Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2022**

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.

Cambridge International is publishing the mark schemes for the October/November 2022 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.

Maths-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, 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 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 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.

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)	75	**2**	**M1** for $\frac{45}{3}$ [× *k*] where *k* is 1, 5 or 8
1(a)(ii)	2.332 oe	**2**	**M1** for 2.65 [million] × $\left(1-\frac{12}{100}\right)$ oe or **B1** for 0.318[million] seen
1(a)(iii)	23 280 cao	**2**	**M1** for $\frac{6.25}{100}\times x = 1455$ or better
1(a)(iv)	1450 or 1449 to 1450	**3**	**M2** for 1631 = $k\left(1+\frac{4}{100}\right)^3$ oe or better or **B1** for $\left(1+\frac{4}{100}\right)^3$ oe seen or **M1** for 1631 = $k\left(1+\frac{4}{100}\right)^n$, $n > 0$ oe
1(b)(i)	$\frac{7x}{2}$ oe	**1**	
1(b)(ii)	$x + 12$ $\frac{7x}{2} - 26$ oe final answer	**2**	**FT** *their* **(b)(i)** **B1** for $x + 12$ **B1** for *their* $\frac{7x}{2} - 26$

Question	Answer	Marks	Partial Marks
1(b)(iii)	$\frac{7x}{2} - 26 = 3(x + 12)$ oe leading to 124	**4**	**M1dep** for *their* $\left(\frac{7x}{2} - 26\right) = 3 \times$ *their* $(x + 12)$ oe **M2dep** for isolating x terms, dep on eqn with term in x and constant on each side and with a bracket **or** fraction. or **M1dep** for correctly removing brackets or dealing with fractions, dep on eqn with term in x and constant on each side and with a bracket **or** fraction.
2(a)(i)	28	**1**	
2(a)(ii)	Correct curve	**4**	**B3FT** for 9 or 10 correct points or **B2FT** for 7 or 8 correct points or **B1FT** for 5 or 6 correct points
2(a)(iii)	2.5 to 2.8 8.2 to 8.5	**2**	**B1** for each value
2(b)(i)	$2x^2 + 4x(9 - x)$ oe	**M1**	Accept the sum of individual areas if done in smaller parts
	$2x^2 + 36x - 4x^2$ oe Leading to $36x - 2x^2$	**A1**	With intermediate step shown and brackets removed with no errors or omissions
2(b)(ii)	144	**3**	**B1** for $x = 6$ identified from graph or using calculus **M1** for $36 \times$ *their*$6 - 2 \times$ (*their* $6)^2$

Question	Answer	Marks	Partial Marks
3(a)(i)	211.275	**4**	**M1** for mid-points **soi** (90, 125, 175, 250, 350) **M1** for use of Σfm with m in correct interval including both boundaries **M1** for (dep on 2nd M1) for $\Sigma fm \div 200$
3(a)(ii)	$32 \times 350 - 32 \times 330$ oe or better, or the reverse of this	**M1**	
	3.2 or – 3.2 final answer	**B1**	
3(a)(iii)	1.75 7.6 1.6	**3**	**B2** for two correct heights or **B1** for one correct height or 3 correct frequency densities or **M1** for scale factor of 5 or 0.2
3(b)	$\frac{4}{25}$ oe	**1**	
3(c)(i)	$\frac{39}{995}$ oe	**2**	**M1** for $\frac{40}{200} \times \frac{39}{199}$ oe
3(c)(ii)	$\frac{147}{4975}$ oe	**3**	**M2** for [2×] $\frac{84}{200} \times \frac{7}{199}$ oe or **B1** for $\frac{84}{200}$ and $\frac{7}{199}$ or $\frac{84}{199}$ and $\frac{7}{200}$ oe If 0 scored, **SC1** for answer $\frac{147}{5000}$ oe

