Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education (9–1)

MATHEMATICS **0626/06**

Paper 6 **October/November 2019**

MARK SCHEME

Maximum Mark: 96

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.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England as a Cambridge International Level 1/Level 2 (9–1) Certificate.

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.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

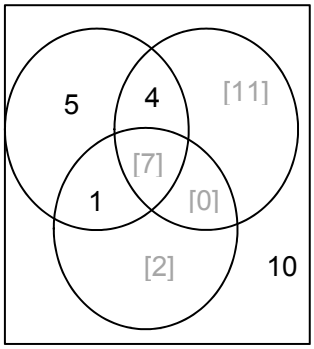
When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation '**dep**' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	$\frac{1}{2}(x+x+4)(x-1)$ oe	**M1**	
	$(x+2)(x-1)=108$ or $(2x+4)(x-1)=216$	**M1**	
	$x^2+2x-1x-2=108$ or $2x^2+4x-2x-4=216$	**M1**	correct expansion of *their* brackets, allow one error or omission
	correct completion to $x^2+x-110=0$	**A1**	All correct with no errors seen
1(b)	–11 and +10 with correct factorisation seen	**3**	**M2** for $(x+11)(x-10)$ or **M1** for $(x+a)(x+b)$ where $ab=-110$ or $a+b=1$ After M1, **SC1** for $x=-their\,a$ and $x=-their\,b$ If 0 scored, **SC1** for both correct answers.
1(c)	9	**1**	**FT** provided 2 values of different signs are given for x in **(b)**.
2(a)	$2x+5y=20$ or $y=\frac{-2}{5}x+4$ or equivalent 3 term equation	**3**	**B1** for $-\frac{4}{10}$ **M1** for $y=\pm\frac{4}{10}x+c$ or, e.g. $(y-4)=\pm\frac{4}{10}(x-0)$
2(b)(i)	21.8 or 21.80…	**2**	**M1** for $\tan[...]=\frac{4}{10}$ or $\tan[...]=\frac{10}{4}$
2(b)(ii)	2.6[0] or 2.599…	**3**	**B1** for using correct right-angled triangle soi, e.g. marked on diagram. **M1FT** for $\sin(their(b)(i))=\frac{d}{7}$ oe
3(a)	624	**3**	**M2** for $\frac{642.72}{1.03}$ oe or **M1** for 642.72 associated with 103[%]

Question	Answer	Marks	Partial Marks
3(b)	15.8	**4**	**M3** for $\frac{1000\times1.36}{1000\times1.174}\times100[-100]$ oe soi by 116 or 115.8 or 15.8 or 15.84… or **M2** for $\frac{1000\times1.36}{1.174}$ soi by 1158 or 1160… or **M1** for 1000×1.36
3(c)	6 with supporting evidence	**4**	**M2** for calculating correctly either 400×1.02^n or 390×1.025^n for $n \geqslant 3$ oe or **M1** if $n = 2$ calculated correctly for either or **M1** for 400×1.02^n and 390×1.025^n both soi **M1** for calculating correctly both investments for a value of n, $n \geqslant 3$ Alternative method: **M2** for calculating correctly $\frac{1.025^n}{1.02^n}$ for $n \geqslant 3$ oe or **M1** if $n = 2$ calculated correctly or **M1** for $\frac{1.025^n}{1.02^n}$ and $\frac{400}{390}$ both soi **M1** for $1.0256[4\ldots]$
3(d)(i)	612.49	**3**	**B1** for 604 and **B1** for 608.16
3(d)(ii)	500	**1**	
	their investment will decrease oe	**1**	dep on *their* (d)(ii) $\leqslant 500$
4(a)	30	**2**	**M1** for $\frac{360}{12}$
4(b)(i)	Parallelogram constructed with arcs	**2**	**M1** for one pair of correct intersecting arcs drawn

Question	Answer	Marks	Partial Marks
4(b)(ii)	Circle drawn with correct constructions shown	**3**	**M2** for correct perpendicular bisector for 2 of the other points with correct arcs or **M1** for correct perpendicular bisector with incorrect or no arcs or for 2 correct pairs of arcs seen. **A1** for correct circle dependent on at least M1 If 0 scored **SC1** for correct circle
5(a)(i)		**3**	**B2** for three numbers correctly placed or **B1** for two numbers correctly placed.
5(a)(ii)	12	**1**	**FT** 7 + *their* (4+1)
5(a)(iii)	13	**1**	
5(b)(i)	$(F \cap G)'$ oe	**1**	
5(b)(ii)	$(P \cup Q) \cap R$ oe	**1**	
6(a)	$y \geqslant 2$ oe $x + y \geqslant 9$oe	**2**	**B1** for each
6(b)	$400x + 700y \leqslant 5600$ oe	**1**	
6(c)	4 correct, continuous, ruled lines drawn and correct region left unshaded	**6**	**B1** for $x = 4$ drawn **B1FT** for *their* $y = 2$ drawn dep on $y = k$ **B1FT** for *their* $x + y = 9$ drawn dep on *their* $x + y = k$ oe **B2FT** for *their* $4x + 7y = 56$ drawn dep on *their* $4x + 7y = k$ or **SC1FT** for line with negative gradient passing through one of *their* intercepts (14, 0) or (0, 8)
6(d)	12	**1**	

