CAMBRIDGE
International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

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

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.

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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).

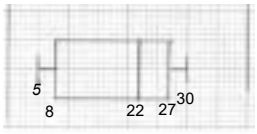
5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

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.

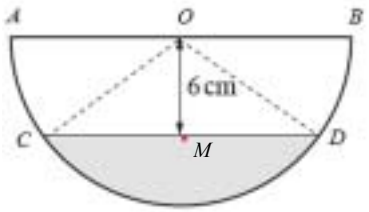
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Abbreviations
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)	10 : 3 final answer	**2**	**M1** for 1500 : 450 oe in ratio form If 0 scored **SC1** for answer 3 : 10
1(b)	360 240 400	**3**	**B2** for answer 0.36 0.24 0.4 or for answer two of 360 240 400 or **M1** for $\frac{1000}{9+6+10}[\times k]$ where k = 1, 9, 6 or 10 If 0 scored, **SC1** for answer with 3 values in ratio 9 : 6 : 10 in that order
1(c)	3.68 cao	**2**	**M1** for $\left(1+\frac{15}{100}\right)\times 3.2$ oe or **B1** for answer 0.48
1(d)	18 804[.0...]	**2**	**1** for $16\,620\times\left(1+\frac{2.5}{100}\right)^5$ oe
1(e)	3.95	**3**	**M2** for 22.5 – (18.5 to 18.6) or (22 to 23) −18.55 or **M1** for 23 – 0.5 oe seen or 23 + 0.5 oe seen or 18.5– 0.05 oe seen or 18.5 + 0.05 oe seen
2(a)	142 142	**2**	**B1** for each **FT** angle *b* = *their* angle *a*
2(b)	150	**2**	**M1** for $\frac{360}{12}$ oe isw or $180\times(12-2)$ oe isw

Question	Answer	Marks	Partial Marks
2(c)	56	**B1**	
	34	**B2**	**M1** for angle at centre = 2 × *their* 56 oe soi or for angle *OMB* = 90 oe soi
2(d)	51	**2**	**B1** for opp angle = 129 soi
3(a)(i)	25.4375	**4**	**M1** for mid-points soi (5, 17.5, 32.5, 50) **M1** for use of Σfm with m in correct interval including both boundaries **M1** for (dep on 2nd M1) for $\Sigma fm \div 40$
3(a)(ii)	correct histogram	**3**	**B2** for 3 correct blocks or **B1** for 2 correct blocks If 0 scored **SC1** for 4 correct frequency densities 0.3, 1.2, 1, 0.2 oe soi
3(a)(iii)	$\frac{19}{260}$ oe	**3**	**M2** for $\frac{19}{40} \times \frac{3}{39}[\times 2]$ oe or **M1** for any of $\frac{19}{40}$, $\frac{3}{40}$, $\frac{19}{39}$, $\frac{3}{39}$ oe seen If 0 scored, **SC1** for $\frac{57}{800}$ oe
3(b)(i)	5	**1**	
3(b)(ii)	 Correct box plot	**3**	**B2** for with LQ at 8 and median at 22 and UQ at 27 and boxed or **M1** for LQ at 8 and median at 22 or for UQ at 27 **B1** for lowest = 5 and highest = 30 Max **B1** if not box and whisker diagram

