Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 120

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.

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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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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.

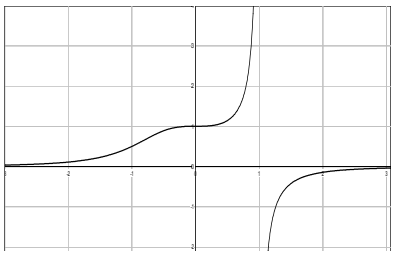
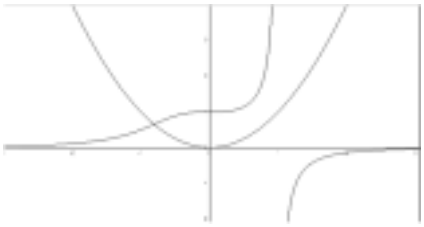
B Mark for a correct result or statement independent of Method marks.

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

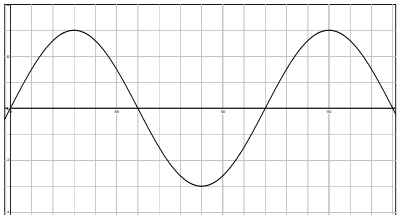
Question	Answer	Marks	Partial Marks
1(a)	6	**1**	
1(b)	7	**1**	
1(c)	7.5	**1**	
1(d)	9.5	**1**	
1(e)	3	**1**	
1(f)	8	**1**	
2(a)	5.22	**2**	**M1** for $4.5 \times \frac{16}{100}$ or better If 0 scored **SC1** for figs 522
2(b)	30	**3**	**M2** for $\frac{11.05 - 8.5}{8.5}[\times 100]$ or $\frac{11.05}{8.5} \times 100$ or **M1** for $\frac{11.05}{8.5}[\times 100]$

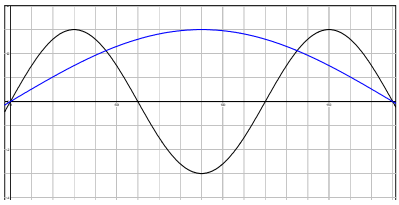
Question	Answer	Marks	Partial Marks
2(c)	1.2[0]	**2**	**M1** for $\frac{0.06}{5}\times 100$
3(a)	Correct sketch 	**3**	**B2** for first branch correct, including gradient zero at y-intercept or **B1** for first branch above x-axis, increasing and crossing y-axis **B1** for second branch correct
3(b)	0.0357 or $0.03571... \leqslant f(x) \leqslant 1$ oe	**2**	**B1** for $0 < f(x)$ or $f(x) \leqslant 1$
3(c)	Correct sketch 	**1**	Vertex at origin
3(d)(i)	–[0].809 or –[0].8087...	**1**	
3(d)(ii)	[u =] 5 [w =] 2	**2**	**B1** for each or **SC1** for answers reversed
4(a)(i)	Translation $\begin{pmatrix}-1\\6\end{pmatrix}$	**2**	**B1** for each
4(a)(ii)	Rotation [centre] (2, 1) 90 clockwise oe	**3**	**B1** for each
4(a)(iii)	Enlargement [centre] (3, 0) [factor] 3	**3**	**B1** for each
4(b)	Correct stretch at (4, 1) (10, 1), (10, 3)	**2**	**B1** for stretch factor 2 with x-axis invariant or for stretch with $x = k$ invariant with stretch factor 2
5(a)	1329	**4**	**B3** for 1328.6 ... or 1330 or **M2** for 2025×0.9^4 oe or **M1** for 2025×0.9^k, $k > 1$ oe
5(b)	2500	**2**	**M1** for $2025 \div 0.9^2$ oe

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Question	Answer	Marks	Partial Marks
5(c)	14	**4**	**B3** for 13.3 or 13.27 to 13.28 seen or **M3** for $n\log 0.9 = \log\frac{500}{2025}$ oe implied by or for correct trials reaching 13 and 14 or good sketch indicating value between 13 and 14 or **M2** for $0.9^n = \frac{500}{2025}$ oe or at least three correct trials with $n > 4$ or sketch that could lead to the solution or **M1** for $2025 \times 0.9^n = 500$ oe or at least two correct trials with $n > 4$ If 0 scored, **SC1** for answer 16 or for 15.3 or 15.27 to 15.28 seen
6(a)	$\frac{1}{6}$ oe	**1**	
6(b)(i)	$\frac{2}{12}$ oe	**2**	**M1** for $\frac{2}{6} \times \frac{1}{2}$ oe
6(b)(ii)	$\frac{8}{12}$ oe	**2**	**M1** for $\frac{2}{6} + \frac{1}{2} - \frac{2}{6} \times \frac{1}{2}$ or indicating all 8 outcomes or $\frac{2}{6} \times \frac{1}{2} + \frac{4}{6} \times \frac{1}{2} + \frac{2}{6} \times \frac{1}{2}$ oe
6(c)	$\frac{7}{8}$ oe	**2**	**M1** for $1 - \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ oe
6(d)	$\frac{36}{216}$ oe	**3**	**M2** for $\frac{3}{6} \times \frac{2}{6} \times \frac{1}{6} \times 6$ oe or **M1** for one product
6(e)	6	**1**	
6(f)	1, 2	**2**	**M1** for probability of 1 then 2 or 2 then 1 is $\frac{1}{2} \times \frac{1}{3}$ or $\frac{1}{3} \times \frac{1}{2}$ or for $2 \times \frac{1}{2} \times \frac{1}{3}$ or $2 \times \frac{1}{3} \times \frac{1}{2}$ seen or for clear list
7(a)	[Angle ABC =] 120	**B1**	
	$10^2 + 12^2 - 2 \times 10 \times 12\cos(\textit{their } ABC)$	**M1**	
	19.078 to 19.079	**A2**	**A1** for 364

