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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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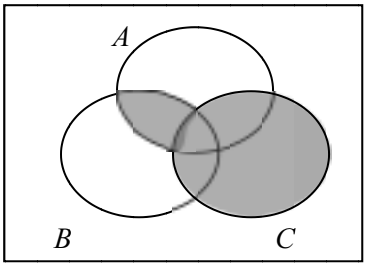
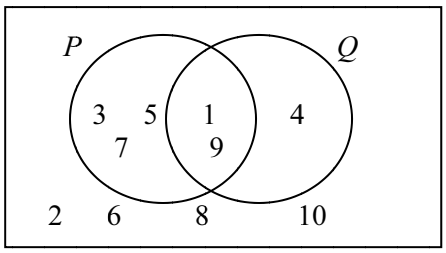
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Question	Answers	Mark	Part marks
1 (a)	2730	2	**B1** for 230 or 2557.5[0] seen or **M1** for $2500 + 2500 \times 0.023 \times 4$ oe
(b)	262.5[0] final answer	2	**B1** for 1012.5[0] seen or **M1** for $0.15 \times 750 + 36 \times 25$ oe
(c)	$w = 4.65$ $x = [0].75$ $y = 40.5[0]$ $z = 31.35$	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 $\tan\theta = \frac{their 12}{15}$ oe **A1** for 38.6 to 38.7 **B1ft** for $[A\hat{B}C =]$ *their* $\theta + 90$ **Alternative method** **M2** for complete method using cosine rule for cos *ABC* using *their* 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 *their* 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 $3x^2y(2y^2-B)$

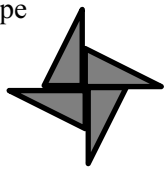
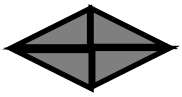
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Question	Answers	Mark	Part marks
(b)	$x = \pm 1.63[...]$ or $\pm\sqrt{\frac{8}{3}}$	**3**	**M1** for $\frac{4(x+2)+2x}{x(x+2)} = 3$ soi **M1dep** for $4x + 8 + 2x = 3x^2 + 6x$ or better
(c) (i)	Correct region shaded with 4 correct lines	**3**	**B2** 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)	λ : 3 λ	**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 *their* 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 $5{:}30 < t \leqslant 6$
(d) (i)	23	1	
(ii)	$\frac{7}{50}$ or 0.14	2	**B1ft** for *their* 2 + *their* 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 $\frac{-12 \pm \sqrt{their 924}}{2}$ oe
(iii)	7.3	2	**M1** for $2AD - 0.8 + 15 + \textit{their}\ 9.2 = 38.0$ oe Or $2BC + 0.8 + 15 + \textit{their}\ 9.2 = 38.0$ oe Or **SC1** for answer [BC =] 6.5

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Question	Answers	Mark	Part marks
(b) (i)	72°	2	**B1** for $L\hat{M}N = 108°$ seen
(ii)	$\frac{4}{7}$	3	**M2** for 126 : *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 × *their* 9.19
(iii)	310 to 310.5	5ft	ft 292 + 2 × *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×(4 + 6 + *their*4.60) + 2×*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

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