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**MATHEMATICS (SYLLABUS D)**

**4024/12**

Paper 1

**October/November 2016**

MARK SCHEME

Maximum Mark: 80

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**Published**

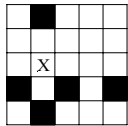
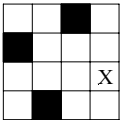
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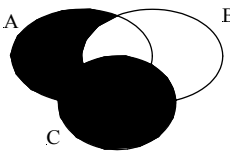
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Page 2	Mark Scheme	Syllabus	Paper
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Question	Answers	Mark	Part marks
1 (a)	2.457	1	
(b)	$\frac{2}{63}$ oe fraction; or 0.031 to 0.032	1 (*)	
2 (a)	123.456	1	
(b)	(0).0643	1	
3 (a)		1	
(b)		1	
4 (a)	2.05	1	
(b)	$-\frac{3}{4}$ $-0.7$ $74\%$ $0.\dot{7}$	1	
5 (a)	$41^\circ$	1	
(b)	$245^\circ$	1	
6	$\sqrt{3.98} \approx \sqrt{4}$ or 2, and $602.3 \approx 600$ (or 602), and $2.987 \approx 3$ all three seen  ( $\pm$ )400 (or 401, 401.3 or better, from 602)	<b>M1*</b> <b>A1</b>	<b>B1</b> for two correct approximations. Could be implied by $2 \times 200$ or $1\ 200/3$ . <b>C1</b> for 400 WAW.
7	Triangle with vertices (1, 1) (1, 5) (7, 5)	2*	<b>B1</b> for two correct vertices
8 (a)	$5.13 \times 10^5$	1	
(b)	$2.4 \times 10^{-8}$	2*	<b>C1</b> for $A \times 10^{-8}$ with $1 \leq A < 10$ or for $2.4 \times 10^{-10}$ ; or <b>B1</b> for $24 \times 10^{-9}$ or for 0.000 000 024
9 (a)	20 25	1 1	
(b)	Rectangle with base 35 to 50 and height 2	1	

Question	Answers	Mark	Part marks
10 (a)	-3.5 or any equivalent	1	
(b)	$\frac{1}{3}$	2*	<b>M1</b> for $5 = 4 + 3x$ or <b>B1</b> for $(f^{-1}(x) =) \frac{x-4}{3}$ oe or <b>B1</b> for $x = \frac{1}{3}$ , followed by further work
11 (a)	4 nfw	2*	<b>B1</b> for “ $k$ ” = 36 from $y = k/x^2$ or <b>M1</b> for $9 \times 2^2 = y \times 3^2$ oe or <b>M1</b> for $(\text{their } k) / 3^2$ oe
(b)	$\frac{p}{4}$	1	
12 (a)	0	1	
(b)	0.8 oe	2*	<b>M1</b> for $(15 \times 1 + 6 \times 2 + 3 \times 3 + 4 \times 1) / 50$
13	Correct triangle	3*	Following an attempt at a rotation of $110^\circ$ about $O$ , award <b>C2</b> for two correct vertices or <b>C1</b> for one correct vertex.  If [0] scored then either <b>B1</b> for arc(s) of correct radii, centre $O$ , (from $A$ , $B$ or $C$ ); or <b>B1</b> for $AOA'$ or $BOB'$ or $COC' = 110^\circ$
14 (a)		1	
(b)	8	2*	<b>M1</b> for $23 + 17 - (36 - 4)$ or <b>M1</b> for $23 - x + x + 17 - x + 4 = 36$ oe or <b>B1</b> for $S \cap F' = 15$ or $F \cap S' = 9$
15	A correct method to eliminate one variable  Either $x = 5$ or $y = -6$ WWW  Both $x = 5$ and $y = -6$ WWW	* <b>M1</b>  <b>A1</b>  <b>A1</b>	If [0] earned, then award <b>C1</b> for a pair of values that satisfy either equation. If only <b>M1</b> earned, then award <b>B1</b> for a <i>correct</i> substitution of their first solution into one, or a <i>correct</i> linear combination of both, of the <i>original</i> equations.

