Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 130

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 International will not enter into discussions about these mark schemes.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

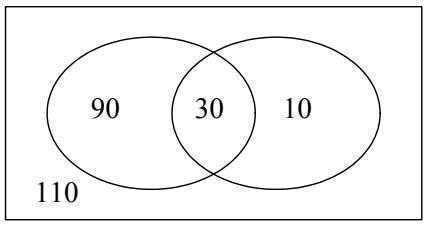
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Abbreviations

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	Marks	Partial Marks
1(a)(i)	Image at (1, 7), (4, 7), (4, 9), (3, 9)	**2**	**B1** for translation by $\begin{pmatrix}-1\\k\end{pmatrix}$ or $\begin{pmatrix}k\\6\end{pmatrix}$
1(a)(ii)	Image at (5, 3), (6, 3), (8, 5), (5, 5)	**2**	**B1** for 180° rotation with wrong centre
1(a)(iii)	Rotation 180° (4.5, 6) OR Enlargement, [factor] – 1 (4.5, 6)	**3**	**B1** for rotation **B1** for 180° **B1FT** for centre from *their* (a)(i) **B1** for enlargement **B1** for – 1 **B1FT** for centre from *their* **(a)(i)**
1(b)(i)	Image at (1, 2), (1, 5), (3, 5), (3, 4)	**2**	**B1** for $y = x$ drawn or for 3 correct points
1(b)(ii)	$\begin{pmatrix}0 & 1\\1 & 0\end{pmatrix}$	**2**	**B1** for one correct row or one column within a 2 by 2 matrix
2(a)	2, 2, 6	**3**	**B1** for each
2(b)	Correct graph	**4**	**B3FT** for 10 or 11 correct plots or **B2FT** for 8 or 9 correct plots or **B1FT** for 6 or 7 correct plots
2(c)	–3.3 to –3.1	**1**	**FT** *their* graph
2(d)	$y = -2x$ ruled	**M1**	or **B1** for $y = -2x$ stated
	–2.6 to –2.45	**A1**	
2(e)	3 or 4 or 5	**1**	**FT** *their* graph Allow more than one correct value

Question	Answer	Marks	Partial Marks
3(a)	530	**4**	**B3** for $[DE] = 130$ m and $[DC] = 80$ m or **B2** for $[DE] = 130$ m or $[DC] = 80$ m or **M1** for $50^2 + 120^2$ or $170^2 - 150^2$
3(b)	52.9 or 52.89…	**4**	**M2** for $\frac{100^2 + 150^2 - 120^2}{2 \times 100 \times 150}$ or **M1** for $120^2 = 100^2 + 150^2 - 2 \times 100 \times 150\cos(\ldots)$ **A1** for 0.603 or 0.6033…or $\frac{181}{300}$
3(c)(i)	28.1 or 28.07…	**2**	**M1** for $\cos = \frac{15}{17}$ oe
3(c)(ii)	331.9 or 331.9…	**2**	**FT** 360 – *their* **(c)(i)** **M1** for 360 – *their* **(c)(i)** oe
3(d)	1.5[0] or 1.498… nfww	**4**	**M1** for $\frac{1}{2} \times 50 \times 120$ oe **M1** for $\frac{1}{2} \times 100 \times 150 \sin(\textit{their}\textbf{(b)})$ oe **M1** for $\frac{1}{2} \times 150 \times \textit{theirCD}$ oe or $\frac{1}{2} \times 150 \times 170 \times \sin \textit{their}\textbf{(c)(i)}$ If 0 scored, **SC1** for dividing *their* area by 10 000
4(a)(i)	range = 7	**1**	
	mode = 21	**1**	
	median = 22.5	**2**	**M1** for evidence of middle value
	mean = 22.7 or 22.71…	**2**	**M1** for use of $\Sigma x \div 14$
4(a)(ii)	$\frac{3}{14}$ oe	**1**	
4(b)	$x - n + 1$ final answer	**3**	**M2** for $nx - (n-1)(x+1)$ or **M1** for $(n-1)(x+1)$
4(c)(i)	16.6 or 16.60 to 16.61 nfww	**4**	**M1** for 5, 12.5, 17.5, 22.5, 30 soi **M1** for Σfx where x is in correct interval, including boundaries **M1 dep** on second M1 for $\frac{\Sigma fx}{50 + 85 + 100 + 120 + 10}$

Question	Answer	Marks	Partial Marks
4(c)(ii)	Correct histogram	**4**	**B1** for each correct block If 0 scored, **SC1** for 5, 20, 24, 1 seen
5(a)	4.73 or 4.730 to 4.731...	**3**	**M2** for $3 \times 1.2 + \pi \times 0.6^2$ oe or **M1** for $\pi \times 0.6^2$ or $\frac{1}{2} \times \pi \times 0.6^2$ or 3×1.2
5(b)	946 or 946.0 to 946.2...	**3**	**M2** for *their* **(a)** $\times 0.2 \times 1000$ oe or **M1** for *their* **(a)** $\times 0.2$ or 20 implied by figs 946[0] to 9462
5(c)	1.28 or 1.29 or 1.284 to 1.290	**3**	**M2** for $\frac{(1007 - \textit{their}(\mathbf{b})) \div 1000}{\textit{their}(\mathbf{a})} \times 100$ oe or for $\frac{1007 - \textit{their}(\mathbf{b})}{\textit{their}(\mathbf{b})} \times 20$ oe or **M1** for figs$\frac{1007 - \textit{their}(\mathbf{b})}{\textit{their}(\mathbf{a})}$ or figs$\frac{1007}{\textit{their}(\mathbf{a})}$ or for $\frac{1007 - \textit{their}(\mathbf{b})}{\textit{their}(\mathbf{b})}$ or $\frac{1007}{\textit{their}(\mathbf{b})} \times 20$ oe
6(a)		**2**	**B1** for any one correct
6(b)	110	**1**	**FT** *their* 110 in Venn diagram
6(c)	$\frac{10}{240}$ oe	**1**	**FT** $\frac{\textit{their}10}{240}$

