CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2013 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.

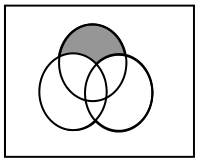
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Qu	Answers	Mark	Part Marks
1	**(a)** 3760	3	**B1** for a correct Δ such as $\frac{1}{2} \times 34 \times 40$ **B1** for $\frac{1}{2}(40 + 58) \times 38$ oe soi
	(b) 42(.0)	2	**M1** for $(BC^2 =)\ 38^2 + (58 - 40)^2$
	(c) 54.1	2	**M1** for $\tan CDE = \frac{58}{42}$ oe
2	**(a)** **(i)** 1.24 isw	2	**M1** for $(0 \times 4) + 35 \times 1 + 2 \times 6 + 3 \times 5$
	(ii) $x = 3$ $y = 5$	2	**B1** for either $x = 3$ or $y = 5$ or **M1** for $37 \times 1 + 2y + 3 \times 5 = 62$ oe soi or for $x + 37 + y + 5 = 50$ soi
	(b) **(i)** $\frac{1}{12}$	1	
	(ii) Correct pie chart labelled.	3	**B2** if no or incorrect labels or One correct angle with an additional label. **B1** for one angle in tolerance or Two angles calculated.
3	**(a)** $-\frac{1}{8}$	2	**B1** for 1 or – 8 or **M1** for $\frac{-4 + \sqrt{(-4)^2 + (-3)^2}}{(-4)^2 - 2(-4)(-3)}$
	(b) $6x^3 - 3$ or $3(2x^3 - 1)$	2	**M1** for $6x^3 - 2x + 9x^2 - 3 - 9x^2 + 2x$
	(c) **(i)** $(9x - 4)(x + 1)$	1	
	(ii) $\frac{4}{9} - 1$	1	
	(d) 27, 28, 29	2	**B1** for such as n, $n + 1$, $n + 2$ seen
4	**(a)** 72 justified	2	**B1** for 72 or either D or $E = 90$
	(b) **(i)** Congruency established	3	**B1** + **B1** for two pairs of equal sides **SC1** After 0, accept all sides the same oe.
	(ii) **(a)** Kite	1	
	(b) 90	1	

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5	**(a)** **(i)** 3	**1**	
	(ii) {4, 8, 10}	**1**	
	(b) 66	**2**	**M1** for $y + 13 + 11 = 90$ oe or **B1** for 52 soi
	(c) **(i)** 	**1**	
	(ii) $C' \cap (A \cup B)$ oe	**1**	
6	**(a)** **(i)** 899	**1**	
	(ii) 33.5	**2**	**B1** for figs $\frac{2400-1596}{2400}$ oe
	(iii) 900	**2**	**M1** for $x + \frac{20}{100}x = 1080$ or **B1** for 120 seen
	(b) 4.5	**3**	**M2** for $600 + \frac{3R}{100} \times 600 = 681$ or **M1** for $600 \times \frac{R}{100} = (681 - 600)$ and **A1** for 13.5 or **B1** for $\frac{600 \times (3)R}{100}$ soi
7	**(a)** $\begin{pmatrix} 6 \\ 7 \\ 15 \end{pmatrix}$	**2**	**B1** for 2 correct entries or for $\begin{pmatrix} 10 \\ -5 \\ 15 \end{pmatrix}$ or $\begin{pmatrix} 4 \\ -12 \\ 0 \end{pmatrix}$ soi
	(b) $\begin{pmatrix} 13 \\ 10 \end{pmatrix}$	**2**	**B1** for one entry correct or for both 13 and 10 seen but not in this form.
	(c) **(i)** $\frac{1}{4}\begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$ oe isw	**2**	**B1** for det $\begin{pmatrix} 1 & 0 \\ -2 & 4 \end{pmatrix} = 4$ soi or $\begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$
	(ii) $\begin{pmatrix} -2 & 0 \\ -2 & 1 \end{pmatrix}$	**2**	**B1** for three entries correct or $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ soi

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8	**(a)** 44.5	**3**	**M1** for numerical $\frac{\theta}{360} \times 2\pi \times 6$ oe and **M1** for *their* arc + 12 If second **M** not scored, **A1** for 32.46 or 5.24 soi. **SC1** after 0 for 2π6 seen (= 37.7)
	(b) 97.4	**2**	**M1** for numerical $\frac{\theta}{360} \times \pi \times 6^2$ **SC1** after 0 for π6² (= 113) seen
	(c) **(i)** 11.4	**3**	**M1** for $\frac{x}{6}$ = cos 25 (= 5.44) oe and **M1** for *their* 5.44 + 6. If the second **M** not scored, **A1** for 5.44 **SC1** after 0 for identifying a right-angled triangle that would lead to x = 5.44.
	(ii) 19.0	**4**	**M1** for $\frac{1}{2} \times 6 \times 6 \times \sin 50$ oe and **A1** for 13.79 (correct triangle only) **M1** for 12 × **(c) (i)** soi and **M1** for $\frac{12 \times \textbf{(c)(i)} - A}{12 \times \textbf{(c)(i)}} \times 100$
9	**(a)** Correct plots and curve	**2**	**P1** for at least 5 correct plots
	(b) (– 0.8)	**2ft**	**M1** for the tangent drawn at x = 0.75
	(c) **(i)** $-b$	**1**	
	(ii) Completed table	**1**	
	(iii) Correct curve	**1**	
	(iv) – (0.8 ± 0.2) cao	**1**	
	(d) **(i)** Correct straight line	**1**	
	(ii) (0.3) (1.7)	**1ft**	
	(iii) $2x^2 - 4x + 1 (= 0)$ or equivalent three term expression.	**2ft**	**M1** for $x + \frac{1}{4} = 4 - x$ oe

