Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D) **4024/21**

Paper 2 **October/November 2017**

MARK SCHEME

Maximum Mark: 100

Published

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[Turn over

Abbreviations

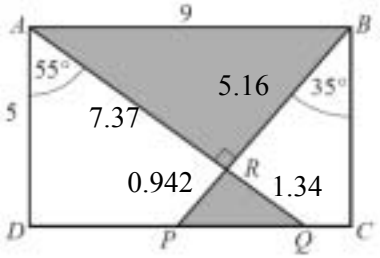
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	503.5[0] **final answer**	**3**	**M2** for 12.50 × 38 × 1.06 oe or 12.50 × 38 × 0.06 oe or **M1** for 12.50 × 38 or 12.50 × 1.06 oe soi or 12.50 × 0.06 oe soi
1(a)(ii)	12	**2**	**M1** for (525 – 462) ÷ 525 oe After **M0**, **SC1** for answer 88
1(a)(iii)	2400 **nfww**	**2**	**M1** for 1.03x = 2472 soi
1(b)	192	**3**	**M1** for 520 × 0.74 **M1** for (*their* 384.8 – 260) ÷ 0.65
2(a)	14.35 or 14.4	**3**	**B1** for use of correct midpoints soi **M1** for (2.5 × 35 + 7.5×42 + 15×30 + 25×28 + 40 × 15) ÷ 150
2(b)	Correct histogram with linear scale on frequency density axis	**3**	**B2** for all 5 bar heights correct with frequency density axis scaled OR **B1** for at least 3 correct heights drawn or 3 correct frequency densities calculated **B1** for 5 bars correct width and position
2(c)	18 to 20	**2**	**M1** for (15 + 14) ÷ 150
3(a)	040	**1**	
3(b)	$BC = \sqrt{25^2 + 38^2 - 2\times25\times38\cos(360-220)}$	**M2**	or **M1** for $25^2 + 38^2 - 2 \times 25 \times 38 \times \cos(360 - 220)$
	BC = 59.36 to 59.37	**A1**	

Question	Answer	Marks	Partial Marks
3(c)	204.1 to 204.3[2…]	**4**	**B3** for 24.1 to 24.3[2…] OR **M2** for $\sin B = \frac{38 \times \sin(360-220)}{59.4}$ or **M1** for $\frac{\sin B}{38} = \frac{\sin(360-220)}{59.4}$ and **M1** for 180 + *their B*
4(a)	$\frac{5}{9}$ oe	**1**	
4(b)(i)	$\frac{25}{81}$ oe	**1**	
4(b)(ii)	$\frac{40}{81}$ oe	**2**	**M1** for $\frac{their\,5}{9} \times \frac{(9-their5)}{9}$ soi or $\frac{their\,5}{9} \times \frac{4}{9}$
4(c)	$\frac{4}{9}$ oe **nfww**	**3**	**M2** for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{3}{8}$ or **M1** for $\frac{4}{9} \times \frac{3}{8}$ or $\frac{5}{9} \times \frac{4}{8}$
5(a)	–3 , 2 **nfww**	**3**	**M1** for $y^2 + 5y = 4y + 6$ **M1** for $(y + 3)(y – 2)$ [= 0]
5(b)	$t = \frac{2p-1}{4+p}$ or $t = \frac{1-2p}{-4-p}$ **final answer**	**3**	**M1** for $p(2 – t) = 4t + 1$ or better **M1FT** for $2p – 1 = 4t + pt$ **M1FT** for completion to explicit formula for t **Max 2 marks if final answer incorrect**
5(c)	$\frac{3x-2}{x+4}$ **final answer**	**3**	**B1** for $(3x – 2)(x – 4)$ seen **B1** for $(x + 4)(x – 4)$ seen
6(a)(i)	[$A\hat{C}B$ =] 38	**1**	
6(a)(ii)	[$A\hat{E}F$ =] 38, angles in same segment are equal	**1**	Strict **FT** *their* (i)
6(a)(iii)	[$C\hat{D}E$ =] 112	**1**	
6(a)(iv)	[$B\hat{C}D$ =] 106	**2**	**FT** 180 – *their CDE* + *their ACB* **M1** for $A\hat{C}D$ = 180 – *their* 112 soi

