UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

4024 MATHEMATICS (SYLLABUS D)

4024/22 Paper 2, maximum raw mark 100

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Abbreviations

cao correct answer only
cso correct solution only
dep dependent
ft follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
www without wrong working
soi seen or implied

Qu	Answers	Mark	Part Marks
1	**(a)** $(m =)\dfrac{A-h^2}{4h}$ final ans	3	**M1** for $A = 4hm + h^2$ or $\dfrac{A}{h} = 4m + h$ and (indep.) **M1** for $4hm = A - h^2$ or $4m = \dfrac{A}{h} - h$ or for isolating the term in m after the first **M0**.
	(b) $(x - 2y)(3a + 5b)$	2	**M1** for $x(3a + 5b) - 2y(3a + 5b)$ or $3a(x - 2y) + 5b(x - 2y)$ or for correct extraction of one common factor at any stage.
	(c) 2 or – 1.6	3	**C2** for one correct www or **M2** for $5x - 1 = \pm 9$ or $5(5x + 8)(x - 2) = 0$ oe or **M1** for $(5x - 1)^2 = 81$ soi or for $5x - 1 = 9$
2	**(a)** 43(.0)	2	**M1** for $\sin x = \dfrac{3.73}{5.47}$ (0.6819) oe
	(b) (±) 2.5(0)	4	**M2** for $5.32^2 + 3.73^2 - 2 \times 5.32 \times 3.73 \times \cos 25$ or **M1** for $\cos 25 = \dfrac{3.73^2 + 5.32^2 - x^2}{2 \times 3.73 \times 5.32}$ or for $5.32^2 + 3.73^2 + 2 \times 5.32 \times 3.73 \times \cos 25$ **A1** for 6.246 seen or 8.84
	(c) (i) 245	1	
	(ii) 16.7	2	**B1** for $\tan y = \dfrac{30}{100}$ or $\dfrac{100}{30}$ ($y = 73.3$)
3	**(a) (i)** One line of symmetry	1	
	(ii) 10 : 1	3	**B1** for π (r or R)^2 and a further **B1** for a valid attempt at an expression or equation involving R and r

	(b) (i) Convincing explanation	**2**	**B1** for $AOB = 72$ soi or **B1** for $ACB = 108$ and conclusion involving 360
	(ii) $7(\pi r)$	**2**	**M1** for $(5\times)\ \frac{252}{360}\times 2\pi r$
4	**(a) (i) (a)** 20	**1**	
	(b) 25	**2**	**M1** for figs $\frac{60\times their12 - 540}{60\times their12}$ oe
	(ii) 6.25	**2**	**B1** for ÷ by figs 16
	(b) (i) $63\times 6 + 4x \le 500$ or $63 + x \le 100$ oe isw	**1**	
	(ii) 93	**2**	**M1** for $63\times 6 + 4x$ (<) 500 or better seen **SC1** for answer 30.
	(c) (i) 435	**1**	
	(ii) 7.2(0)	**2**	**M1** for ÷ by figs 145
5	**(a)** $x = 5$ $y = 4$	**2**	**B1** for one correct www or **M1** for $\begin{pmatrix} 3x-11 \\ x+y \end{pmatrix}$ soi
	(b) (i) (a) (a, c)	**1**	
	(b) (b, d)	**1**	
	(ii) $\begin{pmatrix} 1 & -3 \\ 3 & -2 \end{pmatrix}$	**1**	
	(iii) Reflection in x-axis	**2**	**B1** for Reflection only.
6	**(a)** $\begin{pmatrix} 6 \\ 2 \end{pmatrix}$	**1**	
	(b) $\frac{1}{3}$ oe isw	**1**	
	(c) $P = -3$ $Q = 21$	**2**	**M1** for $7P + Q = 0$ or $9P + Q = -6$ or **B1** for an equation with m = their **(b)** or $c = 7$
	(d) (i) (18, –5)	**1**	
	(ii) (±) 13	**1**	

