



MATHEMATICS

0580/22

Paper 2 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 70

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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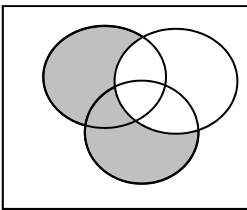
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Abbreviations

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 (a)	15000 cao	1	
(b)	1.5×10^4	1FT	FT <i>their</i> (a)
2	25	2	B1 for 67 or 113 seen once in correct position or M1 for $a + 42 = 67$ or $a + 42 + 113 = 180$ or better
3	21	2	M1 for $k - 8 = 13$ or $6k - 48 = 78$ or better
4	58	2	M1 for $\frac{(13+16) \times 4}{2}$ or $4 \times 13 + \frac{1}{2} \times 4 \times 3$ oe
5	$9y^3$ final answer	2	B1 for $9y^k$, $9 \times y^3$ or ky^3 ($k \neq 0$) as final answer
6	72.25 cao	2	M1 for $8 + 0.5$ or better seen
7	1, 2, 3	3	B2 for $t < 4$ or M1 for $2 + 6 > 3t - t$ oe or better If zero scored, SC1 for answer 0, 1, 2, 3 or 1, 2, 3, 4
8	correctly eliminating one variable [x =] 9 [y =] 3.5	M1 A1 A1	If zero scored, SC1 for 2 values satisfying one of the original equations SC1 if no working shown but 2 correct answers given
9	234 or 234.3 to 234.4	3	M2 for [dist =] $\frac{300}{\tan 52}$ oe or M1 for correct implicit trig statement allow M1 if they use <i>their</i> 52 or <i>their</i> 38 provided it is marked on the diagram or B1 for 52 or 38 correctly placed If zero scored, SC1 for final answer 384

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Question	Answer	Mark	Part marks
10	46.3 or 46.29 to 46.30	3	M2 for $53 \times \sqrt[3]{\frac{20}{30}}$ oe or M1 for $\sqrt[3]{\frac{20}{30}}$ or $\sqrt[3]{\frac{30}{20}}$ or $\left(\frac{53}{x}\right)^3 = \frac{30}{20}$ or better
11 (a)	Accurate angle bisector with correct arcs	2	B1 for accurate angle bisector or correct arcs with no/wrong line
(b)	Equidistant (oe) from AB and AC	1	
12 (a)	38	2	M1 for $57 \div (2 + 1)$ or better
(b)	12 : 7	2	M1FT for <i>their</i> $38 - 2$ and <i>their</i> $19 + 2$ seen dep on sum = 57 If M0 SC1 for answer 7 : 12
13 (a)	$m(m^2 + 1)$ final answer	1	B1 for $(x - 4)(x + 7)$ seen then spoiled or M1 for $(x + a)(x + b)$ where $ab = -28$ or $a + b = 3$ or for $x(x + 7) - 4(x + 7)$ or $x(x - 4) + 7(x - 4)$
(b)	$(5 - y)(5 + y)$ final answer	1	
(c)	$(x - 4)(x + 7)$ final answer	2	
14	Common denominator 24 Two correct from $\frac{18}{24}, \frac{16}{24}$ and $\frac{3}{24}$ oe $1\frac{7}{24}$ cao	B1 M1 A2	accept $k \times 24$ accept $\frac{18k}{24k}, \frac{16k}{24k}$ and $\frac{3k}{24k}$ A1 for $\frac{31}{24}$ or $\frac{31k}{24k}$ or $1\frac{7k}{24k}$
15 (a) (i)	9	1	
(ii)	12	1	
(b)	$\frac{5}{14}$	1	
(c)		1	

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Question	Answer	Mark	Part marks
16 (a)	$\begin{pmatrix} -7 \\ 3 \end{pmatrix}$	2	M1 for $\overline{CB} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$ or for correct route allow e.g. $BA - BC$, $CB + BA$
(b)	7.81 or 7.810....	2	M1 for $\sqrt{(-5)^2 + 6^2}$
17	1024 cao	5	B4 for 1023 to 1024.0... or 1020 or M3 for $\frac{125}{360} \times \pi \times 48^2 - \frac{125}{360} \times \pi \times 40^2 + 32 \times 8$ or M1 for $\frac{125}{360} \times \pi \times 48^2$ or $\frac{125}{360} \times \pi \times 40^2$ and M1 for $32 \times 8 + k\pi$ If B0 scored B1 for <i>their</i> more accurate decimal answer rounded correctly to an integer
18 (a)	Enlargement [s.f.] $\frac{1}{2}$ [centre] $(-1, 3)$	1 1 1	
(b)	Triangle at $(3, -1)$ $(5, -1)$ $(5, -5)$	3	M2 for 2 correct vertices on grid or in working or M1 for identifying matrix as a reflection in the x -axis or for $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 3 & 5 & 5 \\ 1 & 1 & 5 \end{pmatrix}$ oe
19 (a)	$\frac{1}{7} \begin{pmatrix} -4 & 3 \\ -5 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} -4 & 3 \\ -5 & 2 \end{pmatrix}$ or $\det = 7$ soi
(b)	6 nfww	4	M3 for $(w-6)^2 = 0$ or M2 for $w^2 - 12w + 36 [= 0]$ or M1 for $w(w-12) - 4 \times (-9) [= 0]$ oe or clear attempt at determinant = 0 oe

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Question	Answer	Mark	Part marks
20 (a)	$(7, 1)$	1	
(b)	-1.25 or $-\frac{5}{4}$ or $-1\frac{1}{4}$	2	M1 for rise/run
(c)	$y = \frac{4}{5}x + 2$ oe	3	B2 for $\frac{4}{5}x + 2$ or $y = \frac{-1}{\text{their}(\mathbf{b})}x + 2$ oe or M1 for $-\frac{1}{\text{their}(\mathbf{b})}$ oe or B1 for $\frac{4}{5}x$ seen or $[y =]mx + 2$ ($m \neq 0$)