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**MATHEMATICS (SYLLABUS D)**

**4024/11**

Paper 1

**October/November 2016**

MARK SCHEME

Maximum Mark: 80

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**Published**

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.

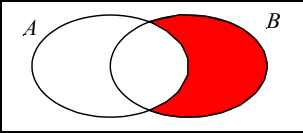
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Question	Answers	Mark	Part marks
1 (a)	$\frac{17}{30}$ h	1	
	(b) (0).0033	1	
2 (a)	7	1	
	(b) 30	1	
3 (a)	$\frac{13}{40}$ cao	1	
	(b) $\frac{7}{20}$ $\frac{9}{25}$ 0.38 0.4	1	
4 (a)	4.8(0)	1	
	(b) 24	1	
5 (a)	360 cao	1	
	(b) 4	1	
6	15	2 *	<b>B1</b> for “k” = -150 provided $y = \text{“k”}/x$ is used. or <b>M1</b> for $-50 \times 3 = -10y$ oe or <b>M1</b> for $y = (\text{their } k)/(-10)$ when $y = \text{“k”}/x$ is used.
7	40	2 *	<b>M1</b> for $\frac{360}{180-171}$ ; or $171n = 180(n-2)$ oe
8 (a)	7	1	
	(b) $\frac{4y}{3x}$ ; or $\frac{4yx^{-1}}{3}$	1	
9 (a)	0.155 cao	1	
	(b) 20 WWW	1 *	
10 (a)	$4.5 \times 10^8$	1	
	(b) $3 \times 10^9$	2 *	<b>C1</b> for $A \times 10^9$ with $1 \leq A < 10$ ; or for $3 \times 10^{11}$ or <b>B1</b> for $0.3 \times 10^{10}$

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11 (a)	0.35 oe	1	
(b)	$3 - 10x$ oe	2 *	<b>C1</b> for $10x - 3$ or <b>B1</b> for $10$ “y” = $3 - “x”$
12 (a) (i)	9	1	
(ii)	89	1	
(b)		1	
13 (a)	0.5 oe	1	
(b)	$\frac{2}{3}$ oe	1 *	
(c)	(-) 8	1	
14 (a)	2.7 oe	2 *	<b>M1</b> for $\frac{BC}{6} = \frac{1.8}{4}$ oe
(b)	$\frac{4}{5}$ oe	1 *	
15 (a)	Rotation 90° clockwise oe, centre (3, 1)	1 1	Mark lost if a second transformation is named.
(b)	vertices: (-2, 4), (-4, 0), (-4, 4)	2 *	<b>B1</b> for two correct vertices, or for vertices (2, 0), (4, 0), (4, 4)
16 (a)	$5(1 - 2t)(1 + 2t)$	2 *	<b>C1</b> for $(1 - 2t)(1 + 2t)$ or <b>B1</b> for one of $5(1 - 4t^2)$ ; $(5 + 10t)(1 - 2t)$ ; $(5 - 10t)(1 + 2t)$
(b)	$(3y - 2x)(y + 3)$	2 *	<b>B1</b> for one of the partial factorisations $y(3y - 2x)$ ; $2x(y + 3)$ ; $3(3y - 2x)$ ; $3y(y + 3)$ ; or their negatives, seen.

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17 (a)	$57^\circ$	1	
(b)	$33^\circ$	1	
(c)	FT $180^\circ$ – their (a); or $123^\circ$	1 * <sup>h</sup>	
(d)	$220^\circ$	1	
18	<p>Correctly equating one pair of coefficients or expressing one variable in terms of the other.</p> <p>A correct method to eliminate one variable.</p> <p>Either <math>x = -4</math> or <math>y = 2</math> WWW.</p> <p>Both <math>x = -4</math> and <math>y = 2</math> WWW.</p>	<p>*</p> <p><b>M1</b></p> <p><b>M1</b></p> <p><b>A1</b></p> <p><b>A1</b></p>	<p>If [0] earned, then award <b>C1</b> for a pair of values that satisfies either equation.</p> <p>If only <b>M1 + 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.</p>
19 (a)	the point $P$ marked correctly	1	
(b)	the point $Q$ marked correctly	1	
(c)	$-a - 2b$ oe	2	<b>C1</b> for $-a$ ; or for $-2b$
20 (a)	$125^\circ$ to $129^\circ$	1	
(b) (i)	correct arc	1	
(ii)	correct straight line	1	
(iii)	$PD = 3.4$ to $3.8$ cm WWW	1 dep	Dependent on correct types of loci, that intersect.
21 (a)	$\begin{pmatrix} 0 & -5 \\ 7 & 9 \end{pmatrix}$	2	<b>C1</b> for 2 or 3 correct elements; or for 3 or 4 elements of $\begin{pmatrix} 12 & -1 \\ -1 & 9 \end{pmatrix}$ .
(b)	$\frac{1}{7}\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ ; or $\begin{pmatrix} \frac{3}{7} & \frac{1}{7} \\ -\frac{1}{7} & \frac{2}{7} \end{pmatrix}$ ; or any equivalent seen	2 *	<b>C1</b> for $\frac{1}{7}\begin{pmatrix} \cdot & \cdot \\ \cdot & \cdot \end{pmatrix}$ ; or for $k\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ , $k \neq \frac{1}{7}$
(c)	$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	1	

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22	(a)	10.4 or any equivalent	2 *	M1 for $\frac{v-4}{8} = \frac{8}{10}$ oe or B1 for 6.4 oe; or for 1.6 oe; seen
	(b)	80	2 *	C1 for 140 or M1 for $10 \times (4 + 12)/2$ oe
	(c)	Curve, concave upwards, from (0, 0) to (10, their(b))  Straight line from (10, their(b)) to (15, 60 + their(b))	1 ✓  1 ✓	independent  independent
23	(a)	7, 21	1	M1 for a sensible method, e.g. writing terms as $3 \times 1, 3 \times 4, 3 \times 9, \dots$ or B1 for $An^2 + Bn + C, A \neq 0$ from a valid method.
	(b)	$2n - 1$ oe	1	
	(c)	FT $3 \times$ their (b) provided this is a function of $n$ ; or $6n - 3$ oe	1 ✓	
	(d) (i)	48	1	
	(ii)	$3n^2$	2 *	
24	(a)	(9, 2)	1	In (b), if [0] scored for $x < 9$ and $y > 2$ then C1 for both $\{x \dots 9$ or $x \dots$ their(9)} and $\{y \dots 2$ or $y \dots$ their(2)}  In (c), if [0] scored then C1 for $a = 4$ and $b = 8$ ; or for $a = 6$ and $b = 3$ .
	(b)	$x < 9$ oe	1	
		$y > 2$ oe	1	
		$x - y > 3$ oe	1	
	(c)	$a = 8$	1	
$b = 4$		1		