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Question	Answers	Mark	Part marks																
16 (a)	13	1																	
(b)	$(\pm)\frac{9}{16}$	1																	
(c)	$4y^3$	1																	
17 (a)	200	1																	
(b)	15 : 1	2*	<b>C/B1</b> for any correct unsimplified ratio, e.g. 210 : 14; 105 : 7; $\frac{30}{2} : 1$ ; $\frac{7}{2} : \frac{14}{60}$ ; 3.5 : 14/60 or <b>M1</b> for $3.5 \times 60 \times 60 : 14 \times 60$ ; $3.5 \times 60 : 14$ or <b>B1</b> for $3\frac{1}{2}$ hrs = $\frac{7}{2} \times 60$ ; or 210 seen.																
18 (a)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>–</td><td>3</td><td>4</td><td>5</td></tr> <tr><td>3</td><td>–</td><td>5</td><td>6</td></tr> <tr><td>4</td><td>5</td><td>–</td><td>7</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>–</td></tr> </table>	–	3	4	5	3	–	5	6	4	5	–	7	5	6	7	–	1	
–	3	4	5																
3	–	5	6																
4	5	–	7																
5	6	7	–																
(b)	0	1																	
(c)	$\frac{4}{12}$ oe ; or FT <i>their table</i>	1 <sup>†</sup>																	
19 (a)	1.65	1																	
(b)	15.15	2*	<b>M1</b> for <i>their(a)</i> + $100 \times 135/1000$ or <b>B1</b> for 13.5 seen.																
20	$3(2x - 1) + 4(x - 2)$ ; or $6x - 3 + 4x - 8$ ; or $10x - 11$  <i>their</i> ( $10x - 11$ ) = 24 or $\frac{\textit{their}(10x-11)}{12} = 2$  3.5 oe WWW	<b>M1*</b>  <b>M1*</b>  <b>A1</b>																	

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Question	Answers	Mark	Part marks
21	600 WWW	3*	<b>M2</b> for $\frac{\pi \times 20^2 \times 16}{\frac{4}{3} \times \pi \times 2^3}$ or <b>B1</b> for (Volume of water =) $\pi \times 20^2 \times 16$ or for (Volume of one drop =) $\frac{4}{3} \times \pi \times 2^3$ soi
22 (a)	Perpendicular bisector of $AB$ .	1	
(b)	Bisector of angle $ABC$ .	1	
(c)	Correct (bottom right) region shaded.	1 ✓	FT for two intersecting lines – slightly inaccurate but correct types of loci.
23 (a)	14	2*	<b>M1</b> for $25 - 1 \times 1 - 2 \times 2 - \frac{1}{2} \times 4 \times 3$ oe dissection.
(b)	18 nfw	2*	<b>B1</b> for sloping side = 5
24 (a)	68	1	
(b)	146	1	
(c)	34; or FT <i>their</i> (a)/2; or FT $180 - \text{their}(b)$	1 ✓	
(d)	56	1	
25 (a)	$(0, 4\frac{1}{3})$	1	
(b)	$x \geq 1$ oe, $y \geq 2$ oe, $3y + 2x \geq 13$ oe – all three	2	<b>C1</b> for one or two correct, or for $x \dots 1$ oe, $y \dots 2$ oe, $3y + 2x \dots 13$ oe, with incorrect “...” .
(c)	(6, 2)	1	
26 (a) (i)	$2n - 1$ oe	1	
(ii)	421	1	
(b) (i)	8	1	
(ii)	14	1	

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<b>Question</b>	<b>Answers</b>	<b>Mark</b>	<b>Part marks</b>
<b>27 (a)</b>	(-)0.9 oe	1	
<b>(b)</b>	420	2*	<b>M1</b> for $\frac{1}{2} \times 20 \times (12+30)$ oe
<b>(c)</b>	25	2*	<b>M1</b> for $(k - 20) \times 12 = 60$ oe or <b>C1</b> for $k = 5$