Question	Answer	Marks	Partial Marks
6(b)	156	**3**	**B1** for sum of angles in pentagon = 540 soi **M1** for $8x + 124 =$ *their* 540 oe
6(c)	105.5	**2**	**B1** for two of 65.5, 131.5 and 57.5 seen After **B0**, **SC1** for answer 108.5
7(a)(i)	$y = -2x + 5$ oe	**2**	**B1** for $y = -2x + c$ oe or for $y = mx + 5$ oe or **M1** for gradient = $\frac{5+3}{0-4}$ oe
7(a)(ii)	$y = -2x - 1$ oe **FT** *their* gradient from (a)(i)	**2**	**B1** for answer $y =$ *their* $(-2)x + k$, where $k \neq$ *their* 5 or **M1** for $3 =$ *their* $(-2) \times -2 + k$ oe
7(b)(i)	3.5	**1**	
7(b)(ii)	Correct smooth curve through 8 correct points	**3**	**B2FT** for 7 or 8 points correctly plotted or **B1FT** for 5 or 6 points correctly plotted
7(b)(iii)	Clear correct tangent drawn at (1, 1)	**M1**	
	–2.4 to –1.6	**A1**	
7(b)(iv)	0.6 to 0.8 and 4.2 to 4.4	**2**	**FT** reading from *their* graph at $y = 2$ **B1** for one correct or for $y = 2$ soi
8(a)	$[x^2 =]\ 6^2 + 12^2$	**M1**	or $[x =]\sqrt{6^2 + 12^2}$
	$[x =]$ 13.41[6…] or 13.42	**A1**	
8(b)	478.7 to 479.4	**3**	**M1** for $\left[\frac{1}{2}\times\right] 4 \times \pi \times 6^2$ seen **M1** for $\pi \times 6 \times 13.4$ seen After 0 scored, **SC1** for consistent use of $r = 3$ in formula for [hemi]sphere and cone
8(c)	904.7 to 905 **nfww**	**3**	**M1** for $\left[\frac{1}{2}\times\right]\frac{4}{3}\times\pi\times 6^3$ seen **M1** for $\frac{1}{3}\times\pi\times 6^2\times 12$ seen After 0 scored, **SC1** for consistent use of $r = 3$ in formula for [hemi]sphere and cone
8(d)(i)	4310 or **FT** $9 \times$ *their* (b)	**2**	**M1** for $\left(\frac{6}{2}\right)^2$ soi
8(d)(ii)	113 or **FT** $\frac{1}{8} \times$ *their* (c)	**2**	**M1** for $\left(\frac{1}{2}\right)^3$ soi

Question	Answer	Marks	Partial Marks
9(a)	7 cao	**2**	**M1** for $\frac{12}{3000}\times 1750$ oe
9(b)(i)	$\frac{2500}{x}$	**1**	
9(b)(ii)	$\frac{2500}{x}-\frac{2500}{x+20}=15$	**M1**	Or equivalent unsimplified equation
	$2500(x + 20) – 2500x = 15x(x + 20)$	**M1**	**FT** elimination of *their* fractions with algebraic denominators
	Correct simplification leading to $3x^2 + 60x – 10\,000 = 0$ AG	**A1**	
9(b)(iii)	48.59 and –68.59 **final answer**	**3**	**B1** for $\sqrt{60^2-4\times 3\times -10000}$ soi **B1** for $\frac{-60\pm\sqrt{their 123600}}{2\times 3}$
9(b)(iv)	36 minutes 27 seconds	**3**	**M2** for $\frac{2500}{their 48.59+20}$ or **M1** for $\frac{2500}{their\ 48.59}$
10(a)(i)	Triangle *B* at (2, –3), (3, –3), (3, –5)	**2**	**B1** for translation of correct triangle B
10(a)(ii)	Triangle *C* at (3, 3), (3, 9), (6, 3)	**2**	**B1** for two vertices correct or for $\begin{pmatrix}3&0\\0&3\end{pmatrix}\begin{pmatrix}1&2&1\\1&1&3\end{pmatrix}$ oe
10(a)(iii)	$\begin{pmatrix}\frac{1}{3}&0\\0&\frac{1}{3}\end{pmatrix}$ oe	**1**	
10(a)(iv)	Enlargement Centre (3, –1.5) SF $-\frac{1}{3}$	**3**	**B1** for each
10(b)(i)	$\begin{pmatrix}4\\8\end{pmatrix}$	**2**	**B1** for one component correct or **M1** for $2\begin{pmatrix}6\\3\end{pmatrix}-\begin{pmatrix}8\\-2\end{pmatrix}$ oe After 0 scored, **SC1** for answer $\begin{pmatrix}-4\\-8\end{pmatrix}$
10(b)(ii)	$\begin{pmatrix}9\\0\end{pmatrix}$	**2**	**B1** for one component correct or **M1** for $-\frac{3}{4}(their\ \overrightarrow{SR})$ or $\frac{1}{4}(their\ \overrightarrow{SR})$ soi

Question	Answer	Marks	Partial Marks
11(a)	$\angle ARB = \angle PRQ$, [vertically] opposite $\angle RAB = \angle RQP$, alternate [angles] $\angle RBA = \angle RPQ$ alternate [angles] ΔARB and ΔQRP similar, equal angles	**3**	**B1** for one pair of angles stated with reason or for two pairs with no reasons or incorrect reasons **B1** for a further correct pair of angles with reason
11(b)(i)	[AQ =] 8.72 or 8.717[…]	**2**	**M1** for $\cos 55 = \frac{5}{AQ}$ or $\sin 35 = \frac{5}{AQ}$ oe
11(b)(ii)	[AR =] 7.37[2…]	**2**	**M1** for $\cos 35 = \frac{AR}{9}$ or $\sin 55 = \frac{AR}{9}$ oe
11(b)(iii)	[Area ARB =] 18.8 to 19.2[…] or **FT** *their AR*	**2**	**M1** for $\frac{1}{2} \times their\,7.37 \times 9 \times \sin 35$ oe Or $\frac{1}{2} \times their\,7.37 \times \sqrt{9^2 - (their\,7.37)^2}$
11(b)(iv)	19.6 to 19.7 **nfww**  	**3**	**M1** for tan $35 = \frac{PR}{their\,RQ}$ oe or $\frac{PR}{their\,RQ} = \frac{their\,RB}{their\,AR}$ oe where *their RQ* = (*their* 8.72 – *their* 7.37) **M1** for *their* area ARB + $\frac{1}{2} \times their\,RQ \times their\,PR$