CAMBRIDGE
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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/43**

Paper 4 (Extended) **May/June 2024**

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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

 [Turn over

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 descriptions 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.

Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

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.

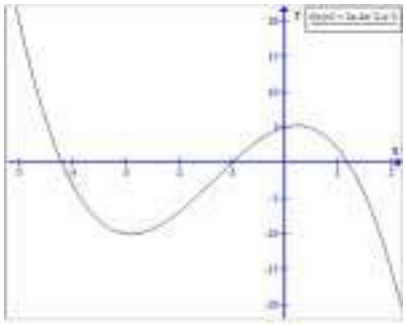
When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation 'dep' is used to indicate that a particular M or B mark is dependent on an earlier mark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

Abbreviations

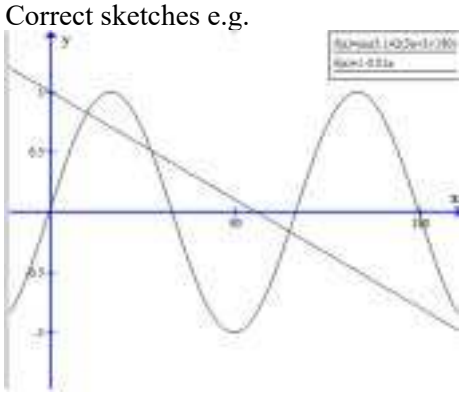
awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	0	**1**	
1(a)(ii)	2	**1**	
1(a)(iii)	6	**1**	
1(a)(iv)	3	**1**	
1(a)(v)	2.175	**2**	**M1** for [0 × 26] + 1 × 20 + 2 × 23 ...
1(b)	14	**3**	**M2** for $\frac{[0\times18]+1\times31+2\times27+3\times18+4\times n+5\times12+6\times5}{18+31+27+18+n+12+5}=2.28$ oe or **M1** for $[0\times18]+1\times31+2\times27+3\times18+4\times n+5\times12+6\times5$ or for (18 + 31 + 27 + 18 + *n* + 12 + 5) × 2.28
2(a)	2400	**2**	**M1** for $\frac{3000}{5}$
2(b)	2.8	**3**	**M2** for $\frac{3000\times r\times10}{100}=840$ oe or **M1** for $\frac{3000\times r\times10}{100}$ or **B1** for [1 year interest] = 84
2(c)	2.6[0]	**3**	**M2** for $\sqrt[8]{\frac{7367.67}{6000}}$ oe or **M1** for $6000(.....)^8=7367.67$
2(d)	23 cao	**4**	**B3** for 22.7 or 22.72 to 22.73 OR **M3** $n\log\left(1+\frac{1.8}{100}\right)=\log\left(\frac{6000}{4000}\right)$ oe or good sketch indicating value between 22 and 23 or correct trials reaching 22 and 23 or **M2** for $\left(1+\frac{1.8}{100}\right)^n=\frac{6000}{4000}$ oe or suitable graph with $n > 1$ or at least 3 correct trials or **M1** for $4000\times\left(1+\frac{1.8}{100}\right)^n=6000$ oe soi by at least 2 correct trials with $n > 1$

Question	Answer	Marks	Partial Marks
3	For all parts accept decimals or percentages with the usual rules for 3sf. Do not penalise incorrect cancelling or converting. Do not accept ratios or words		
3(a)(i)	$\frac{2}{3}$ oe	**1**	
3(a)(ii)	$\frac{1}{2}$ oe	**1**	
3(b)(i)	$\frac{1}{36}$ oe	**2**	**M1** for $\frac{1}{6}\times\frac{1}{6}$
3(b)(ii)	$\frac{35}{36}$ oe	**1**	**FT** 1 – *their* **(b)(i)**
3(c)(i)	0.52 oe 0.72 oe 0.16 oe Correctly placed	**2**	**B1** for one correctly placed
3(c)(ii)	0.4368 oe	**2**	**M1** for *their* 0.52 × 0.84 oe
4(a)	$-\frac{2}{3}$ oe $\frac{8}{3}$ or $2\frac{2}{3}$ oe	**3**	**B2** for one correct or **M1** for correctly isolating y oe
4(b)	gradient = $\frac{3}{2}$	**M1**	**FT** 1 ÷ *their* $-\frac{2}{3}$
	substituting (2, 10) into y = *their* m + c	**M1**	**FT** *their* $m \neq -\frac{2}{3}$
	completing to $2y - 3x = 14$ with at least one line of working and no errors	**A1**	
4(c)	Correctly equating coefficients or sketch of one equation with positive slope and positive y-intercept	**M1**	
	Correct method to eliminate one variable or sketch of other equation with negative slope and positive y-intercept	**M1**	
	$x = -2$ in correct answer space	**A1**	
	$y = 4$ in correct answer space	**A1**	If 0 scored, **SC1** for correct answer with no working

Question	Answer	Marks	Partial Marks
5(a)	Correct sketch 	**2**	With minimum in 3rd quadrant and maximum in 1st quadrant **B1** for any cubic with negative x^3
5(b)	–4.19 or –4.193 to –4.192 –1 1.19 or 1.192 to 1.193	**3**	**B1** for each or **B1** for –1 and **B1** for –4.2 and 1.2
5(c)	(–2.9[0], –10.1) or (–2.897 to –2.896, –10.05...)	**2**	**B1** for each coordinate
5(d)	*their* –2.9[0] < a < 0.23[0]	**2**	–2.896 to 2.897 , 0.2301... **B1** for 0.23[0] seen or *their* –2.9[0] < a < k
5(e)	Integer $\leqslant$ –11 or $\geqslant$ 6	**1**	
6(a)(i)	Triangle at (1, –2), (4, –2) , (3, –3)	**2**	**B1** for reflection in $y = -x$ or correct size and orientation
6(a)(ii)	Rotation 90° clockwise oe [centre] (4, 1)	**3**	**B1** for each
6(a)(iii)	Enlargement [Scale factor] –2 [centre] (–1, 3)	**3**	**B1** for each
6(b)(i)	Translation $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$	**2**	**B1** for each
6(b)(ii)	Stretch $y = 1$ [invariant] factor $\frac{1}{3}$	**3**	**B1** for each
7(a)	$\pi d = 37 - 12 - 12$ oe	**M1**	
	4.137 to 4.138...	**A1**	

