



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

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**MATHEMATICS**

**0580/22**

Paper 2 (Extended)

**May/June 2016**

MARK SCHEME

Maximum Mark: 70

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**Published**

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### Abbreviations

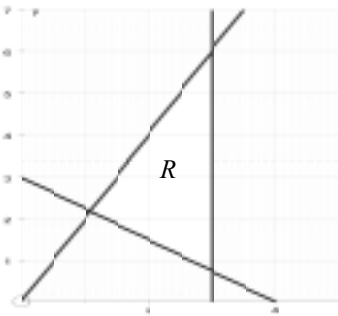
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1	$5.74 \times 10^{-5}$	1	
2	5.89 or 5.885 to 5.886	1	
3	3.590 cao	1	
4	Parallelogram	1	
5 (a)	9 and 16	1	
(b)	11	1	
6	$\frac{1}{8}x^2$ or $0.125x^2$ final answer	2	<b>B1</b> for answer $\frac{1}{8}x^k$ or $nx^2$
7	460	2	<b>B1</b> for $1 \text{ cm}^2 : 100 \text{ km}^2$ oe or <b>M1</b> for $4.6 \times 1\,000\,000^2 \div 100\,000^2$ oe seen
8	$x > -9$	2	<b>M1</b> for $\frac{x}{3} > 2 - 5$ oe or $\left(\frac{x}{3} + 5\right) \times 3 > 2 \times 3$ oe
9	45	3	<b>M2</b> for $360 \div (180 - 172)$ or <b>M1</b> for $180 - 172$ or $\frac{180(n-2)}{n} = 172$ oe
10	$p = \frac{8r-5}{r-3}$ oe final answer	3	<b>M1</b> for correctly collecting terms in $p$ on one side and terms not in $p$ on the other side <b>M1</b> for correct factorising <b>M1</b> for correct division dependent on $p$ appearing only once in a factorised expression Maximum M2 for an incorrect final answer
11	68 76 78 78	3	<b>B1</b> for four values with a mode of 78 <b>B1</b> for four values with a median of 77 <b>B1</b> for total of four values is 300

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Question	Answer	Mark	Part marks
12	$\frac{11}{30}$ cao	3	<b>B2</b> for $\frac{33}{90}$ oe as final answer or <b>M1</b> for $36.\dot{6} - 3.\dot{6}$ or $36.6^r - 3.6^r$ oe or <b>B1</b> for $\frac{k}{90}$
13	10 cao nfw	3	<b>M2</b> for $42.5 \times 2 \div 8.5$ allowing one error in the UB or LB provided it is still $UB \times 2 \div LB$ or <b>M1</b> for one of 42.5 or 8.5 seen as bounds
14	$\frac{21}{8} \times \frac{3}{7}$ oe $1\frac{1}{8}$ cao final answer	<b>M1</b> <b>A2</b>	Must be shown <b>A1</b> for $\frac{9}{8}$ oe e.g. $\frac{63}{56}$
15	$a = 3.5$ or $\frac{7}{2}$ <b>and</b> $b = -17.25$ or $-\frac{69}{4}$	3	<b>B2</b> for one correct or <b>M2</b> for $(x + \frac{7}{2})^2 - 5 - (\frac{7}{2})^2$ or <b>M1</b> for $(x + \frac{7}{2})^2$ oe or $2a = 7$ or $a^2 + b = -5$ after $x^2 + 2ax + a^2$
16	Correctly eliminating one variable $x = 4$ $y = 0.5$ oe	<b>M1</b> <b>A1</b> <b>A1</b>	If zero scored <b>SC1</b> for 2 values satisfying one of the original equations or if no working shown, but 2 correct answers given
17 (a)	Bisector of angle $B$ accurate with two pairs of correct arcs	2	<b>B1</b> for accurate line with no/wrong arcs or for correct arcs with no/wrong line
(b)	Ruled line parallel to $AC$ at a distance of 3 cm to $AC$ only inside the triangle	1	
18 (a)	$3n + 13$ oe final answer	2	<b>M1</b> for $3n + c$ or $kn + 13$
(b)	$3^{n-1}$ oe final answer	2	<b>M1</b> for recognition of terms being powers of 3
19 (a)	7.74 or 7.738 to 7.739 [ billion]	2	<b>M1</b> for $7.23 \times \left(1 + \frac{1.14}{100}\right)^6$
(b)	2042	2	<b>B1</b> for 28 or 28.6...or 29 or answer 2043

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Question	Answer	Mark	Part marks
20 (a)	240	2	<b>M1</b> for any three pairs of products from $2.5 \times 12, 2.5 \times 26, 5 \times 15, 5 \times 10, 10 \times 2$
(b)	29.2 or 29.16 to 29.17	2	<b>M1</b> for $(5 \times 10 + 10 \times 2) / \text{their (a)}$ or for their total of the bars above 10 minutes $\div$ their (a)
21	62 on answer line or clearly identified as $\angle ACB$  <b>and</b>  two correct supporting reasons	4	<b>B1</b> for $\angle AOB = 124$ or for $\text{their } \angle AOB \div 2$ or other appropriate correct angle one step from $\angle ACB$ <b>B1</b> for any correct reason e.g. isosceles triangle <b>or</b> angles in triangle = 180 <b>B1</b> for a different correct reason leading directly to $\angle ACB$ e.g. angle at circumference is $\frac{1}{2}$ angle at centre <b>or</b> <b>B1</b> for 62
22 (a)	$\begin{pmatrix} 20 & 4 \\ -12 & -8 \end{pmatrix}$	1	
(b)	$\begin{pmatrix} 22 & 3 \\ -9 & 1 \end{pmatrix}$	2	<b>B1</b> for two correct elements
(c)	$-\frac{1}{7} \begin{pmatrix} -2 & -1 \\ 3 & 5 \end{pmatrix}$ <b>or</b> $\text{isw}$	2	<b>M1</b> for $-\frac{1}{7} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ <b>or</b> $k \begin{pmatrix} -2 & -1 \\ 3 & 5 \end{pmatrix}$ or $\det = -7$ <b>or</b> $\text{soi}$
23	Correct shading with three ruled accurate solid boundary lines 	5	<b>B2</b> for $3x + 4y = 12$ line through (0, 3) and (4, 0) or <b>B1</b> for a diagonal line through one of these points <b>B1</b> for $y = 2x$ line through (0, 0) and (1, 2) or through (1, 2) and (3, 6) <b>B1</b> for $x = 3$ line

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Question	Answer	Mark	Part marks
24 (a)	$\mathbf{a + b - c}$	1	
(b)	$\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{c}$	2	<b>M1</b> for $\mathbf{c} + \frac{1}{2}$ ( <i>their</i> (a)) or for a correct route e.g. $\overline{OC} + \frac{1}{2}\overline{CB}$ , $\overline{OQ}$
(c)	$\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a} - \frac{1}{6}\mathbf{b}$	2	<b>M1</b> for $\frac{1}{3}\mathbf{b} - \frac{1}{2}$ ( <i>their</i> (a)) or other correct route e.g. $-\frac{2}{3}\mathbf{b} - \mathbf{a} +$ <i>their</i> (b), $\overline{PO} + \overline{OQ}$