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MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2024**

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.

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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 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.

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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.

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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

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)	25.2[0]	**1**	
1(a)(ii)	5.67	**2**	**M1** for $9 \times 6.3[\div 10]$ oe
1(b)(i)	25	**1**	
1(b)(ii)	104	**2**	**M1** for $650 \times \left(1 - \frac{84}{100}\right)$ oe or **B1** for 546
1(c)	4.3[0] 2.15	**3**	**B2** for 4.3[0] or 2.15 in correct place or for both correct in the reverse order. or **M1** for $\frac{10 - 3.55}{3}[\times k]$ oe $k = 1$ or 2
1(d)(i)	2 [hours] 35 [minutes]	**1**	
1(d)(ii)	1705	**1**	

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Question	Answer	Marks	Partial Marks
1(e)	303.6[0]	**4**	**M3** for $(4+4+5.5+5.5+5)\times 11.5$ $+ (4+4)\times \left(\frac{30}{100}\times 11.5\right)$ oe **OR** **B2** for 59.8 (or 119.6) or 63.25 (or 126.5) or 57.5 or 184 or 276 or 27.6 seen **OR** **M1** for 4 + 4 + 5.5 + 5.5 + 5 oe or 4 + 4 oe and 5.5 + 5.5 + 5 oe and **M1** for $\frac{30}{100}\times 11.5$ oe or $\left(1+\frac{30}{100}\right)\times 11.5$ oe
2(a)(i)	$\frac{1}{3}$ cao	**2**	**M1** for $\frac{120}{360}$ oe
2(a)(ii)	37.5	**1**	
2(a)(iii)	9 : 2 : 5 : 8 cao	**2**	**B1** for 135 : 30 : 75 : 120 or better
2(a)(iv)	$\frac{105}{360}$ oe	**2**	**M1** for $\frac{75+30}{360}$ oe
2(a)(v)	$\frac{675\times 360}{135}\left[=1800\right]$	**1**	
2(a)(vi)(a)	375 600	**2**	**B1** for each
2(a)(vi)(b)	A correct bar chart drawn with linear scale labelled.	**3**	**B1** for an appropriate linear scale written with at least 2 more numbers. AND **B2FT** *their* table for 4 bars drawn correctly or **B1FT** *their* table for two or three bars drawn correctly
2(b)	130	**2**	**M1** for $\frac{2208}{1.15}$ oe or $\frac{2050\times 1.15-2208}{1.15}$ oe
3(a)(i)	12 07	**2**	**B1** for 1 [hour] 20 [min] or 80[min] or 28 [min] seen
3(a)(ii)	10 27 drawn correctly on clock face.	**1**	

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Question	Answer	Marks	Partial Marks
3(b)	21	**3**	**B2** for 20 as final answer or **M2** for $\frac{22:10-07:10}{45}\times 60$ oe or **M1** for $(22:10-07:10)\times 60$ oe
3(c)	57.75	**3**	**M2** for $50\times\left(1+\frac{10}{100}\right)\left(1+\frac{5}{100}\right)$ oe or **B2** for 1.155 or **M1**for $50\times\left(1+\frac{10}{100}\right)$ oe or $50\times\left(1+\frac{5}{100}\right)$ oe or *their*$55\times\left(1+\frac{5}{100}\right)$ oe or $\left(1+\frac{10}{100}\right)\left(1+\frac{5}{100}\right)$ oe
3(d)(i)	232	**1**	
3(d)(ii)	125	**1**	
3(d)(iii)	The number of workers who travel to work by train but who do not travel on a bus oe.	**1**	
3(d)(iv)	$\frac{9}{232}$ oe	**1**	**FT** *their* **3(d)(i)** in denominator.
3(e)	45	**2**	**M1** for $\frac{75}{8-3}\times k$ oe $k=1,3,8$
4(a)(i)	38	1	
4(a)(ii)	36	**1**	
4(a)(iii)	40	**1**	
4(a)(iv)	43.75	**2**	**M1** for $\frac{7}{16}$ or $\frac{\textit{their}\,7}{16}$ correctly converted to a %.
4(b)	38 37 41	**2**	**FT** *their* **(a)(i)**, **(a)(ii)** + 1, **(a)(iii)** + 1 **B1FT** for one or two correct

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Question	Answer	Marks	Partial Marks
4(c)	2 | [5 7 9] 3 | [6 8 8 8] 4 | 1 3 3 9 5 | 2 3 9 9 6 | 0	**2**	**B1** for 53 seen or for stem and leaf with no more than 2 errors or omissions.
4(d)	47	**2**	**B1** for a final answer satisfying 2 of the 3 conditions.
5(a)(i)	obtuse	**1**	
5(a)(ii)	23 angles in a triangle add to 180	**2**	**B1** for each
5(a)(iii)	52 alternate	**2**	**B1** for each
5(b)	128.57 cao	**3**	**B2** for 129 or 128.5 to 128.6 **OR** **M1** for $180-\frac{360}{7}$ oe or $\frac{(7-2)\times 180}{7}$ oe **B1** for their value seen, to at least 3dp, rounded correctly to 2dp as final answer
5(c)	7.5 –4 11.5	**5**	**B1** for $[w=]7.5$ **B2** for $[x=]-4$ or **M1** for $x+7=3$ or better or $5x=15-5\times 7$ or better **B2** for $[y=]11.5$ or **M2** for $15-\textit{their } w-\textit{their } x$ correctly evaluated or **M1** for $\textit{their } w+\textit{their } x+y=15$
6(a)	*P* plotted at (13,4)	**1**	
6(b)	36.9 or 36.86 to36.87	**2**	**M1** for $\tan[a=]\frac{3}{4}$ oe or $\sin[a=]\frac{3}{5}$ or $\cos[a=]\frac{4}{5}$ oe

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Question	Answer	Marks	Partial Marks
6(c)(i)	Rotation [centre] (0,0) 90° clockwise	**3**	**B1** for each
6(c)(ii)	Translation $\begin{pmatrix} 6 \\ -5 \end{pmatrix}$	**2**	**B1** for each
6(d)(i)	7	**1**	
6(d)(ii)	(1,28), (29,7)	**2**	**B1FT** for each
7(a)	*H* correctly marked 7.2 cm from *C* on bearing 236°	**3**	**B2** for *H* 7.2 cm from *C* or **M1** for 4.8×3 **B1** for *H* on bearing 236 from *C*
7(b)(i)	263	**2**	**M1** for $83+180$ oe or indicates correct angle on diagram
7(b)(ii)	4.5 5.5	**2**	**B1** for each If 0 scored **SC1** for both correct but reversed
7(c)	[1 :] 1800	**2**	**M1** for 5 : 9000 or 0.05:90 or $\frac{9000}{5}$ or $\frac{90}{0.05}$ or **B1** for answer figs 18
7(d)	13.8	**2**	**M1** for $\frac{9.2}{x}=\frac{5.6}{8.4}$ oe or better
7(e)	377 or 376.9 to 377.04	**2**	**M1** for $2\pi\times2.4\times25$
	m^2	**1**	
8(a)	9, 3, −3, −3, 3	**3**	**B2** for 3 or 4 correct or **B1** for 1 or 2 correct
8(b)	Completely correct curve	**4**	**B3FT** for 7 or 8 correctly plotted points or **B2FT** for 5 or 6 correctly plotted points or **B1FT** for 3 or 4 correctly plotted points
8(c)	$(0.5,k)$ $-3.6\leqslant k<-3$	**1**	
8(d)	3.7 −2.7	**2**	**B1FT** for each

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