Question	Answer	Marks	Partial Marks
6(e)	5, 5 27.5[0]	**2**	**B1** for 5,5 or for 27.5[0] If 0 scored **SC1** for clear use of $[P=]1.5x+4y$ for a point in *their* region.
7(a)	349 or 349.0 to 349.11…	**2**	**M1** for $\left[\frac{64}{360}\times\right]\pi\times25^2$
7(b)	48.1 or 48.06…	**4**	**B1** for 148° or 74° or 16° seen on diagram or used. **M2** for $\frac{25\sin148}{\sin16}$ or **M1** for $\frac{\sin16}{25}=\frac{\sin148}{x}$ oe OR **M2** for $\sqrt{25^2+25^2-2\times25\times25\cos148}$ or **M1** for $25^2+25^2-2\times25\times25\cos148$ OR **M2** for $2\times25\times\sin74$ oe or **M1** for $\sin74=\frac{x}{25}$ oe
7(c)	166 or 165.5 to 165.6	**2**	**M1** for $\frac{1}{2}\times25\times25\times\sin148$ or for $\frac{1}{2}\times25\times\textit{their}\,7(b)\times\sin16$
7(d)	35.2 or 35.17 to 35.3	**4**	**M3** for $\textit{their}\ 7(a)+2\times\textit{their}(c)-\frac{32}{360}\times\pi\times\textit{their}\,7(b)^2$ or **M2** for $\frac{32}{360}\times\pi\times\textit{their}\,7(b)^2$ or for two of the M1 cases or **M1** for $\textit{their}\ 7(a)+2\times\textit{their}(c)$ or $k\times\pi\times\textit{their}\,7(b)^2$ or $BOC=32°$
8(a)	Two correct limitations with improvement	**2**	**B1** for each
8(b)	20, 60, 50, 80	**2**	**B1** for two correct

Question	Answer	Marks	Partial Marks
8(c)	1580	**4**	**M1** for midpoints soi (375, 750, 1250, 2000, 3000) **M1** for use of $\sum fx$ with x in correct interval including both boundaries $20\times375+60\times750+50\times1250+$ $80\times2000+40\times3000$ **M1** (dep on 2nd M1) for $\sum fx\div250$
8(d)(i)	Correct graph	**4**	**B1** for 6 points plotted at upper ends of intervals **B1FT** from *their* frequency table for heights of 0, 20, 80, 130, 210, 250 **B1FT** for increasing curve or polygon through 5 or 6 points
8(d)(ii)	1350 – 1400	**2**	**FT** *their* cumulative frequency diagram **M1** for correct UQ or LQ for *their* cumulative frequency diagram
9(a)	$3x^2-6x$	**2**	**M1** for ax^2-bx or **B1** for $3x^2$ or $-6x$
9(b)(i)	(0, 0) (2, –4)	**4**	**M1** for *their* $ax^2-bx=0$ **M1** for $x=0$ and $x=\frac{theirb}{theira}$ or $x(ax-b)=0$ **A1** for $x=0$ and $x=2$ or (0, 0) dep on first M1 seen or(2, –4) dep on first M1 seen

Question	Answer	Marks	Partial Marks
9(b)(ii)	(0, 0) maximum (2, −4) minimum with supporting evidence	**3**	**M1FT** for $\left[\frac{d^2y}{dx^2} =\right] 6x - 6$ or *their* $2ax - b$ **A1** for $x = 0$ $\left[\frac{d^2y}{dx^2} =\right] -6 < 0$ therefore maximum **A1** for $x = 2$ $\left[\frac{d^2y}{dx^2} =\right] 6 > 0$ therefore minimum Alternative method **M1FT** for considering $\frac{dy}{dx}$ both sides of $x = 0$ or $x = 2$ **A1** for $x = 0$ is a maximum with valid points tested correctly **A1** for $x = 2$ is a minimum with valid points tested correctly
9(c)	$1 \pm \sqrt{3}$	**3**	**M1FT** for $3x^2 - 6x = 6$ or *their* $\frac{dy}{dx} = 6$, dep on *their* $\frac{dy}{dx}$ being a function of x. **M1FT** for $\frac{6 + \sqrt{(-6)^2 - 4 \times 3 \times (-6)}}{2 \times 3}$ or $\frac{6 - \sqrt{(-6)^2 - 4 \times 3 \times (-6)}}{2 \times 3}$ or better, dep on *their* $\frac{dy}{dx}$ being quadratic