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

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Qu	Answers	Mark	Part Marks
1	**(a)** 57(.0 °)	2	**M1** for $\tan A\hat{C}B = \frac{10}{6.5}$ 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 $\tan^{-1}\frac{their\ DB}{6.5}$ **M1** for $\cos D\hat{C}B = \frac{6.5}{16.4}$ oe
2	**(a)** $(2x - 1)(2x + 1)$	1	
	(b) **(i)** 3	1	
	(ii) (R =) $\frac{2Q}{P-1}$ asc	3	**SC2** for $\frac{2Q}{P+1}$ or $-\frac{2Q}{P+1}$ **M2** for $\frac{2Q}{R} = P - 1$ or $PR - R = 2Q$ or **M1** for $P = \frac{2Q}{R} + 1$ or $PR = 2Q + R$ soi
	(c) $x = 7$ $y = -1$	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 $\frac{45-36}{36}$
	(iii) 3.5	2	**M1** for Figs $\frac{3000\times0.45-1302.75}{3000\times0.45}$

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	(b) 0.6 (0)	**3**	**M2** for $5.40 - \frac{5.40\times100}{112.5}$ oe or **M1** for $x + \frac{12.5}{100}\ x = 5.40$ 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 $\frac{150}{360} \times 2\ \pi r$ and **B1** for their arc AD + their arc BC + 50
	(b) 2130	**3**	**M2** for $\frac{150}{360}\ \pi\ (45^2 - 20^2)$ or **M1** for $\frac{150}{360}\ \pi r^2$
	(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)** $\frac{60}{150}$ oe isw	**1**	
	(ii) $\frac{4800}{22350}$ oe isw	**2**	**B1** for $\frac{60}{150}\times\frac{40}{149}$ seen or $2 \times \frac{60}{150}\times\frac{40}{150}\ \left(=\frac{4800}{22500} = 0.213\right)$

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	(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 $\div 10^4$
	(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.

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9	**(a)** 42.3	**3**	**M2** for $\frac{30\sin 58}{\sin 37}$ or **M1** for $\frac{AB}{\sin 58}=\frac{30}{\sin 37}$ oe
	(b) 83.9	**4**	**M3** for $\sqrt{30^2+64^2-2\times30\times64\cos(180-58)}$ **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 $\frac{1}{2} \times 30 \times 64\sin((180 –)58)$ oe
	(d) 17.2	**3**	**M2** for 30sin58tan34 or **M1** for $\frac{H}{their\ AP}$ = tan34 or tan56 or **B1** for AP = 30sin58 (= 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 ½ × x × **(b)(i)** or $\sqrt{(40-x)^2+x^2}$ 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 $\sqrt{(-40)^2-4\times1\times250}$ soi and **B1** for $\frac{-(-40)\pm\sqrt{their\ 600}}{2\times1}$ 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

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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)

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