Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2023**

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 May/June 2023 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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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

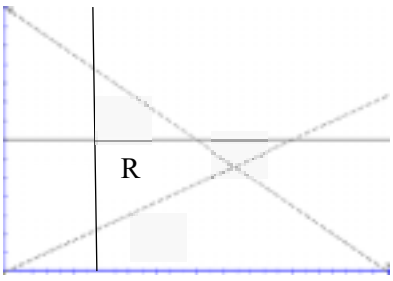
Question	Answer	Marks	Partial Marks
1(a)(i)	600	**2**	**M1** for $\frac{1250}{12+9+4}\times k$ where k = 1, 4, 9, 12 oe
1(a)(ii)	80	**2**	**M1** for 1250 × 64 [÷ 1000]
1(a)(iii)	60	**2**	**M1** for $x\times\left(1-\frac{10}{100}\right)=54$ oe
1(a)(iv)	1000	**2**	**M1** for 1250 – (1250 ÷ 5) oe or **B1** for 250
1(b)(i)	3.52	**2**	**M1** for [10 –] 12 × 0.54 or **B1** for 6.48
1(b)(ii)	0.08	**3**	**B2** for 0.077[4...] or **M1** for 0.51 ÷ 0.826 If 0 or 1 scored award instead **SC2** for 0.93 final answer OR If 0 scored **SC1** for 0.06 as answer
2(a)	[sin =] $\frac{145}{\frac{1}{2}\times 6.4\times 5.7\times 15}$	**M2**	**M1** for $145 = \frac{1}{2}\times 6.4\times 5.7\times \sin x\times 15$ oe or for $\frac{1}{2}\times 6.4\times h\times 15=145$ and $\sin x=\frac{h}{5.7}$
	32.0[0]	**A1**	If M0, **SC1** for 145 = $0.5\times 6.4\times 5.7\times sin32\times 15$ oe
2(b)	3.4[0] or 3.402 to 3.403 nfww	**3**	**M2** for $\sqrt{6.4^2+5.7^2-2\times 6.4\times 5.7\times\cos(32)}$ OR **M1** for $6.4^2+5.7^2-2\times 6.4\times 5.7\times\cos(32)$ **A1** for 11.6 or 11.57 to 11.58
2(c)	3.02 or 3.020 to 3.021	**3**	**M2** for $\sin(32)=\frac{x}{5.7}$ $\sqrt{80^2+50^2-2\times 80\times 50\times\cos 75}$ or **M1** for recognition that the line from E is perpendicular to AB e.g. right angle seen or $\frac{1}{2}\times 6.4\times h$

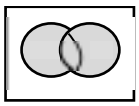
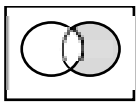
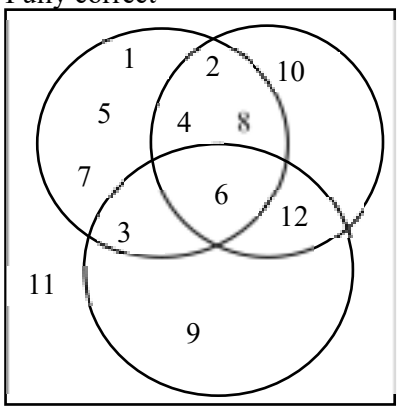
Question	Answer	Marks	Partial Marks
2(d)	10.8 or 10.9 or 10.84 to 10.85...	**4**	**M3** for [sin =] $\frac{their\,(c)}{\sqrt{15^2+5.7^2}}$ or $\left[\tan =\right]\frac{their\,(c)}{\sqrt{\left(5.7\times cos32\right)^2+15^2}}$ or **M2** for $15^2+5.7^2$ or $\left(5.7\times\cos 32\right)^2+15^2$ oe or **M1** for recognition of correct angle
2(e)	136 or 136.0...	**3**	**M2** for $938\times145\times\frac{1000}{1000000}$ oe or **M1** for figs 136 or 13601
3(a)(i)	55.87	**4**	**M1** for midpoints soi **M1** for use of $\sum fm$ where m is in the correct interval including boundaries **M1** (dep on 2nd M1) for $\sum fm \div 1000$
3(a)(ii)	$\frac{177}{500}$ cao	**2**	**M1** for $\frac{154+200}{1000}$ oe
3(b)(i)	25000	**1**	
3(b)(ii)	2.473×10^4	**1**	
3(c)(i)	166 650 or 165816 nfww	**3**	**M2** for (500 + 5) × '320 to 340' or '500 to 510' × (320 + 10) or **M1** for 500 − 5 or 500 + 5 or 320 −10 or 320 +10 Alternative method **M2** for 504 × '320 to 340' or '500 to 510' × 329 or **M1** for 504 or 329
3(c)(ii)	285 or 286 nfww	**2**	**M1** for 800 −10
4(a)(i)	96	**2**	**M1** for $\frac{1}{2}\times24\times8$
4(a)(ii)	18.4 or 18.43...	**2**	**M1** for $\tan\left[x\right]=\frac{8}{24}$ oe