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10	**(a)** **(i)** 11.9	**4**	**M3** for $\sqrt{8^2+6^2-2\times8\times6\times\cos 115}$ **M2** for $8^2 + 6^2 - 2 \times 8 \times 6 \times \cos 115$ **M1** for $8^2 + 6^2 + 2 \times 8 \times 6 \times \cos 115$ and **A1** for 7.71 or **M1** for $8^2 + 6^2 - 8 \times 6 \times \cos 115$ and **A1** for 10.96 or **M1** for $8^2 + 6^2 - 2 \times 8 \times 6 \times \sin 115$ and **A1** for 3.60 or **M1** for $8^2 - 6^2 - 2 \times 8 \times 6 \times \cos 115$ and **A1** for 8.28
	(ii) 265° cao	**2**	**B1** for 85, 95 seen or **M1** for 200 – 115.
	(b) **(i)** $\frac{200\sin 65}{\sin 35}$ correctly obtained	**2**	**M1** for $\frac{PR}{\sin 65} = \frac{200}{\sin RPQ}$ oe **B1** for 180 – (44 + 36 + 65)
	(ii) $\frac{200\sin 65\sin 36}{\sin 35\sin 44}$ correctly obtained	**2**	**M1** for $\frac{SR}{\sin 36} = \frac{PR}{\sin 44}$ oe
	(iii) 267	**1**	
	(iv) 2.34 ft or $\frac{200 + \textbf{(b)(iii)}}{200}$	**1ft**	

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11	**(a)** $\dfrac{10p-29}{(p+2)(2p-3)}$ Final Answer	**3**	**M1** $\dfrac{7(2p-3)-4(p+2)}{(p+2)(2p-3)}$ **B1** for $14p - 21 - 4p - 8$ seen
	(b) **(i)** $\dfrac{320}{x}$ isw	**1**	
	(ii) $2x^2 + 5x - 20$ (= 0) correctly found	**3**	**M2** for $their\dfrac{320}{x} - their\dfrac{320}{x+2\frac{1}{2}} = 80$ oe **M2** for $their\dfrac{320}{x} - their\dfrac{320}{x+2\frac{1}{2}} = -80$ oe **SC1** after 0 for $\dfrac{320}{x+2\frac{1}{2}}$ seen.
	(iii) 2.15 – 4.65	**3**	**B1** for $\sqrt{5^2 - 4\times 2\times(-20)}$ soi and **B1** for $\dfrac{-5 \pm \sqrt{their\,185}}{2\times 2}$ soi If **B1** or **B0** at this stage, allow **M1** for both values of $\dfrac{p \pm \sqrt{q}}{r}$
	(iv) 69	**2**	**M1** for $\dfrac{320}{their + ve\ x + 2.5}$ oe

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12	**(a)** **(i)** 6.08	1	
	(ii) $\begin{pmatrix} 2 \\ -1.5 \end{pmatrix}$	2	**B1** for $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ or $\frac{1}{2}\begin{pmatrix} 6 \\ 1 \end{pmatrix}$ oe or **M1** for $\left(\overrightarrow{EH} =\right)\overrightarrow{EA} + \overrightarrow{AH}$
	(iii) $\begin{pmatrix} 2 \\ -1.5 \end{pmatrix}$	1	
	(iv) Equal and parallel	1	Dependent on **(ii)** and **(iii)** correct.
	(v) Shows G is midpoint of CD	2	**M1** for $\begin{pmatrix} -3 \\ 0 \end{pmatrix} + \begin{pmatrix} -2 \\ -4 \end{pmatrix} + \begin{pmatrix} 6 \\ 1 \end{pmatrix}$ oe seen or **B1** for $\left(\overrightarrow{CD} =\right) 2\overrightarrow{CG} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$
	(b) **(i)** Correct triangle (B)	2	**B1** for two vertices correct or positive enlargement centre (1, 2) or an enlargement scale factor 1.5.
	(ii) Correct triangle (C)	2	**B1** for two vertices correct or negative enlargement centre (1, 2) or An enlargement scale factor – 0.5.
	(iii) 1 : 9 oe	1	

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