



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**MATHEMATICS**

**0580/22**

Paper 2 (Extended)

**October/November 2016**

MARK SCHEME

Maximum Mark: 70

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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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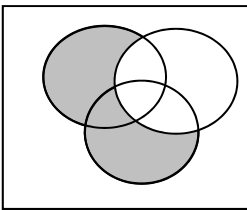
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**Abbreviations**

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

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

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Question	Answer	Mark	Part marks
16 (a)	$\begin{pmatrix} -7 \\ 3 \end{pmatrix}$	2	<b>M1</b> 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	<b>M1</b> for $\sqrt{(-5)^2 + 6^2}$
17	1024 cao	5	<b>B4</b> for 1023 to 1024.0... or 1020 or <b>M3</b> for $\frac{125}{360} \times \pi \times 48^2 - \frac{125}{360} \times \pi \times 40^2 + 32 \times 8$ or <b>M1</b> for $\frac{125}{360} \times \pi \times 48^2$ or $\frac{125}{360} \times \pi \times 40^2$ <b>and M1</b> for $32 \times 8 + k\pi$  If B0 scored <b>B1</b> 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	<b>M2</b> for 2 correct vertices on grid or in working or <b>M1</b> 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	<b>B1</b> for $k \begin{pmatrix} -4 & 3 \\ -5 & 2 \end{pmatrix}$ or $\det = 7$ soi
(b)	6 nfww	4	<b>M3</b> for $(w-6)^2 = 0$ or <b>M2</b> for $w^2 - 12w + 36 [= 0]$ or <b>M1</b> 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	<b>M1</b> for rise/run
(c)	$y = \frac{4}{5}x + 2$ oe	3	<b>B2</b> for $\frac{4}{5}x + 2$ or $y = \frac{-1}{\text{their}(\mathbf{b})}x + 2$ oe or <b>M1</b> for $-\frac{1}{\text{their}(\mathbf{b})}$ oe or <b>B1</b> for $\frac{4}{5}x$ seen or $[y = ]mx + 2$ ( $m \neq 0$ )