

MARK SCHEME for the October/November 2015 series

4024 MATHEMATICS (SYLLABUS D)

4024/21

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.

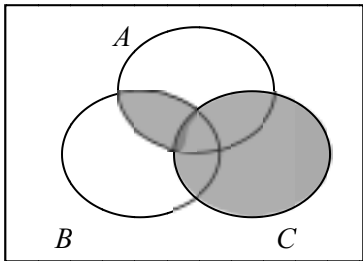
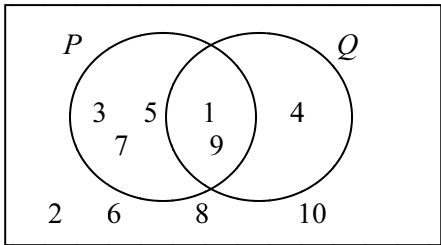
Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

Page 2	Mark Scheme	Syllabus	Paper
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Question	Answers	Mark	Part marks
1 (a)	2730	2	B1 for 230 or 2557.5[0] seen or M1 for $2500 + 2500 \times 0.023 \times 4$ oe
(b)	262.5[0] final answer	2	B1 for 1012.5[0] seen or M1 for $0.15 \times 750 + 36 \times 25$ oe
(c)	$w = 4.65$ $x = [0].75$ $y = 40.5[0]$ $z = 31.35$	5	B1 for $[w =] 4.65$ B1 for $[x =] [0].75$ B2 for $[y =] 40.5[0]$ or M1 for $32.4[0] \div 0.8$ oe B1ft for 31.35
2 (a) (i)	19.2[...] or $3\sqrt{41}$	2	M1 for $[AB^2 =] 12^2 + 15^2$ or better
(ii)	128.6 to 128.7 or 129	3	M1 for $\tan \theta = \frac{\text{their } 12}{15}$ oe A1 for 38.6 to 38.7 B1ft for $[\hat{ABC} =] \text{their } \theta + 90$ Alternative method M2 for complete method using cosine rule for $\cos ABC$ using <i>their</i> 19.2
(b)	44.8[2...]	3	M2 for $\frac{7 \sin 65}{9}$ Or M1 for $\frac{9}{\sin 65} = \frac{7}{\sin x}$ oe
3 (a) (i)	$\begin{pmatrix} 3 & 4 \\ -1 & 2 \end{pmatrix}$	2	B1 for one row or one column correct
(ii)	$\frac{1}{4} \begin{pmatrix} 2 & -2 \\ 3 & -1 \end{pmatrix}$ or $\begin{pmatrix} 1 & -1 \\ 2 & 2 \\ 3 & 1 \\ 4 & -4 \end{pmatrix}$ oe isw	2	B1 for $\det = 4$ soi or for $\begin{pmatrix} 2 & -2 \\ 3 & -1 \end{pmatrix}$
(b)	$\begin{pmatrix} 4 & -2 \\ 0 & -6 \end{pmatrix}$ oe	2	B1 for one row or one column correct Or M1 for $2\mathbf{C} = -4 \begin{pmatrix} -2 & 1 \\ 0 & 3 \end{pmatrix}$ oe or for $-\frac{1}{2}\mathbf{C} = \begin{pmatrix} -2 & 1 \\ 0 & 3 \end{pmatrix}$

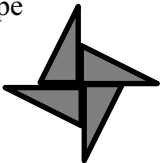
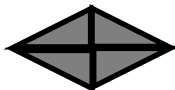
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Question	Answers	Mark	Part marks
(c) (i)	$\begin{pmatrix} 3110 \\ 2715 \\ 2750 \end{pmatrix}$	2	B1 for 2 elements correct in a 3 by 1 matrix or all 3 values correct in dollars or M1 for $\begin{pmatrix} 1950 + 1160 \\ 975 + 1740 \\ 1300 + 1450 \end{pmatrix}$
(ii)	Amount [in cents] for each week	1	
(iii)	85.75 cao	1	
4 (a)		1	
(b)	$E \cap (D \cup F)'$ or $(D \cup F)' \cap E$	1	Or $E \cap D' \cap F'$
(c) (i)		2	B1 for 8 or 9 numbers correctly placed or for 10 numbers correctly placed with one additional number or for 1, 3, 4, 5, 7, 9 seen correctly positioned and no numbers positioned incorrectly
(ii)	7	1ft	
(iii)	$\frac{3}{10}$ oe	2ft	B1 for <i>their</i> 3 seen as numerator of a fraction soi
5 (a)	$3x^2y(2y^2 - 5x)$	2	B1 for $3x^2(2y^3 - 5xy)$ or $3y(2x^2y^2 - 5x^3)$ or $x^2y(6y^2 - 15x)$ or $3xy(2xy^2 - 5x^2)$ or $3x^2y(A - 5x)$ or $3x^2y(2y^2 - B)$