	(iii) **(a)** (12, 11)	**2**	**B1** for (x =) 12
	(b) $2\overrightarrow{AB}$	**1**	
7	**(a)** **(i)** 27.7	**2**	**M1** for ½ × 8 × 8 × sin(their60) oe
	(ii) Convincing explanation	**1**	
	(iii) 4.62	**2**	**M1** for $\frac{AF}{\sin 30} = \frac{8}{\sin 120}$ oe such as $\frac{4}{AF} = \cos 30$
	(b) **(i)** 111	**1ft**	Accept 4 × their **(a)(i)** ft
	(ii) 60.3	**3ft**	**M1** for (VF^2 =) 8^2 – (their **(a)(iii)**)^2 **A1** for (VF =) 6.53 or ft soi **SC1** for $\frac{1}{3}$ × their **(a)(i)** × their VF
	(c) **(i)** 2 ± 0.01	**2**	**M1** for $\sqrt[3]{}$ of ratio of their volumes soi
	(ii) 8	**1**	
8	**(a)** **(i)** 1240	**1**	
	(ii) 11 correct plots (and smooth curve)	**2**	**P1** for 7 correct plots (joined.)
	(iii) (4.6)	**1ft**	ft from their graph at y = 42
	(b) **(i)** 1100	**1**	
	(ii) Correct line, ruled	**2**	**L1** for freehand line or line with intercept 25 or gradient 3.75
	(c) (4.8)	**1ft**	
	(d) **(i)** 6 ≤ gradient ≤ 7 ($/yr)	**2**	**M1** for correct tangent
	(ii) 3.75 ($/yr)	**1**	
	(iii) (2)	**1ft**	
9	**(a)** Complete congruency case www	**3**	**R1** for $A = B$ (= 90) **S1** for $AP = BQ$ or $AB = BC$ stated
	(b) Convincing explanation www	**2**	**C1** for stating $ABP = BCQ$
	(c) **(i)** Angle in a semicircle	**1**	
	(ii) B 2	**1**	

	(iii) **(a)** 6	1	
	(b) Convincing explanation www	1	
	(c) 12	1	
	(d) 45	2	**B1** for ½ × 6 × their **(c)** or ½ × 6 × 3 seen
10	**(a)** **(i)** $3x$ seen	1	
	(ii) $7 - 2x$ oe seen	2	**M1** for $[28 - 2(x + \text{their}3x)] \div 4$
	(b) **(i)** $x^2 - 28x + 49 = 0$	2	AG so www **M1** for $3x^2 = (7 - 2x)^2$
	(ii) 1.88 26.1	4	**B3** One correct or both 1.875 and 26.12 seen or both 1.9 and 26.1 or better seen or **B1** for $p = 28$ and $r = 2$ and **B1** for $q = 588$ or $\sqrt{q} = 24.248$ **B1** for $(x - 14)^{(2)}$ and **B1** for 147 or 12.12
	(iii) 1.88 with convincing reason (Accept the accuracy marked in **(ii)**)	2	**B1** for 1.88 (or the accuracy marked in **(ii)**)
	(iv) 10.6 or 10.5 cao	1	
11	**(a)** **(i)** 7 correct plots and smooth curve	3	**P2** for 7 correct plots or **P1** for 4 correct plots **SC1** for ogive curve **SC1** for all heights correct
	(ii) (43)	1ft	ft's dependent on ogive curve
	(iii) (18)	1ft	
	(iv) (26)	1ft	

	(b) (i) Completion of diagram	2	**B1** for two correct probabilities
	(ii) (a) $\frac{1}{11}$	1	
	(b) $\frac{k10}{k11}$ isw	2	**B1** for two of the following products correct $\frac{8}{12}\times\frac{7}{11}+\frac{8}{12}\times\frac{4}{11}+\frac{4}{12}\times\frac{8}{11}$
	(iii) $\frac{k}{55k}$ isw	1	