Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2022**

MARK SCHEME

Maximum Mark: 104

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 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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[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 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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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.

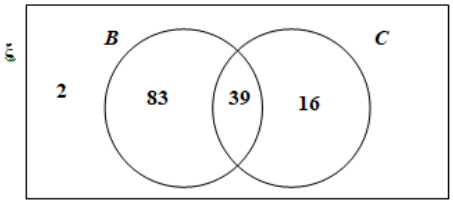
Abbreviations
cao – correct answer only
dep – dependent
FT – follow through after error
isw – ignore subsequent working
oe – or equivalent
SC – Special Case
nfww – not from wrong working
soi – seen or implied

Question	Answer	Marks	Partial Marks
1(a)	6 500 000	**1**	
1(b)	6540	**1**	
1(c)	34	**1**	
1(d)(i)	16	**1**	
1(d)(ii)	64	**1**	
1(d)(iii)	29	**1**	
1(e)	0.035	**1**	
1(f)	$\frac{1}{8}$ or 0.125	**1**	
1(g)	1	**1**	
1(h)(i)	$2 \times 2 \times 3 \times 3 \times 5$	**2**	**B1** for 2, 2, 3, 3, 5 or **M1** for correct factor tree or table

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Question	Answer	Marks	Partial Marks
1(h)(ii)	1440	**2**	**B1** for $1440k$ as final answer or **M1** for [160 =] $2 \times 2 \times 2 \times 2 \times 2 \times 5$ **and** [180 =] $2 \times 2 \times 3 \times 3 \times 5$ or a list of multiples of 160 and 180 with at least the first three correct or two correct factor trees or tables or 2, 2, 2, 2, 2, 5, 3, 3 or $2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 3 \times 3$ oe
1(i)	472.5 473.5	**2**	**B1** for each If zero scored, **SC1** for both correct but reversed
2(a)	6	**1**	
2(b)(i)	Isosceles	**1**	
2(b)(ii)	124	**1**	
2(b)(iii)	Obtuse	**1**	
2(c)	$180 - \frac{360}{5}$ [= 108] or $\frac{(5-2)\times 180}{5}$ [= 108]	**M2**	**M1** for $\frac{360}{5}$ or $(5 - 2) \times 180$
2(d)	68	**2**	**M1** for $248 - 180$ or $\frac{360 - 2\times(360 - 248)}{2}$ or $180 - (360 - 248)$ or **B1** for $ADC = 112$
2(e)	84	**3**	**M2** for $\frac{180}{3+5+7} \times j$ or better where $j = 1, 3, 5$ or 7 or **B1** for 180 or $\frac{7}{15}k$
3(a)	1332	**2**	**M1** for $2 \times 375 + 3 \times 194$ oe
3(b)	129.8[0]	**2**	**M1** for $110 \times (1+\frac{18}{100})$ oe or **B1** for 19.8[0]
3(c)	−7	**1**	
3(d)	288	**1**	
3(e)(i)	14	**2**	**M1** for $604 \div 46$ or 13.1[3…]
3(e)(ii)	44.4 or 44.37…	**1**	

