

Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

MATHEMATICS

Paper 2 (Extended)

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.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

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



Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0580	22

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 $4.6 \times 1000000^2 \div 100000^2$ 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

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0580	22

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 \times 2 \div LB or M1 for one of 42.5 or 8.5 seen as bounds
14	$\frac{21}{8} \times \frac{3}{7}$ oe	M1	Must be shown
	$1\frac{1}{8}$ cao final answer	A2	A1 for $\frac{9}{8}$ oe e.g. $\frac{63}{56}$
15	$a = 3.5 \text{ or } \frac{7}{2}$ and $b = -17.25 \text{ or } -\frac{69}{4}$	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) (b)	Bisector of angle <i>B</i> accurate with two pairs of correct arcs Ruled line parallel to <i>AC</i> at a distance of 3 cm to <i>AC</i> only inside the triangle	1	B1 for accurate line with no/wrong arcs or for correct arcs with no/wrong line
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 28.6or 29 or answer 2043

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0580	22

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 \div their (a)
21	62 on answer line or clearly identified as <acb and="" correct="" reasons<="" supporting="" td="" two=""><td>4</td><td>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 $\frac{1}{2}$ angle at centre oe B1 for 62</td></acb>	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 $\frac{1}{2}$ 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

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0580	22

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 $\mathbf{c} + \frac{1}{2}$ (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), $\overrightarrow{PO} + \overrightarrow{OQ}$