

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.

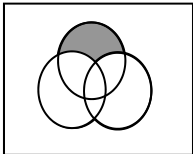
Cambridge will not enter into discussions about these mark schemes.

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Page 2	Mark Scheme	Syllabus
	GCE O LEVEL – October/November 2013	4024

Qu	Answers	Mark	Part Marks
1	(a) 3760 (b) 42(.0) (c) 54.1	3 2 2	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 M1 for $(BC^2 =) 38^2 + (58 - 40)^2$ M1 for $\tan CDE = \frac{58}{42}$ oe
2	(a) (i) 1.24 isw (ii) $x = 3$ $y = 5$ (b) (i) $\frac{1}{12}$ (ii) Correct pie chart labelled.	2 2 1 3	M1 for $(0 \times 4) + 35 \times 1 + 2 \times 6 + 3 \times 5$ 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 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) $-\frac{1}{8}$ (b) $6x^3 - 3$ or $3(2x^3 - 1)$ (c) (i) $(9x - 4)(x + 1)$ (ii) $\frac{4}{9} - 1$ (d) 27, 28, 29	2 2 1 1 2	B1 for 1 or -8 or M1 for $\frac{-4 + \sqrt{(-4)^2 + (-3)^2}}{(-4)^2 - 2(-4)(-3)}$ M1 for $6x^3 - 2x + 9x^2 - 3 - 9x^2 + 2x$ B1 for such as $n, n + 1, n + 2$ seen
4	(a) 72 justified (b) (i) Congruency established (ii) (a) Kite (b) 90	2 3 1 1	B1 for 72 or either D or $E = 90$ B1 + B1 for two pairs of equal sides SC1 After 0, accept all sides the same oe.

Page 3	Mark Scheme	Syllabus
	GCE O LEVEL – October/November 2013	4024

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

Page 4	Mark Scheme	Syllabus
	GCE O LEVEL – October/November 2013	4024

8	(a) 44.5	3	M1 for numerical $\frac{\theta}{360} \times 2\pi \times 6$ oe and M1 for <i>their</i> arc + 12 If second M not scored, A1 for 32.46 or 5.24 soi. SC1 after 0 for $2\pi 6$ seen (= 37.7)
	(b) 97.4	2	M1 for numerical $\frac{\theta}{360} \times \pi \times 6^2$ SC1 after 0 for $\pi 6^2$ (= 113) seen
	(c) (i) 11.4	3	M1 for $\frac{x}{6} = \cos 25$ (= 5.44) oe and M1 for <i>their</i> 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 $12 \times$ (c) (i) soi and M1 for $\frac{12 \times \text{(c)(i)} - A}{12 \times \text{(c)(i)}} \times 100$
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

Page 5	Mark Scheme	Syllabus
	GCE O LEVEL – October/November 2013	4024

10	(a) (i) 11.9	4	M3 for $\sqrt{8^2 + 6^2 - 2 \times 8 \times 6 \times \cos 115}$ 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 $\frac{200 + (b)(iii)}{200}$	1ft	

Page 6	Mark Scheme	Syllabus
	GCE O LEVEL – October/November 2013	4024

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

Page 7	Mark Scheme	Syllabus
	GCE O LEVEL – October/November 2013	4024

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 $(\overrightarrow{EH} =) \overrightarrow{EA} + \overrightarrow{AH}$
	(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 $(\overrightarrow{CD} =) 2\overrightarrow{CG} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$
	(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	