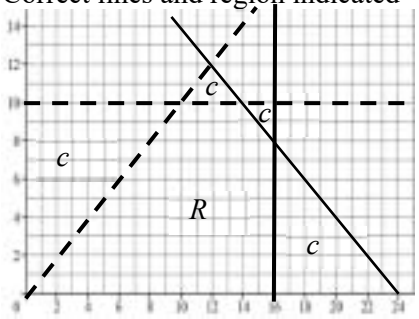
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Question	Answer	Marks	Partial Marks
3(b)(iii)	Correct explanation which states the median is 22 and correct reference to 100 or 101 e.g. • Median is 22 which is 50% of the people and 101 is more than 50% oe • The median is 22 which is the 100th number (accept 100.5th number)	**1**	
4(a)(i)	22 620 cao	**3**	**B2** for 7200π or 22 608 to 22 629 or **M1** for $\frac{1}{2}\times\pi\times12^2$[×figs 1] oe
4(a)(ii)	8840 or 8850 or 8836 to 8850.  	**5**	**M1** for cos $COM = \frac{6}{12}$ oe or sin $AOC = \frac{6}{12}$ oe **M1** for $\left(\frac{their\,COD}{360}\times\pi\times12^2\right)$ oe **M1** for $\left(\frac{1}{2}\times12^2\times\sin(their\,COD)\right)$ oe **M1dep** for (*their* area of sector *COD*–*their* area of triangle *COD*) ×100 **dep** on at least M1M1 oe
4(b)	647 or 646.8	**3**	**M2** for $2.2 = \frac{m}{42\times35\times0.2}$ oe or **M1** for [vol of stone =] 42×35×0.2 oe If 0 scored **SC1** for answer figs 647 or figs 6468
4(c)	46.1 or 46.12 to 46.14	**4**	**M3** for $\tan = \frac{15}{\sqrt{8^2+12^2}}$ oe or **M2** for $8^2 + 12^2$ oe or $8^2 + 12^2 + 15^2$ oe or **M1** for identifying the angle *GAC*
5(a)	$125x^9$ final answer	**2**	**B1** for answer $125x^k$ or mx^9 or for correct answer seen then spoilt

Question	Answer	Marks	Partial Marks
5(b)	6^{n-2} oe final answer	**2**	**B1** for answer of form 6^k oe or answer of the form $\left(\frac{1}{6}\right)^{-k}$ oe or for correct answer seen
5(c)	$3x^3 + 2x^2 - 37x + 12$ final answer	**3**	**B2** for correct expansion of three brackets unsimplified or for simplified four-term expression of correct form with 3 terms correct or **B1** for correct expansion of two brackets with at least 3 terms out of 4 correct
5(d)(i)	eliminates the fraction correctly eg $(3x + 5)(x - 2) + 7 = x(x - 2)$	**M1**	
	$3x^2 + 5x - 6x - 10 + 7 = x^2 - 2x$ oe	**B2**	**B1** for $3x^2 + 5x - 6x - 10$ [+ 7] oe seen with at least 3 terms correct
	leading to $2x^2 + x - 3 = 0$	**A1**	**dep** on M1 B2 with no errors or omissions
5(d)(ii)	$(2x+3)(x-1)$	**M2**	or **M1** for $(2x + a)(x + b)$ where $ab = -3$ or $2b + a = [+]1$ or for partial factors $2x(x - 1) + 3(x - 1)$ or $x(2x + 3) - [1](2x + 3)$
	−1.5 oe and +1	**B1**	
5(e)	[TSA cylinder =] $2\pi x^2 + 2\pi x \times 3x$	**M1**	
	[TSA hemisphere=] $\pi(5y)^2 + \frac{4\pi(5y)^2}{2}$	**M1**	
	Leading to $2\pi x^2 + 6\pi x^2 = 50\pi y^2 + 25\pi y^2$ oe	**M1**	dep **M1M1**
	$x^2 = \frac{75y^2}{8}$	**A1**	dep on **M1M1M1**
6(a)	$\sqrt{10.4^2 + 6.5^2 - 2 \times 10.4 \times 6.5 \times \cos 64}$	**M2**	**M1** for $10.4^2 + 6.5^2 - 2\times 10.4 \times 6.5 \times \cos 64$ **A1** for 91.1 to 91.2
	9.546 to 9.547	**A1**	

