CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2012 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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Qu	Answers	Mark	Part Marks
1	**(a)** $57(.0°)$	2	**M1** for $\tan A\hat{C}B = \dfrac{10}{6.5}$ oe
	(b) (i) 5 m 6 cm cao	3	**B2** for $(BD =)$ 15.1 or better or **M1** for $BD^2 = 16.4^2 - 6.5^2$ and/or **SC1** for their $BD - 10$
	(ii) 66.6 or 66.7 (°)	2ft	e.g. accept $\tan^{-1}\dfrac{their\ DB}{6.5}$ **M1** for $\cos D\hat{C}B = \dfrac{6.5}{16.4}$ oe
2	**(a)** $(2x - 1)(2x + 1)$	1	
	(b) (i) 3	1	
	(ii) $(R =)\ \dfrac{2Q}{P-1}$ asc	3	**SC2** for $\dfrac{2Q}{P+1}$ or $-\dfrac{2Q}{P+1}$ **M2** for $\dfrac{2Q}{R} = P - 1$ or $PR - R = 2Q$ or **M1** for $P = \dfrac{2Q}{R} + 1$ or $PR = 2Q + R$ soi
	(c) $x = 7\quad y = -1$	3	**B2** for one correct **M1** for eliminating one variable
	(d) (i) $3.2x + 16$	2	**B1** for $(x + 20) \times 0.8$ oe seen
	(ii) $x > 73.125$ isw	2	**B1** for their answer to **(i)** > 250
	(iii) 74	1ft	
3	**(a) (i)** 43.2 (0) seen isw	1	
	(ii) 25 isw	2	**SC1** for answer 125 % **M1** for Figs $\dfrac{45-36}{36}$
	(iii) 3.5	2	**M1** for Figs $\dfrac{3000\times0.45-1302.75}{3000\times0.45}$

	(b)	0.6 (0)		3	**M2** for $5.40 - \dfrac{5.40 \times 100}{112.5}$ oe or **M1** for $x + \dfrac{12.5}{100}\ x = 5.40$ oe and **A1** for 5.40 – their x ft or **B1** for division by 112.5 seen and **dependent** **B1** for multiplication by 12.5 seen.
4	**(a)**	**(i)** 102		1	
		(ii) **(i)** ft (102)		1ft	
		(iii) 180 – **(ii)** ft (78)		1ft	
	(b)	**(i)** Similar triangles established www		2	**B1** for a correct pair of equal angles
		(ii) 7.2		2	**B1** for corresponding sides in the ratio 5 : 2 soi
5	**(a)**	220		3	**M1** for $\dfrac{150}{360} \times 2\ \pi r$ and **B1** for their arc AD + their arc BC + 50
	(b)	2130		3	**M2** for $\dfrac{150}{360}\ \pi\ (45^2 - 20^2)$ or **M1** for $\dfrac{150}{360}\ \pi r^2$
	(c)	8.33		2	**M1** for $2\pi r = $ *their* arc AD from **(a)** soi
6	**(a)**	158 www		3	**B1** for $10 \times 135 + 30 \times 145 + 20 \times 152.5 + 30 \times 157.5 + 35 \times 165 + 25 \times 180$ and **B1** for division by $10 + 30 + 20 + 30 + 35 + 25$
	(b)	**(i)** $\dfrac{60}{150}$ oe isw		1	
		(ii) $\dfrac{4800}{22350}$ oe isw		2	**B1** for $\dfrac{60}{150} \times \dfrac{40}{149}$ seen or $2 \times \dfrac{60}{150} \times \dfrac{40}{150}\ (= \dfrac{4800}{22500} = 0.213\ )$