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Question	Answers	Mark	Part marks
(b)	$x = \pm 1.63[\dots]$ or $\pm \sqrt{\frac{8}{3}}$	3	M1 for $\frac{4(x+2)+2x}{x(x+2)} = 3$ soi M1dep for $4x + 8 + 2x = 3x^2 + 6x$ or better
(c) (i)	Correct region shaded with 4 correct lines	3	B2 for 3 or 4 correct lines or B1 for 2 correct lines
(ii)	$-\frac{1}{2}$ oe	2	B1 for (3, 3) or (1, 4) soi
6 (a) (i)	$a = 1, b = -3$	2	B1 for one correct
(ii)	5.38 to 5.39 or $\sqrt{29}$	2	M1 for $\sqrt{5^2 + 2^2}$
(b) (i)	$\mathbf{b} - \frac{1}{2}\mathbf{a}$ or $\frac{1}{2}(2\mathbf{b} - \mathbf{a})$ final answer	1	
(ii)	$2\mathbf{b} + \frac{1}{2}\mathbf{a}$ or $\frac{1}{2}(\mathbf{a} + 4\mathbf{b})$ final answer	1	
(iii)	$\lambda : 3\lambda$	2dep	B1dep for $\mathbf{b} + \frac{1}{4}\mathbf{a}$ seen or $n(\mathbf{b} + \frac{1}{4}\mathbf{a})$ seen or $k = \frac{1}{2}$ or $OF = \frac{1}{2}OE$ oe

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Question	Answers	Mark	Part marks
	SECTION B		
7 (a)	A correct shape with one of diagonal lines as line of symmetry	1	
(b)	Correct shape 	2	B1 for three additional triangles drawn round M , at least two correct Or SC1 for 
(c) (i)	C at (3, 1) (3, 3) (4, 3)	2	B1 for either vertical or horizontal correct Or for two vertices correct and correct orientation
(ii)	$y = x$ oe	1	
(iii)	Translation $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$	2	B1 for translation or $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ Or M1 for D seen at (1, 3), (3, 3), (3, 4)
(iv) (a)	(2, 0) (4, 0) (4, -1)	1	
(b)	Rotation, 90° clockwise, (0,0) oe	2	B1 for two correct from: Rotation, 90° clockwise oe, (0, 0) oe
(c)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	1	
8 (a)	$\pi r^2 + \pi r(r + 4)$ with correct working leading to $6r(r + 2)$	2	M1 for $\pi r^2 + \pi r(r + 4)$ or $\pi r(r + r + 4)$
(b)	48, 90	1	
(c)	Correct shape curve through 7 correct points	2	B1ft for at least 5 correct points plotted
(d)	$[h =] \sqrt{8r + 16}$ or $2\sqrt{2r + 4}$ $[h =] \sqrt{(r + 4)^2 - r^2}$ or better	2	M1 for $(r + 4)^2 = r^2 + h^2$ or better
(e)	16	2	M1 for $8r + 16 = 144$ oe

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Question	Answers	Mark	Part marks
(f) (i)	4.8 to 4.95	1	
(ii)	8 cao	2	B1 for 7.[...] or M1 for substituting <i>their</i> f(i) into $\sqrt{(r+4)^2 - r^2}$
9 (a) (i)	4 [minutes] 18 [seconds]	1	
(ii)	1 [minute] 0 [seconds]	2	B1 for attempt to read at 12.5 and 37.5
(b)	10, 12, 13, 5, 2	2	B1 for 3 correct
(c)	17 [minutes] 30 [seconds]	2	B1 for three times only seen including 6, 5:30 and time in range $5:30 < t \leq 6$
(d) (i)	23	1	
(ii)	$\frac{7}{50}$ or 0.14	2	B1ft for <i>their</i> 2 + <i>their</i> 5 seen or time = 5 [mins] seen Or SC1 for answer $\frac{2}{50}$ oe
(e)	$\frac{4}{175}$ oe	2	M1 for $\frac{a}{50} \times \frac{a-1}{49}$ where $a < 50$ Or B1 for $\frac{8}{50}$ and $\frac{7}{49}$ seen Or SC1 for answer $\frac{8}{175}$ oe or answer $\frac{16}{625}$ oe
10 (a) (i)	$\frac{1}{2}(x+15)(x-3) = 75$ Correct expansion leading to $x^2 + 12x - 195 = 0$ www	M1 A1	Or equivalent equation for area
(ii)	9.2 cao	3	B2 for 9.19[8...] or 9.2[0] seen OR B1 for $\sqrt{12^2 - 4 \times 1 \times -195}$ soi And B1 for $\frac{-12 \pm \sqrt{\text{their } 924}}{2}$ oe
(iii)	7.3	2	M1 for $2AD - 0.8 + 15 + \text{their } 9.2 = 38.0$ oe Or $2BC + 0.8 + 15 + \text{their } 9.2 = 38.0$ oe Or SC1 for answer $[BC =] 6.5$

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(b) (i)	72°	2	B1 for $\hat{LMN} = 108^\circ$ seen
(ii)	$\frac{4}{7}$	3	M2 for $126 : \text{their } 72$ soi or B1 for 126 seen Or SC2 for answer $\frac{7}{4}$
11 (a) (i)	9.19[...]	2	M1 for $\frac{1}{2} \times 4 \times 6 \times \sin 50$
(ii)	183 to 184	1ft	ft $20 \times \text{their } 9.19$
(iii)	310 to 310.5	5ft	ft $292 + 2 \times \text{their } 9.19$ B3 for 4.60 or 4.59[8...] or M2 for $4^2 + 6^2 - 2 \times 4 \times 6 \times \cos 50$ or M1 for cosine formula with one error AND M1 for $20 \times (4 + 6 + \text{their } 4.60) + 2 \times \text{their } 9.19$ oe
(b)	21.3[2...]	4	B1 for correct change of units soi M1 for use of $\pi \times r^2 \times 0.7 = 0.1$ M1 for $r^2 = \frac{0.1}{0.7 \times \pi}$ soi