Two correct reasons for their choices	 B1 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)	$\angle EBF = \angle DFB = 90°$ Cointerior/interior/supplementary/allied angles [sum to 180] OR $\angle BEF = \angle EFD = 60°$ Alternate angles [are equal]	1 1dep OR 1 1dep	Both 90° could be marked on diagram Both 60° could be marked on diagram
(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'