	(c)	Correct Histogram		3	**H2** for 3 correct additional columns **H1** for 1 correct additional column After 0 **SC2** for all additional heights correct **SC1** for 3 additional heights correct
7	**(a)**	**(i)**	874	3	**M2** for (2) $\pi r^2 + 2\pi r \times 8$ or **M1** for either (2) πr^2 or $2\pi rh$
		(ii)	3070	2ft	**M1** for Figs [(*their* 874 + 150) × 3] or **B1** for ÷ 10^4
	(b)	**(i)**	77 (.0)	1	
		(ii)	500	3ft	**M2** for $\pi R^2 - 4\pi r^2 + $ **4(b)(i)** or **M1** for $\pi R^2 - 4\pi r^2$ or **4(b)(i)**
		(iii)	2410	3	**M2** for $\pi R^2 \times 8 - 4 \times \frac{2}{3} \times \pi \times r^3$ or **M1** for $\pi R^2 \times 8$ or $4 \times \frac{2}{3} \times \pi \times r^3$
8	**(a)**		– 2.1	1	
	(b)		Correct plots and curve	3	**P2** for 7 or 8 correct plots ft or **P1** for at least 4 correct plots and dependent **C1** for a smooth curve through all plotted points
	(c)		– *a* ft 1 cao *b* ft	2	**B1** for at least one solution ft
	(d)		–3.5 to – 2	2	**M1** for the correct tangent drawn
	(e)		(1.7) ft	2ft	**M1** for $y = x$ drawn.
	(f)		1 < k < 2. ft	2ft	**B1** for one correct end point ft or clearly using TP's.

9	(a)	42.3	3	**M2** for $\dfrac{30\sin 58}{\sin 37}$ or **M1** for $\dfrac{AB}{\sin 58}=\dfrac{30}{\sin 37}$ oe
	(b)	83.9	4	**M3** for $\sqrt{30^2+64^2-2\times 30\times 64\cos\left(180-58\right)}$ **M2** for $30^2+64^2-2\times 30\times 64\cos(180-58)$ or **M1** for $30^2+64^2+2\times 30\times 64\cos(180-58)$ and **A1** for 54.4
	(c)	814	2	**M1** for $\dfrac{1}{2}\times 30\times 64\sin((180-\ )58)$ oe
	(d)	17.2	3	**M2** for $30\sin 58\tan 34$ or **M1** for $\dfrac{H}{their\ AP}=\tan 34$ or $\tan 56$ or **B1** for $AP=30\sin 58\ (=25.4)$ oe soi
10	**(a)**	Congruency established	3	**B2** for $S\hat{A}P = P\hat{B}Q$ and AP = BQ or AS = PB or **B1** for the equal angle or either pair of sides
	(b) (i)	$40-x$	1	
	(ii)	($y=$) $2x^2-80x+1600$ correctly obtained	2	**M1** for $\frac{1}{2}\times x\times$ **(b)(i)** or $\sqrt{\left(40-x\right)^2}+x^2$ seen
	(c) (i)	$x^2-40x+250=0$	1	
	(ii)	7.8 32.2	3	**B2** for 7.8 and 32.2 or better or **B1** for $\sqrt{\left(-40\right)^2-4\times 1\times 250}$ soi and **B1** for $\dfrac{-\left(-40\right)\pm\sqrt{their\ 600}}{2\times 1}$ soi and After **B0 B1**, allow **SC1** for a correct ft for both roots or **B1** for one correct solution or both 8 and 32.
	(d)	Accurately drawn quadrilaterals	2ft	**B1** for one correct ft or both mirror images

11	(a)	(i)	(a)	$-\mathbf{p}+\mathbf{q}$	1	
			(b)	$\frac{1}{3}(4\mathbf{q}-\mathbf{p})$ oe isw	1ft	
			(c)	$2\mathbf{q}-\frac{1}{2}\mathbf{p}$ oe isw	1	
		(ii)		E, C and D lie on a straight line CD is $\frac{2}{3}$ of ED oe	2	**B1** for either
	(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)		Rotation clockwise 90 centre (0,3)	3	**B1** for rotation soi and **B1** for clockwise 90 or centre (0,3)