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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2016**

MARK SCHEME

Maximum Mark: 70

Published

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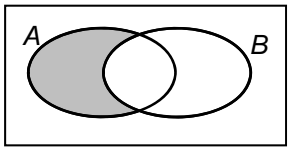
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Abbreviations

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	Mark	Part marks
1	17	**1**	
2	71000 cao	**1**	
3	10.3 oe	**2**	**M1** for $5x = 51.5$ oe
4	0.5 or $\frac{1}{2}$	**2**	**M1** for correct first step e.g. $6y + 6 = 9$ or $y + 1 = \frac{9}{6}$
5	$\frac{1}{12} \times \frac{6}{5}$ oe $\frac{1}{10}$ final answer cao	**M1** **A1**	Must be shown
6	Correct perpendicular bisector with 2 pairs of correct arcs	**2**	**B1** for correct bisector with no arcs or incorrect arcs or for correct intersecting arcs with no/wrong line
7	$8x^6$ final answer	**2**	**B1** for $8x^k$ or cx^6
8	$\frac{29}{90}$ oe, must be a fraction	**2**	**M1** for $32.\dot{2} - 3.\dot{2}$ or **B1** for $\frac{k}{90}$
9	$\frac{1}{4}\mathbf{a} - \frac{1}{4}\mathbf{b} - \frac{1}{4}\mathbf{c}$ oe	**2**	**B1** for $\overrightarrow{GK} = \mathbf{a} - \mathbf{b} - \mathbf{c}$ oe soi or $\overrightarrow{GL} = \frac{1}{4}(\overrightarrow{GK})$ or for any correct route
10	14	**2**	**M1** for $56 = 2\times2\times2\times7$ soi or $70 = 2\times5\times7$ soi or 2×7 as final answer
11 (a)	0.6 oe	**1**	
(b)	20 0.3 oe 0.3 oe	**2**	**B1** for 20 **B1** for 0.3 oe and 0.3 oe
12	110	**3**	**B2** for $ADC = 25$ or **B1** for $AEC = 135$ or $CAE = 25$

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Question	Answer	Mark	Part marks
13 (a)	72	**1**	
(b)	123	**2FT**	FT dep. on answer being obtuse **M1** for (360 – *their*(a) – 42) [÷2]
14 (a) (i)	8	**1**	
(ii)	9, 15	**1**	
(b)		**1**	
15	310 or 310.2 to 310.3	**3**	**M2** for $7^3 - \frac{1}{2}\times\frac{4}{3}\times\pi\times\left(\frac{5}{2}\right)^3$ or **M1** for $\frac{1}{2}\times\frac{4}{3}\times\pi\times\left(\frac{5}{2}\right)^3$ or **SC1** for $7^3 - \frac{4}{3}\times\pi\times\left(\frac{5}{2}\right)^3$ soi
16	90	**3**	**M1** for $y = k(x + 2)^2$ **A1** for $k = 2.5$ or **M2** for $\frac{(8+2)^2}{250} = \frac{(4+2)^2}{y}$ oe
17 (a)	10.4675 cao nfww	**2**	**B1** for 3.95 **or** 2.65 seen or **M1** for (4.0 – 0.05) × (2.7 – 0.05)
(b)	34 nfww	**2**	**B1** for 7.65 **or** 0.225 seen or **M1** for (7.6 + 0.05) ÷ (0.23 – 0.005)
18 (a)	2 cao	**2**	**M1** for rise/run attempted e.g. 4/2 or other correct method for finding gradient or **SC1** for $y = 2x - 1$ as answer
(b)	$y = 2x + 6$ oe	**2FT**	**FT** for $y =$ *their(a)*$x + 6$ **B1** for $y = mx + 6$ ($m \neq 0$ or 2) or $y = 2x$ [+ k] or $y =$ *their(a)*x [+ k] ($k \neq 6$) or for answer $2x + 6$ or answer *their(a)*$x + 6$
19 (a)	57 122	**2**	**M1** for $20\,000 \times (1+\frac{30}{100})^4$ oe
(b)	15	**2**	**M1** for two substitutions greater than 4 e.g. $20\,000 \times (1+\frac{30}{100})^k$ where $k > 4$

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Question	Answer	Mark	Part marks
20	$y < 4$ $y \geqslant 3$ $x \geqslant 2$ $y > x$	**4**	**B1** for each correct answer to a maximum of 3 marks. First two may be combined as a single inequality e.g. $3 \leqslant y < 4$ for **B2** After 0 scored **SC1** for use of = signs or incorrect inequality signs in all four equations
21 (a)	5	**2**	**M1** for $\frac{9}{k} = \frac{6 + 4.8}{6}$ oe
(b)	24	**3**	**M2** for $\sqrt[3]{\frac{2592}{1500}} \times 20$ oe or **M1** for $\sqrt[3]{\frac{2592}{1500}}$ or $\sqrt[3]{\frac{1500}{2592}}$
22 (a)	1.5 nfww	**2**	**B1** for 2.5 or 1
(b)	3.5	**2**	**B1** for 114 soi
(c)	18	**2**	**B1** for 102 soi
23 (a)	9.11 or 9.110…	**4**	**M3** for $\sqrt{5^2 + 3^2 + 7^2}$ or **M2** for $\sqrt{5^2 + 3^2}$ or $\sqrt{3^2 + 7^2}$ or $\sqrt{5^2 + 7^2}$ or **M1** for $5^2 + 3^2$ or $3^2 + 7^2$ or $5^2 + 7^2$
(b)	33.3 or 33.28 to 33.29	**3**	**M2** for sin = $\frac{5}{their(a)}$ oe or **B1** for identifying angle *ECH*

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