UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2010 question paper

for the guidance of teachers

4024 MATHEMATICS (SYLLABUS D)

4024/21 Paper 2, maximum raw mark 100

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UNIVERSITY of CAMBRIDGE
International Examinations

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
art anything rounding to
soi seen or implied

1	**(a)**	**(i)** –55	1	
		(ii) (Q =) $\frac{4}{7}$ $(P-15)$ oe	2	**M1** for $\frac{7}{4}$ Q = P – 15, or $4P = 7Q + 4 \times 15$ or better **SC1** for $\frac{4P-15}{7}$, $\frac{4(P+15)}{7}$ or $4(\frac{P}{7}-15)$ oe
	(b)	**(i)** $7(c-2d)(c+2d)$	2	**B1** for $7(c^2-4d^2)$ or $(7c+14d)(c-2d)$ or $(7c-14d)(c+2d)$ or $(c-2d)(c+2d)$ seen
		(ii) $(3x+2)(x-3)$	2	**B1** for one correct factor seen or signs reversed
	(c)	6.2 oe	2	**M1** for $4 = 5(7-y)$ soi
2	**(a)**	**(i)** 74.8 or 74.7	2	Here and elsewhere accept answers rounding to the given 3 significant figure answers. No obvious wrong working seen. **M1** for $\tan BAC = \frac{180}{49}$ oe soi
		(ii) 15.2 or 90 – their **(a)(i)**	1ft	
	(b)	**(i)** 500	2	**M1** for $(LP^2 =)\ 1300^2 - 1200^2$ soi
		(ii) 293 cao	3	**M1** for $\sin LPS = \frac{1200}{1300}$ or $\cos LSP = \frac{1200}{1300}$ or for correct use of their **(b)(i)** **A1** for LPS = 67.4 cao or LSP = 22.6 cao **B1** for 360 – their LPS or 270 + their LSP
		(iii) 9.75	2	**M1** for figs $\frac{13}{1604-1556}$
3	**(a)**	**(i)** 38	1	
		(ii) 38	1ft	Their **(i)** (must be < 90º)
		(iii) 74	1	
		(iv) 68	1ft	180 – (their **(iii)** + their **(i)** or **(ii)**) or 106 – their **(i)** dep on positive ans.
	(b)	$(y =)$ ½$(90 - x)$ oe	3	**B2** for $y + y + 90 + x = 180$ or better **B1** for ABO = y or (OAC =) 90

4	**(a)**	**(i)** *P* correct **(ii)** All 10 elements correctly placed	1 3	In **(a)** ignore numbers outside the given range **B1** for 21 correct **B1** for at least two non-empty subsets correct (ignoring the position of 21) If 0 scored then allow **SC2** if all the elements other than 21 are correctly placed.
	(b)	**(i)** 10 **(ii)** {b, c, d, f, g} **(iii)** 2 **(iv)** $\frac{3}{5}$ oe	1 1 1 1	
	(c)	**(i)** 3 **(ii)** 51	1 1	
5	**(a)**	25	1	
	(b)	**(i)** 2376.12	2	**B1** for 212.67 × 36 (= 7656.12)
		(ii) 15	3ft	**B1** for $5280 \times \frac{x}{100}$ soi or their **(b)(i)**/5280 soi **M1** for $5280 \times \frac{x}{100} \times 3$ = their 2376.12 oe
	(c)	1625 cao	3	**M2** for $\frac{30}{130} \times 7040$ oe **M1** for 130% = 7040 soi
6	**(a)**	**(i)** 2.25 isw **(ii)** 2 www	2 1ft	**M1** for $(1 \times 8 + 2 \times 17 + 3 \times 12 + 4 \times 3) \div 40$
	(b)	**(i)** Correct pie chart	3	**B2** for 2 angles correct or 1 angle correct with all "correct" labels **B1** for 1 angle correct with wrong or no labels or **B1** for at least 2 angles calculated
		(ii) 6	1	
7	**(a)**	**(i)** 9.6 **(ii)** 16 cm	1 2	**M1** for $\frac{9600}{20 \times 30}$
		(iii) 2 200 cm^2	2ft	**B1** for areas 20 × 30, their 16 × 20 and their 16 × 30 ft for 600 + 100 × their **(a)(ii)**
		(iv) 191	3	**B1** for $\pi \times 0.8^2 \times 25$ soi **M1** for their$(\pi \times 0.8^2 \times 25) \times t = 9600$
	(b)	**(i)** 11 or 10.8(3…)	2	**B1** for figs $\frac{25 \times 26}{2 \times 3}$ soi
		(ii) 0.853 cm	2	**M1** for $\frac{3 \times 2.6}{4\pi}$

