

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2015 series

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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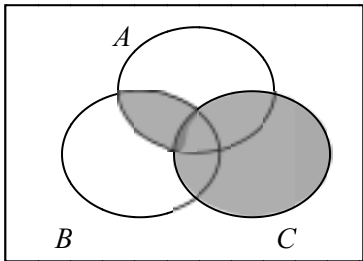
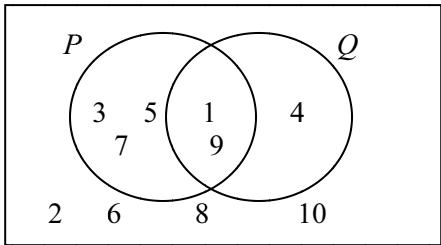
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Question	Answers	Mark	Part marks
1 (a)	2730	2	B1 for 230 or 2557.5[0] seen or M1 for $2500 + 2500 \times 0.023 \times 4$ oe
(b)	262.5[0] final answer	2	B1 for 1012.5[0] seen or M1 for $0.15 \times 750 + 36 \times 25$ oe
(c)	$w = 4.65$ $x = [0].75$ $y = 40.5[0]$ $z = 31.35$	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 $\tan \theta = \frac{their12}{15}$ oe A1 for 38.6 to 38.7 B1ft for $[\hat{ABC} =] their \theta + 90$ 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 $\begin{pmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{3}{4} & -\frac{1}{4} \end{pmatrix}$ 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 $-\frac{1}{2}\mathbf{C} = \begin{pmatrix} -2 & 1 \\ 0 & 3 \end{pmatrix}$

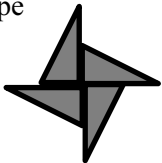
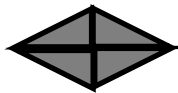
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Question	Answers	Mark	Part marks
(c) (i)	$\begin{pmatrix} 3110 \\ 2715 \\ 2750 \end{pmatrix}$	2	B1 for 2 elements correct in a 3 by 1 matrix or all 3 values correct in dollars or M1 for $\begin{pmatrix} 1950 + 1160 \\ 975 + 1740 \\ 1300 + 1450 \end{pmatrix}$
(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 <i>M</i> , at least two correct Or SC1 for 
(c) (i)	<i>C</i> 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 <i>D</i> 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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Question	Answers	Mark	Part marks
(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