CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2012 series

4024 MATHEMATICS (SYLLABUS D)

4024/21 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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Qu	Answers	Mark	Part Marks
1	**(a)** 4.28	**2**	**M1** for PQ = 4.5cos18 oe
	(b) **(i)** 36 (.0)	**2**	**M1** for $\sin A\hat{B}C = \frac{6}{10.2}$ oe
	(ii) 5.68 or 5.69	**4ft**	**M3** for $\sqrt{14.3^2 - (10.2^2 - 6^2)} - 6$ oe or **M2** for a complete method for CD or **M1** for $BC^2 = 10.2^2 - 6^2$ or $DC^2 = 14.3^2 -$ their BC^2 oe **SC1** for their CD – 6
2	**(a)** **(i)** $10p + 1$	**2**	**B1** for $5p - 1 + 5p + 2$
	(ii) $x < -1$	**2**	**B1** for $-2x$, $5 - 3$ oe correctly isolated.
	(b) **(i)** 3	**1**	**SC** 2 for $\frac{A}{y+2}$ or $\frac{A}{2-y}$
	(ii) $(x =) \frac{A}{y-2}$	**3**	**M2** for $\frac{A}{x} = y - 2$ or $yx - 2x = A$ or **M1** for $y = \frac{A}{x} + 2$ or $yx = A + 2x$.
	(c) **(i)** $y = 6x - 5$ correctly derived	**1**	
	(ii) $y = 2x + 19$ correctly derived	**1**	
	(iii) $x = 6$ $y = 31$ isw	**2**	**B1** for one correct or **M1** for eliminating one variable
3	**(a)** **(i)** 30	**1**	
	(ii) 29 (.0)	**3ft**	**SC** 2 for the answer 51.7 or 51.8 or For the answer 129 **M2** for Figs $\frac{(200 - \text{a(i)}) - 131.8}{131.8}$ or **M1** for 200 – **a(i)** or for Figs $\frac{200 - 131.8}{131.8}$
	(b) 950	**3**	**M2** for $x - \frac{15}{100} \times -647.5 = 160$ oe or **B1** for 807.50 soi and **B1** for division by 85.

4	**(a) (i)** 20°	**1**	
	(ii) 70°	**1**	
	(iii) Rectangle stated and justified	**3**	**B1** for Rectangle stated **B1**for establishing a right angle using 20° and 70° **B1** for 3 right angles stated.
	(b) (i) Similar triangles established	**2**	**B1** for $\frac{CO}{DO}=\frac{AO}{BO}$ oe or for $C\hat{O}A = D\hat{O}B$
	(ii) 1.8	**1**	
5	**(a)** 15.7	**1**	
	(b) 25.7	**1ft**	
	(c) (i) Correct 4 lines drawn	**1**	
	(ii) 4	**1**	
	(d) (i) 25	**1**	
	(ii) 14.3	**3ft**	**M2** for $\frac{1}{2}\pi r^2$ – (d)(i) or **M1** for area of a circle πr^2 soi
6	**(a)** 98.2	**3**	**B1** for $4 \times 70 + 10 \times 85 + 14 \times 92.5 + 20 \times 97.5 + 24 \times 105 + 8 \times 120$ and **B1** for division by 4+10+14+20+24+8
	(b) (i) $\frac{28}{80}$ oe	**1ft**	
	(ii) $\frac{992}{6320}$ oe	**2ft**	**B1** for $\frac{32}{80}\times\frac{31}{79}$ seen or $\frac{32\times31}{80\times80}=\frac{992}{6400}=0.155$
	(c) Correct histogram	**3**	**H2** for 3 correct additional columns **H1** for 1 correct additional column

7	**(a)** 130 g tin	**2**	**B1** for one correct rate such as 1.3 (g/cen)t or 0.769 (cent/g) seen.
	(b) **(i)** 423 to 424	**2**	**M1** for $\pi \times r^2 \times 11$.
	(ii) 319	**3**	**M2** for $2\pi r^2 + 2\pi r 11$ or **M1** for either of these
	(iii) 1050	**2ft**	**M1** for Figs (their 319 + 30)×3 **B1** for $\div 10^4$
	(c) 7.2	**3**	**M2** for $\frac{x}{9} = \sqrt[3]{\frac{512}{1000}}$ oe or **B1** for $\sqrt[3]{512} : \sqrt[3]{1000}$ soi
8	**(a)** 4.1	**1**	
	(b) Correct plots and curve.	**3**	**P2** for 7 or 8 correct plots ft or **P1** for at least 4 correct plots ft and (dep) **C1** for a smooth curve through all plotted points
	(c) *a* ft 1 cao *b* ft	**2ft**	**B1** for at least one solution
	(d) 1 to 2	**2**	**B1** for the correct tangent drawn
	(e) **(i)** –1	**1**	
	(ii) –1 1 2	**3ft**	**B2** for at least one ft and line drawn or **M1** for their $y = x + a$ drawn. **SC1** for all three found by solving the equation

9	**(a)** 59.2	**3**	**M2** for $(AB =) \dfrac{65\sin 60}{\sin(180-(60+48))}$ or **M1** for $\dfrac{AB}{\sin 60} = \dfrac{65}{\sin(180-(60+48))}$ oe
	(b) 2360	**2**	**M1** for $\dfrac{1}{2} \times 84 \times 65\sin((180 -) 60)$
	(c) 129	**4**	**M3** for $\sqrt{84^2 + 65^2 - 2 \times 84 \times 65 cos(180 - 60)}$ or **M2** for $84^2 + 65^2 - 2 \times 84 \times 65\cos(180–60)$ or **M1** for $84^2 + 65^2 + 2 \times 84 \times 65\cos(180–60)$ and a dep **A1** for 76.3
	(d) 31.9°	**3**	**M2** for $\tan^{-1} \dfrac{35}{65\sin 60}$ oe or **M1** for $\tan^{-1} \dfrac{35}{d}$ or $\dfrac{d}{35}$ and **B1** for for 65sin60 (= 56.3)

10	**(a)** $\frac{320}{x}$ oe isw	**1**	
	(b) $\frac{320}{x-80}$ isw	**2**	**B1** for $x - 80$ seen
	(c) $x^2 - 80x - 10240 = 0$ correctly obtained	**3**	**M2** for $\frac{320}{x-80} - \frac{320}{x} = \frac{5}{2}$ oe **M1** for (a) – (b) = ± their2½
	(d) 148.8 – 68.8	**4**	**B1** for $\sqrt{(-80)^2 - 4 \times 1 \times (-10240)}$ soi and **B1** for $\frac{-(-80) \pm \sqrt{\text{their}47360}}{2 \times 1}$ soi and After **B0B1**, allow **SC1** for a correct ft. or **B2** for 148.8 and – 68.8 Final answer or **B1** for one correct solution seen or 148.81. and – 68.81 or 149 and – 69.
	(e) 2 h 9 mins	**2ft**	**B1** for 2.15
11	**(a) (i) (a)** $\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{r}$	**1**	
	(b) $\mathbf{r} + \mathbf{p} - \mathbf{q}$	**1**	
	(c) $\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{r}$	**2ft**	**B1** for unsimplified
	(ii) Equal and Parallel	**1**	
	(b) (i) Correct triangle	**2**	**B1** for two correct vertices or triangle correct size and orientation
	(ii) Correct triangle	**2**	**B1** for two correct vertices or triangle correct size and orientation
	(iii) Complete description www	**3**	**B1** for Rotation **B1** for either 90 anticlockwise or centre (0,3)