Question	Answer	Marks	Partial Marks
7(b)	$\frac{10\sin 120}{19.08}$	**M2**	**M1** for $\frac{19.08}{\sin 120} = \frac{10}{\sin ACB}$ oe
	26.99...	**A1**	**M1** only and **A1** imply **M2 A1**
7(c)	249.8 to 250[.0]	**4**	**M2** for $[\cos ACD =]\frac{21^2 + 19.08^2 - 18^2}{2 \times 21 \times 19.08}$ oe or **M1** for $18^2 = 21^2 + 19.08^2 - 2 \times 21 \times 19.08 \times \cos(ACD)$ **M1** for 360 – (30 + 27 + *their ACD*) oe
7(d)	5.45 or 5.446 to 5.448	**2**	**M1** for 12sin27.0 oe
7(e)	52[.0] or 51.94 to 51.99...	**2**	**M1** for $\frac{1}{2} \times 19.08 \times$ *their* **(d)** or for $\frac{1}{2} \times 10 \times 12 \times \sin 120$ oe or for $\frac{1}{2} \times 19.08 \times 12 \times \sin 27$
8(a)(i)	Correct curve	**3**	**B2** for two of (2500, 100), (3000, 180), (4000, 200) plotted or **B1** for 100, 180, 200 soi
8(a)(ii)	600 to 700	**2**	**B1** for [u.q.=] 2750 to 2800 or [l.q. =] 2100 to 2150 not as final answer
8(a)(iii)	5 to 15	**2**	**B1** for 185 to 195 seen
8(b)(i)	600, 600, 300	**2**	**B1** for two correct
8(b)(ii)	118.75	**2**	**M1** for at least two of 25 × 500 + 75 × *their* 600 + 150 × *their* 600 + 300 × *their* 300
9(a)	6.77 or 6.765 to 6.766	**2**	**M1** for 10.6 ÷ 94 or 94 ÷ 60
9(b)	3.33 or 3.333... or $3\frac{1}{3}$	**3**	**M2** for $\frac{2+3}{\frac{2}{4}+\frac{3}{3}}$ or **M1** for $\frac{2}{4}$ oe or $\frac{3}{3}$ oe
9(c)	$\frac{18v}{5}$ or 3.6*v* or $3\frac{3}{5}v$	**2**	**M1** for × (60 × 60) oe or for ÷ 1000
9(d)(i)	$\frac{130x+500}{x(x+10)}$ or $\frac{130x+500}{x^2+10x}$	**3**	**M1** for $\frac{50}{x} + \frac{80}{x+10}$ **B1** for common denominator *x*(*x* + 10) oe

Question	Answer	Marks	Partial Marks
9(d)(ii)	$130x + 500 = 2x(x + 10)$ oe	**M1**	i.e. fraction with linear numerator and quadratic denominator removed correctly
	$130x + 500 = 2x^2 + 20x$ leading to $x^2 - 55x - 250 = 0$	**A1**	i.e. equation with four terms no errors or omissions
9(d)(iii)	59.2 or 59.22... only	**3**	**M2** for correct graph of quadratic showing positive root or for $\frac{-(-55) \pm \sqrt{(-55)^2 - 4(1)(-250)}}{2(1)}$ oe or **M1** for appropriate quadratic graph or for $\sqrt{(-55)^2 - 4(1)(-250)}$ oe or for $\frac{-(-55)}{2(1)}$ oe in correct formula
10(a)(i)	–1	**1**	
10(a)(ii)	2	**1**	
10(b)	$\frac{1}{5}$ oe	**2**	**B1** for 5 or **M1** for $\frac{1}{2x+3}$ soi e.g. $\frac{1}{2(1)+3}$
10(c)	–3	**1**	
10(d)	4	**1**	
10(e)	$4x + 9$	**2**	**M1** for $2(2x + 3) + 3$ oe
10(f)	$4x^2 + 14x + 13$	**3**	**M1** for $(2x+3)^2 + 2x + 3 + 1$ oe **B1** for $[(2x+3)^2 =]\ 4x^2 + 12x + 9$
10(g)	3^x	**2**	**M1** for $x = \log_3 y$ or for $x = 3^y$
11(a)	Correct sketch 	**2**	**B1** for sine graph with incorrect amplitude and/or incorrect period, passing through (0, 0).
11(b)	3 120	**2**	**B1** for each
11(c)	$70 < x < 110$	**2**	**B1** for 70 and 110 seen

Question	Answer	Marks	Partial Marks
11(d)(i)	Correct sketch 	**1**	
11(d)(ii)	Two areas shaded, which are below graph of $y = f(x)$ and above graph of $y = g(x)$	**1**	
11(d)(iii)	Stretch [factor] $\frac{1}{3}$ invariant line y-axis oe	**3**	**B1** for each