Question	Answer	Marks	Partial Marks
7(b)	40.3 or 40.4 or 40.33 to 40.36…	**3**	**M2** for $2 \times \sin^{-1}\frac{4.14}{12}$ oe or $\cos ACB = \frac{12^2+12^2-(2\times 4.14)^2}{2\times 12\times 12}$ or **M1** for $\sin(...) = \frac{4.14}{12}$ or $(2\times 4.14)^2 = 12^2+12^2-2\times 12\times 12\times \cos ACB$
7(c)	60[.0] or 60.1 or 60.01 to 60.13	**3**	**M1** for $\frac{1}{2}\times 12\times 12\times \sin(their\ b)$ oe **M1** for $2\times\frac{1}{2}\times\pi\left(\frac{4.14}{2}\right)^2$ oe
7(d)	28.2 or 28.3 or 28.23 to 28.26	**3**	**M2** for $37\times\sqrt{\frac{35}{their\ c}}$ oe or **M1** for $\sqrt{\frac{35}{their\ c}}$ or $\sqrt{\frac{their\ c}{35}}$ or $\frac{35}{their\ c}=\left(\frac{p}{37}\right)^2$
8(a)	$h^2 = 0.8^2 – 0.35^2 – 0.35^2$ oe	**M3**	**M2** for $0.8^2 = 0.35^2 + 0.35^2 + h^2$ oe or **M1** for $0.35^2 + 0.35^2$ or $0.7^2 + 0.7^2$ oe
	0.6284 to 0.6285	**A1**	
8(b)	165 or 165.0 to 165.2	**5**	**B4** for 262 or 262.1 to 262.2… OR **M1** for $6 \times 4.9 \times 4.9$ **M1** for $\pi \times 1.2^2 \times 25$ **M1** for $\frac{1}{3}\times 0.7\times 0.7\times 0.628$ [× 49] **M1** for at least 1 of *their* volumes × 0.63
9(a)(i)	$-\frac{2}{7}$	**2**	**M1** for $2x + 5x = 1 – 3$ or better
9a)(ii)	–5 –1	**2**	**B1** for each or **M1** for $x + 3 = \pm 2$
9(b)	$3x^2y^2(2x – y)$ Final answer	**2**	**B1** for correctly extracting 2 or more factors
9(c)	$\frac{x-31}{(2x+3)(x-5)}$ or $\frac{x-31}{2x^2-7x-15}$ Final answer	**3**	**B1** for $5(x – 5) – 2(2x + 3)$ oe ISW **B1** for denominator $(2x + 3)(x – 5)$ oe

Question	Answer	Marks	Partial Marks
9(d)	$\frac{-3 \pm \sqrt{3^2 - 4 \times 2x - 7}}{2 \times 2}$ or suitable sketch(es) with both answers indicated	**M2**	**M1** for $\sqrt{3^2 - 4 \times 2 \times -7}$ or **M1** for $\frac{-3 + \sqrt{p}}{2 \times 2}$ or $\frac{-3 - \sqrt{p}}{2 \times 2}$ Denominator must be shown as 2×2 to earn the second M1 but a denominator of 4 is condoned for M2
	1.27 and –2.77 cao	**B1**	
10(a)	$3\frac{1}{2}$ oe	**1**	
10(b)	6	**2**	**M1** for $5 - \frac{1}{2}x = 2$
10(c)	$3\frac{1}{2} - 1\frac{1}{2}x$ or $\frac{7 - 3x}{2}$ oe Final answer	**2**	**M1** for $5 - \frac{1}{2}(3(x+1))$ oe
10(d)	$\frac{x-3}{3}$ oe Final answer	**2**	**M1** for $x = 3(y + 1)$ or $x + 1 = \frac{y}{3}$ or $y - 3 = 3x$
10(e)	1	**2**	**B1** for h(90) or **M1** for sin(3(x + 1)) oe
10(f)	sin(3(x + 1)) soi	**1**	
	Correct sketches e.g. 	**2**	or a single graph of h(g(x)) – 1 + 0.01x **B1** for each graph
	17.5 or 17.52... 48.7 or 48.71... 115.9 or 115.94...	**2**	**B1** for 1 correct.
11(a)	[cos$B$] = $\frac{72^2 + 85^2 - 102^2}{2 \times 72 \times 85}$	**M2**	**M1** for $102^2 = 72^2 + 85^2 - 2 \times 72 \times 85 \times \cos[B]$
	80.57...	**A1**	
11(b)	319.4	**2**	**B1** for 40.6 or 139.4

Question	Answer	Marks	Partial Marks
11(c)	14 17	**6**	**M2** for sin $[A] = \frac{85\sin 80.6}{102}$ or $\cos[A] = \frac{72^2 + 102^2 - 85^2}{2 \times 72 \times 102}$ or **M1** for $\frac{85}{\sin A} = \frac{102}{\sin 80.6}$ or $85^2 = 72^2 + 102^2 - 2 \times 72 \times 102 \cos A$ **M1** for [AP =] 72 cos *their A* oe **M1** for [time =] *their AP* ÷ 32 **M1** adding *their* time to 13 00 If 0 scored, **SC1** for showing BP on diagram with right angle correctly placed on AC