Question	Answer	Marks	Partial Marks
4(a)(i)	Translation $\begin{pmatrix} 7 \\ -8 \end{pmatrix}$ oe	**2**	**B1** for each
4(a)(ii)	Rotation 90° [anticlockwise] oe (0, 8)	**3**	**B1** for each
4(a)(iii)	Enlargement [sf] $\frac{1}{2}$ oe [centre] (–1, –4)	**3**	**B1** for each
4(b)	Image at (–4, 4) (–3, 4) (–2, 5) (–2, 3) (–4, 3)	**2**	**B1** for the line $y = x + 8$ drawn soi long enough to be fit for purpose or correct size and orientation but wrong position

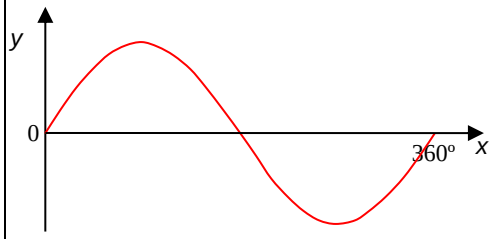
Question	Answer	Marks	Partial Marks
5(a)(i)	$\frac{14}{18}$ oe	**1**	
5(a)(ii)	17.5	**4**	**M3** for $\frac{1}{2}(10+24)18+22\times24\ -134 = 40v$ oe or **M2** for $\frac{1}{2}(10+24)18+22\times24$ oe or **B2** for [distance covered by bus =] 700 or **M1** for correct method for any partial area for the car or for $40v$
5(b)	92.8 or $92\frac{4}{5}$	**3**	**M1** for $\frac{figs162[4]}{their10\,\text{min}30\,\text{sec}}$ oe **M1** for correct conversion to km/h, e.g. $\times\frac{60}{1000}$

Question	Answer	Marks	Partial Marks
6(a)	-1.5 or $-1\frac{1}{2}$ or $-\frac{3}{2}$	**2**	**M1** for $4x = 9 - 15$ or $x + \frac{15}{4} = \frac{9}{4}$
6(b)	$(a - 3)(a + 3)$ final answer	**1**	
6(c)	$\frac{8c}{3d}$ final answer	**3**	**B2** for $\frac{8ac}{3ad}$ or $\frac{40c}{15d}$ or $\frac{4}{1}\times\frac{2c}{3d}$ seen or for correct answer seen then spoiled or **M1** for $\frac{4a}{5}\times\frac{10c}{3ad}$ or $\frac{8ac}{10c}\div\frac{3ad}{10c}$ oe
6(d)	$n + 1$ final answer	**2**	**M1** for 5×5^n or 5^{n+1} seen
6(e)	$(2x - 1)(2x + 5)$ [= 0] oe	**B2**	**M1** for $2x(2x + 5) - [1](2x + 5)$ [= 0] or $2x(2x - 1) + 5(2x - 1)$ [= 0] or for $(2x + m)(2x + n)$ [= 0] with and $mn = -5$ or $n + m = 4$
	$\frac{1}{2}$ or 0.5 and -2.5 or $-2\frac{1}{2}$ or $-\frac{5}{2}$	**B1**	
6(f)(i)	7	**3**	**M1** for $y = k(x + 3)^3$ or better **M1** for $108 =$ *their* $k(x + 3)^3$
6(f)(ii)	4	**2**	**M1** for $\left(\frac{1}{2}\right)^2$ oe or $\frac{k}{\frac{1}{4}d^2}$ oe seen or better

Question	Answer	Marks	Partial Marks
6(g)	$2x^3 + 7x^2 - 9$ final answer	**3**	**B2** for correct expansion unsimplified or for simplified 4 term expression of correct form with 3 terms correct or **B1** for one pair of brackets expanded with at least 3 terms out of 4 correct
6(h)	$6x + 4$	**2**	**B1** for $6x$ or 4 or $6x + 4$ with one extra term seen

