

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

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

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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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## Abbreviations

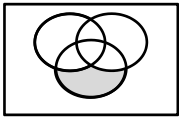
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part Marks
1	168	2	<b>M1</b> for $240 \div (7 + 3)$ or better
2	$3x(3x - 2)$ final answer	2	<b>B1</b> for $3(3x^2 - 2x)$ or $x(9x - 6)$
3	66.4[2...]	2	<b>M1</b> for $\cos [\dots] = \frac{2}{5}$ oe
4	18.45 18.75	1 1	If 0 scored, <b>SC1</b> for 6.15 <b>and</b> 6.25 seen or for correct answers reversed
5	$(2x + 1)(x - 3)$	2	<b>B1</b> for $(2x + a)(x + b)$ , where $ab = -3$ or $a + 2b = -5$
6	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	<b>B1</b> for one correct column
7	1.60 cao	3	<b>B2</b> for 1.597... or 1.6 or <b>M1</b> for $2 \div 1.252$
8	$\frac{15}{8}$  <i>their</i> $\frac{15}{8} \times \frac{9}{5}$ oe  $\frac{27}{8}$ or $3\frac{3}{8}$ cao	<b>B1</b>  <b>M1</b>  <b>A1</b>	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	<b>M2</b> for $12 + 2 = 8x - 3x$ or better or <b>M1</b> for $3x + 12$ or $8x - 2$
10	20.6 or 20.58 to 20.59	3	<b>M2</b> for $\frac{85 - 67.5}{85} \times 100$ or $\left(1 - \frac{67.5}{85}\right) \times 100$  or <b>M1</b> for $\frac{85 - 67.5}{85}$ or $\frac{67.5}{85} \times 100$  If zero scored <b>SC1</b> for $\frac{67.5 - 85}{85} \times 100$

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

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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 $\frac{25 - \text{their (a)(i)}}{30}$ or $\frac{\text{their } 11}{30}$ from diagram
(iii)	$\frac{11}{12}$ oe	1FT	FT their diagram e.g. $\frac{\text{their } 11}{12}$ or $\frac{25 - \text{their (a)(i)}}{12}$
(b)		1	
17 (a)	6	1	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
(b)	2	2	
(c)	180	2	
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 $20 \times 20$

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Question	Answer	Mark	Part Marks
19 (a) (i)	$-\mathbf{b} + \mathbf{a}$	1	B1 for any one of these statements
(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	
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 $\sqrt{(9^2 + 10^2 - 2 \times 9 \times 10 \times \cos(\text{their } P))}$ or M2 for $9^2 + 10^2 - 2 \times 9 \times 10 \times \cos(\text{their } P)$ or M1 for a correct implicit expression e.g. $\cos(\text{their } P) = \frac{9^2 + 10^2 - RQ^2}{2 \times 9 \times 10}$ Note: 87.8, 87.81[...] or 87.7[55...] score 4 marks or M is foot of perpendicular from R to PQ M2 for $\text{perp.ht} = 38.5 \div \frac{1}{2} \times 10$ or 7.7 or M1 for $\frac{1}{2} \times 10 \times [...] = 38.5$ M1 for $PM = \sqrt{(9^2 - 7.7^2)} [= 4.659... \text{ or } 4.66]$ M1 for $QM = 10 - \text{their } 4.659... [= 5.34...]$ M1 for $QR = \sqrt{((\text{their } QM)^2 + 7.7^2)}$