Question	Answer	Marks	Partial Marks
6(d)	$\frac{870}{1560}$ oe	**3**	**M2** for $\frac{their30}{40}\times\frac{their30-1}{39}$ or **M1** for $\frac{p}{q}\times\frac{p-1}{q-1}$ $p<q$ or for $\frac{their30}{40}$ soi
7(a)(i)	1.991×10^3	**4**	**B3** for 1991 or 1.99×10^3 or $1.991\ldots\times10^3$ or **B2** for 1990 or 1991. … OR **M1** for $104.3\times26.5+\frac{1}{2}\times(-2.2)\times26.5^2$ oe **B1** for *their* seen value correctly rounded to 4 sf **B1** for *their* seen value correctly converted into standard form
7(a)(ii)	$\frac{2(s-ut)}{t^2}$ oe final answer	**3**	**M1** for correct multiplication by 2 oe **M1** for correct rearrangement to isolate term with a **M1** for correct division by t^2 for 3 marks e.g. cannot have a fraction in denominator nor $\div t^2$ in numerator
7(b)(i)	$(2x+3)(x-1)-(x+1)(x-2)=62$	**M1**	
	$2x^2+3x-2x-3$ oe or $x^2+x-2x-2$ oe	**B1**	
	$x^2+2x-63=0$	**A1**	Established with no errors or omissions
7(b)(ii)	$(x+9)(x-7)$	**2**	**B1** for $(x+a)(x+b)$ where $ab=-63$ or $a+b=2$ or for $x(x-7)+9(x-7)$ or for $x(x+9)-7(x+9)$
7(b)(iii)	20	**2**	**FT** $2\times$ *their* positive root $+6$ **M1** for substituting *their* positive root into four lengths or for stating $2x+6$

Question	Answer	Marks	Partial Marks
8(a)	6 nfww	**3**	**M2** for $\frac{2.65-2.50}{2.50}[\times 100]$ or for $\frac{2.65}{2.50}\times 100$ or **M1** for $\frac{2.65}{2.50}$
8(b)	552.5[0]	**3**	**B2** for 52.5[0] or **M2** for $500\times\frac{1.5}{100}\times 7+500$ oe or **M1** for $500\times\frac{1.5}{100}$ [× 7] oe
8(c)	37.4 or 37.36…	**2**	**M1** for $\left(1+\frac{1.6}{100}\right)^{20}$ oe soi 1.37…
8(d)	4[.00...]	**3**	**M2** for $\sqrt[22]{\frac{2607}{6400}}$ or **M1** for $6400\times x^{22}=2607$ oe or better
9(a)	82	**2**	**M1** for $(3^x)^2+1$ soi by $(3^2)^2+1$ or g(9) isw
9(b)	$\frac{x+2}{7}$ final answer	**2**	**M1** for $y+2=7x$ or $\frac{y}{7}=x-\frac{2}{7}$ or $x=7y-2$
9(c)	[a =] 1, [b =] 2, [c =] 2	**3**	**B2** for $x^4+x^2+x^2+1+1$ or **M1** for $(x^2+1)^2+1$
9(d)	$\frac{6}{7}$ oe	**3**	**M2** for $7x-2=4$ or **M1** for $3^x=81$ soi f(x) = 4 or for $3^{7x-2}=81$ or better
10(a)	10	**1**	
10(b)	6.2[0] or 6.203 to 6.204	**3**	**M2** for [x^3 =] $1000\div\frac{4}{3}\pi$ oe or better or **M1** for $\frac{4}{3}\pi x^3=1000$
10(c)	7.82 or 7.815 to 7.816	**4**	**B3** for $[x^3=]1000\div\frac{1}{3}\pi\div 2$ oe or better or **M1** for $\left(x\sqrt{5}\right)^2-x^2$ soi by $4x^2$ or $2x$ **M1dep** for $\frac{1}{3}\pi\times x^2\times$ *theirh*[=1000]

Question	Answer	Marks	Partial Marks
10(d)	$6\frac{2}{3}$ or 6.67 or 6.666 to 6.667	**4**	**B3** for $[x^3 =]1000 \div \frac{27}{8}$ oe or $\frac{3x}{2} = 10$ or better or **M2** for $\frac{1}{2} \times x \times \frac{x}{2} \times \frac{27x}{2} = 1000$ oe or **M1** for $\frac{1}{2} \times x \times \frac{x}{2}$ If 0 scored, **SC2** for answer 5.29 or 5.291..
11	[Total time =]16 h 6 min or 16.1 h	**2**	**B1** for 22 h 6 min or 22.1h or 966 mins If 0 scored, **SC1** for 9 h 41 min
	[Distance to airport in New York =] 16.5	**2**	**M1** for 18×55
	[Arc length =] 6200 or 6199 to 6200. …	**3**	**M2** for $\frac{55.5}{360} \times 2 \times \pi \times 6400$ or **M1** for $\frac{55.5}{360}$ or $2 \times \pi \times 2400$
	[Distance Geneva to Chamonix =] 104	**2**	**M1** for 65×1.6 or 65×96 oe
	392 to 393	**2**	**M1** for $\frac{6316 \text{ to } 6322.4}{\textit{their}\,16.1}$ Must be correct value in numerator