Question	Answer	Marks	Partial Marks
3(f)	2 (h) 20 (min)	**3**	**M1** for 126 ÷ 54 **A1** for 2.33… or 140 mins If **A0** scored, **SC1** for *their* (decimal time) correctly changed to hours and minutes
4(a)(i)	Fully correct net	**4**	**B1** for 5 × 7 rectangle and **B2** for 3 correct faces in the correct places or **B1** for 1 or 2 correct faces in the correct places
4(a)(ii)	42	**2**	**M1** for $\frac{1}{2} \times 4 \times 3 \times 7$ oe
4(b)(i)	2 × 8 × 3 or 16 + 16 + 16 or 16 × 3 or 8 × 6 or 8 + 8 + 8 + 8 + 8 + 8	**1**	
4(b)(ii)	1536	**2**	**M1** for 32 × 48 oe
	cm^2	**1**	
4(b)(iii)	21.5 or 21.45 to 21.47	**3**	**M1** for $\pi \times 8^2$ [× 6] oe **M1** for $\frac{\textbf{(b)(ii)} - \textit{their } 1206}{\textbf{(b)(ii)}}[\times 100]$ oe or $[100 -]\frac{\textit{their } 1206}{\textbf{(b)(ii)}} \times 100$ oe or $\left(1 - \frac{\textit{their } 1206}{\textbf{(b)(ii)}}\right)[\times 100]$ oe
5(a)(i)	3, 1	**1**	
5(a)(ii)	Correct point plotted	**1**	
5(a)(iii)	*C* plotted such that *ABC* is isosceles	**1**	
5(b)(i)	2	**1**	
5(b)(ii)	2 correct lines and no extras	**2**	**B1** for 1 correct line and no extras or for 2 correct lines and one extra
5(c)(i)	Enlargement [centre] (2, 1) [sf] 2	**3**	**B1** for each
5(c)(ii)	Rotation [centre] (0, 0) 180°	**3**	**B1** for each
5(c)(iii)(a)	Triangle at (–3, 4) (0, 4) (–3, 6)	**2**	**B1** for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$

Question	Answer	Marks	Partial Marks
5(c)(iii)(b)	Triangle at (2, –5) (5, –5) (2, –7)	**2**	**B1** for reflection in $y = k$ ($k \neq -2$)
6(a)	$3w + [1]d$ final answer	**2**	**B1** for $3w$ or $[1]d$ in final answer
6(b)	28 40 53	**5**	**M2** for $x + x + 12 + 2x - 3 = 121$ or better or **B1** for $x + 12$ or $2x - 3$ or $4x + 9$ **M1** for $4x + 9 = 121$ or better or for simplifying *their* equation to $ax + b = 121$or better **M1** for solving *their* linear equation if 0 scored then **SC1** for 3 numbers adding to 121
6(c)(i)	$9a + 3b$ final answer	**2**	**B1** for $9a$ or $3b$ in final answer or $9a + 3b$ seen and spoilt
6(c)(ii)	$7x + 16$ final answer	**2**	**B1** for $12x + 6$ or $-5x + 10$ or $5x - 10$ or for $7x$ or 16 in the final answer
6(d)	Correctly equating one set of coefficients	**M1**	
	correct method to eliminate one variable	**M1**	
	$[x =] 7$	**A1**	
	$[y =] -2$	**A1**	If **M0** scored, **SC1** for 2 values satisfying one of the original equations or no working shown but 2 correct answers given
7(a)(i)	2 points correctly plotted	**1**	
7(a)(ii)	Positive	**1**	
7(a)(iii)	A ruled line of best fit within tolerance	**1**	
7(a)(iv)	32 – 42	**1**	**FT** *their* ruled line with positive gradient
7(b)(i)		**2**	**B1** for 2 or 3 correct values in the correct places or for the 2 correctly positioned and total in B equals 122 and total in C equals 55 provided $B \cap C \neq \varnothing$
7(b)(ii)	$\frac{39}{140}$ oe	**1**	**FT** *their* $B \cap C$

Question	Answer	Marks	Partial Marks
8(a)	$[y =] -\frac{1}{2}x + 2$	**2**	**M1** for rise ÷ run or for $[y =] kx + 2$ $(k \neq 0)$ or $[y =] -\frac{1}{2}x + j$ oe
8(b)(i)	−1	**1**	
8(b)(ii)	Correct ruled line on grid	**1**	
8(c)	−1.2, 2.6	**1**	**FT** Line *L* and *their* **(b)(ii)**
8(d)	$y = 2x + 18$	**1**	
9(a)	−2 … −4 … −12 12 … 4 … 2	**3**	**B2** for 4 or 5 correct **B1** for 2 or 3 correct
9(b)	Correct curve	**4**	**B3FT** for 9 or 10 points plotted correctly **B2FT** for 7 or 8 points plotted correctly **B1FT** for 5 or 6 points plotted correctly
9(c)	Correct ruled line drawn	**1**	
9(d)	2.4	**1**	**FT** *their* graph and $y = 5$

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