8	**(a)**	15, 8, 3, 0, -1, 0, 3, 8, 15	2	**B1** for at least 7 correct
	(b)	All points plotted ft and curve drawn	3ft	**P2** for 9 correct plots ft **P1** for at least 5 correct ft and **C1** for a smooth curve dependent on at least **P1**
	(c)	**(i)** Correct straight line	2	**L1** for a correct but short line or with a correct section at least 6cm long but deviates elsewhere.
		(ii) –1	2ft	**M1** for $x = \frac{y+7}{2}$ soi or $3 = \frac{x+7}{2}$ ft from their line
		(iii) **(a)** –1.9 2.4	1ft	ft from their graphs
		(b) $2x^2 - x - 9$ (= 0)	2	**M1** for $\frac{y+7}{2} = x^2 - 1$ **SC1** for $x^2 - 0.5x - 4.56$
9	**(a)**	**(i)** 26	1	
		(ii) 11.8	2	**M1** for $\frac{BC}{\sin \text{their } 26} = \frac{15}{\sin 34}$
	(b)	**(i)** 104	4	**M1** for $55^2 + 70^2 \pm 2 \times 55 \times 70\cos 112$ **M1** for $\sqrt{55^2 + 70^2 - 2 \times 55 \times 70 \cos 112}$ **A1** for 10809(.4). or 71.0 **SC2** for 104 anw
		(ii) **(a)** 11 14	1	
		(b) 71.4	2ft	**M1** for ½ × 11 × 14sin112 ft from their 11 and 14
		(c) 810	2	**B1** for use of the factor with figs 25
10	**(a)**	**(i)** $\begin{pmatrix} 14 \\ -4 \end{pmatrix}$	1	
		(ii) 14.6	2	**M1** for $\sqrt{\text{their } 14^2 + \text{their } (-4)^2}$
		(iii) Convincing demonstration	2	**B1** for $\overrightarrow{EF} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ or $\overrightarrow{HG} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$
	(b)	Full description	3	**B1** for enlargement **B1** for centre (–2, 4) **B1** for scale factor 2
	(c)	**(i)** (5, 0) (7,3) (2,3)	2	**B1** for two correct or **M1** for $\begin{pmatrix} 5 & 2 \\ 0 & 3 \end{pmatrix}\begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$ seen
		(ii) $\frac{1}{15}\begin{pmatrix} 3 & -2 \\ 0 & 5 \end{pmatrix}$	2	**B1** for determinant 15 or $\frac{1}{15}$ seen or $\begin{pmatrix} 3 & -2 \\ 0 & 5 \end{pmatrix}$ seen Or **M1** for $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} 5 & 7 & 2 \\ 0 & 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$

11	**(a)**	3 : 1000	1	
	(b)	**(i)** **(a)** 3 www	3	**M1** for $27 \times 25 \times \frac{15}{10}$ **A1** for 1012.5 **SC1** for answer 3 anw
		(b) 487.5	1ft	ft their **(a)** × 500 – their 1012.5
		(ii) **(a)** $x^2 + 34x - 225 = 0$	2	**M1** for $(27 + 3x)(25 + x) = 2 \times 27 \times 25$ oe
		(b) 5.67 –39.67	4	**B1** for $p = -34$ and $r = 2$ **B1** for $q = 2056$ or $\sqrt{q} = 45.3(4...)$ or **B1** for $(x + 17)^{(2)}$ **B1** for 22.67 or 514 **B1** for one correct final answer or both 5.671... and –39.671....seen (possibly with no working) or both 5.7 and –39.7 **SC1** + 1 for 5.67 and –39.67 anw
		(c) 44.0 cao	1ft	ft 27 + 3 × their +ive x but lost if negative value given as well