Question	Answer	Marks	Partial Marks
7(a)(i)	52.[0] or 52.01…	**4**	**M2** for [cos$P$ =] $\frac{39.4^2 + 46.5^2 - 38.2^2}{2 \times 39.4 \times 46.5}$ oe or **M1** for $38.2^2 = 39.4^2 + 46.5^2 - 2 \times 39.4 \times 46.5 \times \cos P$ oe **A1** for 0.616 or 0.6155…
7(a)(ii)	36.6 or 36.64 to 36.65	**3**	**M2** for $\frac{d}{46.5} = \sin(\textit{their}\,52.01)$ oe or **M1** for recognition that the line from Q is perpendicular to PR
7(b)(i)	41[.0] or 41.01… nfww	**3**	**M2** for $29^2 + 21^2 + 20^2$ oe or better or **M1** for $29^2 + 21^2$ oe or $29^2 + 20^2$ oe or $21^2 + 20^2$ oe or better
7(b)(ii)	29.2 or 29.18 to 29.2	**3**	**M2** for sin[GAC] = $\frac{20}{\textit{their}\,AG}$ oe or **M1** for angle GAC identified
7(c)	bearing 286	**B2**	**B1** for angle MLK = 49 or for angle MKL = 35 correctly identified or angle from North to ML = 106
	distance 64.6 or 64.59…	**B3**	**M2** for $\frac{112 \times \sin(\textit{their}35)}{\sin(96)}$ oe or **M1** for the implicit form

Question	Answer	Marks	Partial Marks
8(a)	(22, 11)	**2**	**B1** for each value
8(b)	$\frac{their 11-3}{their 22-2}$ oe or better	**M1**	
	$-\frac{1}{their\ m}$	**M1**	
	Substitution of (12, 7) into $y = (their\ m)x + c$	**M1**	Accept $y - 7 = their\ m(x - 12)$ oe
	leading to $2y + 5x = 74$ final answer	**A1**	Without error or omission
8(c)	32	**1**	
8(d)	145	**2**	**M1** for $\frac{1}{2} \times (their\ 32 - 3) \times 10$ oe or $\frac{1}{2} \times \sqrt{(7-3)^2 + (12-2)^2} \times \sqrt{(their 32 - 7)^2 + (2-12)^2}$ oe

Question	Answer	Marks	Partial Marks
9(a)	Correct sketch to go through (0, 0), and (360, 0) 	**2**	**M1** for correct sine curve shape through the origin or for almost correct sketch fitting all tramlines but with an omission at either end or incorrect curvature in one place only
9(b)	233.1 or 233.13… and 306.9 or 306.86 to 306.87	**3**	**B2** for one correct angle or **M1** for $\sin x = -0.8$ oe If 0 scored **SC1** for 2 reflex angles that add to 540 or two non-reflex angles that add to 180
10(a)	42.05 final answer	**2**	**M1** for 11.4 + 0.05 oe or 14.8 + 0.05 oe or 15.7 + 0.05 oe
10(b)	319 or 318.5 to 318.6	**2**	**M1** for $\frac{150}{360} \times \pi \times 15.6^2$ oe
10(c)	$\frac{360-x}{360} \times 2\pi r + 2r = 3\left(\frac{x}{360} \times 2\pi r + 2r\right)$ oe	**M2**	**M1** for $\frac{x}{360} \times 2\pi r$ oe seen or $\frac{360-x}{360} \times 2\pi r$ oe seen
	$\frac{4x}{360} \times 2\pi[r] = 2\pi[r] - 4[r]$ oe	**M1**	i.e. M mark for isolating and collecting terms in x
	Leading to $\frac{90(\pi-2)}{\pi}$	**A1**	With no errors or omissions

Question	Answer	Marks	Partial Marks
11(a)	2.5 and – 2.5 oe	**3**	**M2** for $1681m^2 = \frac{42025}{4}$ oe or **M1** for $(9m)^2 + (40m)^2$ oe
11(b)(i)(a)	**c** – **a** final answer	**1**	
11(b)(i)(b)	$\frac{3}{4}$ **a** final answer	**1**	
11(b)(i)(c)	**c** + $\frac{3}{4}$ **a** final answer	**1**	**FT c** + *their* **(b)(i)(b)**, must be a vector in terms of **a** and/or **c** in its simplest form
11(b)(ii)	**a** + $\frac{4}{3}$ **c** oe	**2**	**B1** for [$\overrightarrow{BQ}$ =] $\frac{1}{3}$ **c** or [$\overrightarrow{AQ}$ =] $\frac{4}{3}$ **c** or **M1** for a correct route or for answer **a** + *k***c** oe**,** where $k > 1$