Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2016**

MARK SCHEME

Maximum Mark: 70

Published

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

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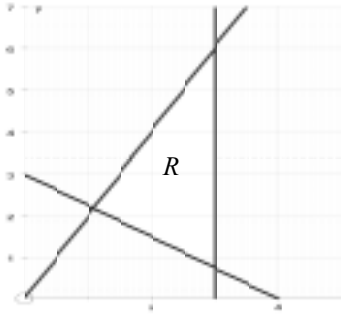
This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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	5.74×10^{-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**	**B1** for answer $\frac{1}{8}x^k$ or nx^2
7	460	**2**	**B1** for 1 cm^2 : 100 km^2 oe or **M1** for $4.6 \times 1\,000\,000^2 \div 100\,000^2$ oe seen
8	$x > -9$	**2**	**M1** for $\frac{x}{3} > 2 - 5$ oe or $\left(\frac{x}{3} + 5\right) \times 3 > 2 \times 3$ oe
9	45	**3**	**M2** for $360 \div (180 - 172)$ or **M1** for $180 - 172$ or $\frac{180(n-2)}{n} = 172$ oe
10	$p = \frac{8r-5}{r-3}$ oe final answer	**3**	**M1** for correctly collecting terms in p on one side and terms not in p on the other side **M1** for correct factorising **M1** 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**	**B1** for four values with a mode of 78 **B1** for four values with a median of 77 **B1** for total of four values is 300

Question	Answer	Mark	Part marks
12	$\frac{11}{30}$ cao	**3**	**B2** for $\frac{33}{90}$ oe as final answer or **M1** for $36.\dot{6} - 3.\dot{6}$ or $36.6^{r} - 3.6^{r}$ oe or **B1** for $\frac{k}{90}$
13	10 cao nfww	**3**	**M2** for $42.5 \times 2 \div 8.5$ allowing one error in the UB or LB provided it is still UB × 2 ÷ LB or **M1** 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	**M1** **A2**	Must be shown **A1** for $\frac{9}{8}$ oe e.g. $\frac{63}{56}$
15	$a = 3.5$ or $\frac{7}{2}$ **and** $b = -17.25$ or $-\frac{69}{4}$	**3**	**B2** for one correct or **M2** for $(x + \frac{7}{2})^2 - 5 - \left(\frac{7}{2}\right)^2$ or **M1** 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	**M1** **A1** **A1**	If zero scored **SC1** 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**	**B1** 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**	**M1** for $3n + c$ or $kn + 13$
(b)	3^{n-1} oe final answer	**2**	**M1** for recognition of terms being powers of 3
19 (a)	7.74 or 7.738 to 7.739 [billion]	**2**	**M1** for $7.23 \times \left(1 + \frac{1.14}{100}\right)^6$
(b)	2042	**2**	**B1** for 28 or 28.6…or 29 or answer 2043

Question	Answer	Mark	Part marks
20 (a)	240	**2**	**M1** for any three pairs of products from 2.5×12, 2.5×26, 5×15, 5×10, 10×2
(b)	29.2 or 29.16 to 29.17	**2**	**M1** for $(5 \times 10 + 10 \times 2)$ / *their* (a) or for their total of the bars above 10 minutes ÷ *their* (a)
21	62 on answer line or clearly identified as $<ACB$ **and** two correct supporting reasons	**4**	**B1** for $<AOB = 124$ or for *their* $<AOB \div 2$ or other appropriate correct angle one step from $<ACB$ **B1** for any correct reason e.g. isosceles triangle **or** angles in triangle = 180 **B1** for a different correct reason leading directly to $<ACB$ e.g. angle at circumference is ½ angle at centre oe **B1** for 62
22 (a)	$\begin{pmatrix} 20 & 4 \\ -12 & -8 \end{pmatrix}$	**1**	
(b)	$\begin{pmatrix} 22 & 3 \\ -9 & 1 \end{pmatrix}$	**2**	**B1** for two correct elements
(c)	$-\frac{1}{7}\begin{pmatrix} -2 & -1 \\ 3 & 5 \end{pmatrix}$ oe isw	**2**	**M1** for $-\frac{1}{7}\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ or $k\begin{pmatrix} -2 & -1 \\ 3 & 5 \end{pmatrix}$ or det = –7 soi
23	Correct shading with three ruled accurate solid boundary lines  	**5**	**B2** for $3x + 4y = 12$ line through (0, 3) and (4, 0) or **B1** for a diagonal line through one of these points **B1** for $y = 2x$ line through (0, 0) and (1, 2) or through (1, 2) and (3, 6) **B1** for $x = 3$ line

Question	Answer	Mark	Part marks
24 (a)	$\mathbf{a} + \mathbf{b} - \mathbf{c}$	1	
(b)	$\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{c}$	2	**M1** for $\mathbf{c}$ + ½ (*their* (a)) or for a correct route e.g. $\overrightarrow{OC} + \frac{1}{2}\overrightarrow{CB}$, $\overrightarrow{OQ}$
(c)	$\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a} - \frac{1}{6}\mathbf{b}$	2	**M1** for $\frac{1}{3}\mathbf{b} - \frac{1}{2}$ (*their* (a)) or other correct route e.g. $-\frac{2}{3}\mathbf{b} - \mathbf{a}$ + *their* (b), $\overrightarrow{PO} + \overrightarrow{OQ}$