Question	Answer	Marks	Partial Marks
6(b)(i)	$180-(26+42)$	**B1**	
6(b)(ii)	6.89 or 6.888 to 6.892...	**3**	**M2** for $\frac{9.55}{\sin 112}\times\sin 42$ oe or **M1** for $\frac{\sin 112}{9.55}=\frac{\sin 42}{CD}$ oe
6(c)	5.84[2…]	**3**	**M2** for $\frac{x}{6.5}=\sin 64$ oe or **M1** for identifying shortest distance from D is perpendicular to AB
7(a)	2	**2**	**M1** for $3x+4x=6+8$ or better
7(b)	$5a(2a+1)$ final answer	**2**	**B1** for $a(10a+5)$ or $5(2a^2+a)$ or $5a(2a+1)$ then spoilt
7(c)	$4x(x-3)$ final answer	**2**	**M1** for $((2x-3)-3)((2x-3)+3)$ or better or for $4x^2-6x-6x+9$ [−9] oe or better
7(d)(i)	$\frac{1}{15}$ oe	**1**	
7(d)(ii)	19 683	**2**	**B1** for g(9), 3^9 or 3^{3^x} seen
7(d)(iii)	−3	**2**	**M1** for $3^k=\frac{1}{27}$ or $3^k=3^{-3}$ or answer g(–3)
8(a)	$y<10$ $y<x$ oe $x+y\leqslant 24$ oe	**3**	**B1** for each If 0 scored, **SC1** for $y\leqslant 10$ and $y\leqslant x$ and $x+y<24$

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Question	Answer	Marks	Partial Marks
8(b)	Correct lines and region indicated  	**6**	**B1** for each correct line and **B2** for R in correct region for all 4 correct lines or **B1** for R in any one of the regions marked *c* or **B1** for R that satisfies 3 of the correct inequalities
8(c)	228 nfww	**2**	**M1** for $8x + 12y$ for any (x, y) in *their* R, x, y both integer or $x = 15, y = 9$
9(a)	[a =] 9 [b =] 14	**3**	**B2** for a =9 OR **M2** for $\frac{60}{360}\times 2\times\pi\times 17+\frac{60}{360}\times 2\times\pi\times 10+7+7$ oe or **M1** for $\frac{60}{360}\times 2\times\pi\times 17$ oe **or** $\frac{60}{360}\times 2\times\pi\times 10$ oe If 0 scored **SC1** for b =14
9(b)(i)	60° at centre or interior angle = 120°	**B1**	
	[6×]$\frac{1}{2}\times d^2\times\sin 60$ oe	**M1**	
	[d^2 =]$\frac{127.3}{6\times\frac{1}{2}\times\sin 60}$	**M1**	
	6.99[9…] to 7.00[…]	**A1**	Dep on M1M1
9(b)(ii)(a)	1273	**1**	
9(b)(ii)(b)	675 or 674.5 to 674.6	**2**	**M1** for 2 ×127.3 oe or 6 × 7 × 10 oe
10(a)(i)	(4.5, −1)	**2**	**B1** for each

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Question	Answer	Marks	Partial Marks
10(a)(ii)	6.71 or 6.708...	**3**	**M2** for $(6-3)^2 + (2--4)^2$ oe or better or **M1** for [–]$(6-3)$ and [–]$(2--4)$ oe or for ([–]3)^2 and ([–]6)^2 oe
10(b)(i)	$-\frac{4}{3}$	**2**	**M1** for $3y = -4x + 12$ or $\frac{4}{3}x + y - \frac{12}{3}$ [= 0] or better seen
10(b)(ii)	(0, 4)	**2**	**B1** for each or for $y = 4$ not in coordinate form
10(b)(iii)	[y =]$\frac{3}{4}x + \frac{1}{2}$ final answer	**3**	**M1** for gradient $\frac{3}{4}$ or $\frac{-1}{\textit{their}\textbf{(b)(i)}}$ oe or better **M1** for (6, 5) substituted into $y = \frac{3}{4}x + c$ or y = *their* $mx + c$ oe
11(a)	–4 (–1)^3 – 9 (–1)^2 + 5 or better	**M1**	
	= 0 [so stationary point]	**A1**	with no errors
11(b)(i)	18	**3**	**B2** for $6x^2 - 6$ isw OR **B1** for $6x^2 + k$ (any k) isw or $px^2 - 6$ isw ($p \neq 0$) or $6x^2 - 6 + 8$ **M1**dep on B1 for $x = -2$ substituted into *their* $\frac{dy}{dx}$
11(b)(ii)	1 and –1	**2**	**M1** for $6x^2 - 6 = 0$ oe seen or for *their* $\frac{dy}{dx} = 0$ if B1 scored in part **(b)(i)**

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