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Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0580 MATHEMATICS

0580/23 Paper 2 (Extended), maximum raw mark 70

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Abbreviations

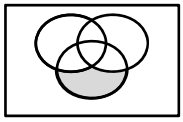
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Mark	Part Marks
1	168	**2**	**M1** for 240 ÷ (7 + 3) or better
2	$3x(3x-2)$ final answer	**2**	**B1** for $3(3x^2-2x)$ or $x(9x-6)$
3	66.4[2…]	**2**	**M1** for cos […=] $\frac{2}{5}$ oe
4	18.45 18.75	**1** **1**	If 0 scored, **SC1** for 6.15 **and** 6.25 seen or for correct answers reversed
5	$(2x+1)(x-3)$	**2**	**B1** for $(2x+a)(x+b)$, where $ab=-3$ or $a+2b=-5$
6	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	**2**	**B1** for one correct column
7	1.60 cao	**3**	**B2** for 1.597…. or 1.6 or **M1** for 2 ÷ 1.252
8	$\frac{15}{8}$ *their* $\frac{15}{8}\times\frac{9}{5}$ oe $\frac{27}{8}$ or $3\frac{3}{8}$ cao	**B1** **M1** **A1**	or $\frac{135}{72}$ or $\frac{135}{72}\div\frac{40}{72}$ or equivalent division with fractions with common denominators
9	2.8 oe	**3**	**M2** for $12+2=8x-3x$ or better or **M1** for $3x+12$ or $8x-2$
10	20.6 or 20.58 to 20.59	**3**	**M2** for $\frac{85-67.5}{85}\times100$ or $\left(1-\frac{67.5}{85}\right)\times100$ or **M1** for $\frac{85-67.5}{85}$ or $\frac{67.5}{85}\times100$ If zero scored **SC1** for $\frac{67.5-85}{85}\times100$

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Question	Answer	Mark	Part Marks
11	12.2 or 12.18 to 12.19	**3**	**M2** for $\frac{24\sin 30}{\sin 100}$ or **M1** for correct implicit equation e.g. $\frac{\sin 100}{24}=\frac{\sin 30}{BC}$
12 (a)	5	**3**	**M2** for $\frac{u\times 10}{2}+2u\times 10=125$ oe or **M1** for evidence that area represents distance e.g. $\frac{u\times 10}{2}$, $2u\times 10$ or $3u\times 10$
(b)	2	**1FT**	**FT** 10 ÷ *their u* correctly evaluated
13 (a)	$4x^9$ final answer	**2**	**B1** for answer kx^9 or $4x^k$ $(k\neq 0)$
(b)	$2y^{32}$ final answer	**2**	**B1** for answer ky^{32} or $2y^k$ $(k\neq 0)$
14	$\sqrt{1^2-4(2)(-2)}$	**B1**	If completing the square **B1** for $\left(x+\frac{1}{4}\right)^2$ oe
	If in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ $p=-1$, $r=2(2)$ or 4	**B1**	**B1** for $x=-\frac{1}{4}+\sqrt{1+\left(\frac{1}{4}\right)^2}$ or $x=-\frac{1}{4}-\sqrt{1+\left(\frac{1}{4}\right)^2}$
	– 1.28 0.78	**B1** **B1**	If **0** scored for the last two **B** marks then **SC1** for – 1.3 **and** 0.8 or – 1.281 to – 1.280 **and** 0.781 or 0.7807 to 0.7808 or 1.28 **and** – 0.78 or – 1.28 **and** 0.78 seen in the working
15 (a)	4.77 or 4.774 to 4.775	**2**	**M1** for 30 ÷ [2]π
(b)	35.7 or 35.8 or 35.74 to 35.82	**2**	**M1** for 0.5 × π × (*their* **(a)**)^2 or 0.5 × π × (30 ÷ 2π)^2

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Question	Answer	Mark	Part Marks
16 (a) (i)	14	**2**	**M1** for any two of 1, 11, 14, 4 correctly placed on Venn diagram or for $1 + 25 - x + x + 18 - x = 30$ oe
(ii)	$\frac{11}{30}$ oe	**1FT**	**FT** $\frac{25 - \textit{their}\ (\mathbf{a})(\mathbf{i})}{30}$ or $\frac{\textit{their}\ 11}{30}$ from diagram
(iii)	$\frac{11}{12}$ oe	**1FT**	**FT** their diagram e.g. $\frac{\textit{their}\ 11}{12}$ or $\frac{25 - \textit{their}\ (\mathbf{a})(\mathbf{i})}{12}$
(b)		**1**	
17 (a)	6	**1**	
(b)	2	**2**	**M1** for 7 identified as the UQ or 5 identified as the LQ or both lines drawn from the 150 and 50 across and down to the horizontal axis
(c)	180	**2**	**M1** for answer 20 or line or mark on graph indicating 20
18	912 or 912.2…	**5**	**M4** for $4 \times 0.5 \times 20 \times \sqrt{8^2 + 10^2} + 20 \times 20$ or better **or** **M3** for $4 \times 0.5 \times 20 \times \sqrt{8^2 + 10^2}$ or better **or** **M1** for $\sqrt{8^2 + 10^2}$ **and** **M1** for $0.5 \times 20 \times \sqrt{8^2 + 10^2}$ **and** **M1** for 20×20

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Question	Answer	Mark	Part Marks
19 (a) (i)	$-\mathbf{b} + \mathbf{a}$	1	
(ii)	$\mathbf{b} + \frac{1}{2}\mathbf{a}$	1	
(b)	$[\overrightarrow{OX} =]\ \mathbf{b} + \frac{1}{3}(-\mathbf{b} + \mathbf{a})$ oe	M1	
	$\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe	A1	
	2 statements from: $\overrightarrow{OM} = \mathbf{b} + \frac{1}{2}\mathbf{a}$ oe or $[\overrightarrow{OX} =]\ \frac{2}{3}(\mathbf{b} + \frac{1}{2}\mathbf{a})$ oe or $\overrightarrow{OX} = \frac{2}{3}\overrightarrow{OM}$ oe	B2	**B1** for any one of these statements
20	9.37 or 9.370 to 9.371	6	**M2** for $\sin[P] = \frac{38.5}{0.5 \times 9 \times 10}$ or **M1** for $0.5 \times 10 \times 9 \times \sin = 38.5$ **M3** for $\sqrt{(9^2 + 10^2 - 2\times9\times10 \times \cos(\textit{their } P))}$ or **M2** for $9^2 + 10^2 - 2\times9\times10 \times \cos(\textit{their } P)$ or **M1** for a correct implicit expression e.g. $\cos(\textit{their } P) = \frac{9^2 + 10^2 - RQ^2}{2 \times 9 \times 10}$ Note: 87.8, 87.81[…] or 87.7[55…] score 4 marks or M is foot of perpendicular from R to PQ **M2** for perp.ht = $38.5 \div \frac{1}{2} \times 10$ or 7.7 or **M1** for $\frac{1}{2} \times 10 \times$ […] = 38.5 **M1** for $PM = \sqrt{(9^2 - 7.7^2)}$[= 4.659… or 4.66] **M1** for $QM = 10 -$ *their* 4.659…[= 5.34…] **M1** for $QR = \sqrt{((\textit{their } QM)^2 + 7.7^2)}$

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