Question	Answer	Marks	Partial Marks
4(b)	622 or 622.0 to 622.1....	**2**	**M1** for $[\frac{1}{2}\times]\ \pi\times 6^2\times 11$ or $\frac{1}{2}\times\pi\times 6^2[\times 11]$
4(c)(i)	246 or 246.2 to 246.3...	**5**	**M4** for $15\times 20-4\times 4-\frac{270}{360}\times\pi\times 4^2$ oe OR **M2** for $\frac{270}{360}\times\pi\times 4^2$ oe or **M1** for $k\times\pi\times 4^2$, where $k\leq 1$ **M1** for 15×20 or 4×4 oe
4(c)(ii)	80.8 or 80.9 or 80.84 to 80.85...	**3**	**M1** for $15+20+11+16$ oe **M1** for $\frac{3}{4}\times 2\times\pi\times 4$ oe
5(a)(i)(a)	25	**1**	
5(a)(i)(b)	17 to 18	**1**	
5(a)(i)(c)	12	**2**	**B1** for 148 seen
5(a)(i)(d)	30	**2**	**B1** for 104 seen
5(a)(ii)(a)	correct diagram or correct for *their* median and LQ	**3**	**B1** for whiskers at 1 **and** at 70 **B1** for with median **and** LQ at *their* **(a)(i)(a)** and **(a)(i)(b)** **B1** for UQ at 34 Maximum 2 marks if diagram incorrect If 0 scored **SC1** for *their* 5 correct ages plotted
5(a)(ii)(b)	50	**1**	
5(b)	correct histogram	**3**	**B1** for each correct block width 10 height 3.7 width 20 height 1.2 width 30 height 2 If 0 scored **SC1** for correct frequency densities 3.7, 1.2, 2 oe

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Question	Answer	Marks	Partial Marks
6(a)	(5, 2) (2, − 2)	**4**	**B3** for 3 correct values or answers for *C* and *D* reversed or correct coordinates given on diagram wrongly labelled or **B2** for one correct coordinate pair correctly labelled or **M2** for *A*,*B*,*C* and *D* correctly plotted or **M1** for *A* and *B* correctly plotted If 0 or 1 scored instead award **SC2** for answers (–3, 8) and (–6, 4) or answers (1.5,1.5) and (–2.5, 4.5)
6(b)(i)	(2.5, 3.5) oe	**2**	**B1** for each
6(b)(ii)	7.07 or 7.071...	**3**	**M2** for $(6--1)^2+(4-3)^2$ oe or **M1** for $(6--1)$ or $(4-3)$ oe
6(b)(iii)	$\frac{1}{7}$	**2**	**M1** for $\frac{4-3}{6--1}$ oe
6(b)(iv)	$y=\frac{1}{7}x-\frac{2}{7}$ or $7y=x-2$ oe final answer	**3**	**M1** for gradient = *their* **(iii)** **M1dep** for substituting (2, 0) in a linear equation with their *m* allow if (2,0) satisfies y=(*their***(b)(iii)** gradient)*x*+c
7(a)(i)	$3(3y-1)(3y+1)$ final answer	**3**	**B2** for $(9y-3)(3y+1)$ or $(3y-1)(9y+3)$ or or **M1** for $3(9y^2-1)$ or [...]$(3y-1)(3y+1)$ if 0 scored **SC1** for an otherwise correctly completely factorised expression but with fractions within the brackets
7(a)(ii)	$(2-p)(m+k)$ final answer	**2**	**M1** for $2(m+k)-p(m+k)$ or $m(2-p)+k(2-p)$
7(b)	$-\frac{1}{2}$ oe nfww	**5**	**B4** $-8x=+4$ oe nfww or **B3** for $\frac{x^2-8x-5}{(x-1)(x+1)}=1$ or better OR **B2** x^2-8x-5 or **M1** for $(x-1)(x-1)-6(x+1)$ or better **B1** $(x-1)(x+1)$ as full denominator or on the right hand side

Question	Answer	Marks	Partial Marks
7(c)	$\frac{-(-3)\pm\sqrt{(-3)^2-4(4)(-2)}}{2\times4}$ oe or $\frac{3}{8}\pm\sqrt{\left(\frac{3}{8}\right)^2+\frac{2}{4}}$ oe	**M2**	**M1** for $\sqrt{(-3)^2-4(4)(-2)}$ or for $\frac{-(-3)+\sqrt{q}}{2(4)}$ or $\frac{-(-3)-\sqrt{q}}{2(4)}$ or for [4]$\left(x-\frac{3}{8}\right)^2$
	−0.43 and 1.18 final ans cao	**A2**	**B1** for each **SC1** for −0.4 ,–0.42 or −0.425.... and 1.2 or 1.17 or 1.175.... or answers 0.43 and –1.18 or −0.43 and 1.18 seen in working
7(d)	$k=\frac{4m}{1-pm}$ or $k=\frac{-4m}{pm-1}$ final answer	**4**	**M1** for clearing fractions **M1** for collecting terms in k **M1** for factorising **M1** for dividing by bracket Maximum 3 marks if answer incorrect
8(a)	$y\leqslant 7$ oe $x+y<14$ oe $y>\frac{2}{3}x$ oe	**3**	**B1** for each
8(b)	$x=4$ solid $y=7$ solid $x+y=14$ dashed $y=\frac{2}{3}x$ dashed	**M4**	**B1** for each
	correct shading everywhere but region R  	**A2**	**M1dep** (dependent on M4 or B1B1B1B0 where the only error is wrong use of solid/dashed lines) for shading the correct side of 3 of the 4 lines.

Question	Answer	Marks	Partial Marks
8(c)	4 dresses and 3 shirts	**1**	
8(d)	106	**2**	**M1** for $10x + 6y$ evaluated for (x, y) in *their* region R or **B1** for (7, 6) After 0 scored, **SC1** for answer 112 or 116
9(a)(i)	*r, l, t, e, a*	**1**	
9(a)(ii)	2	**1**	
9(b)		**1**	
		**1**	
9(c)(i)	Fully correct 	**3**	**B2** for 7, 6, or 5 sections correct or **B1** for 4, 3 or 2 sections correct
9(c)(ii)	5	**1FT**	strict FT from their diagram
10(a)(i)	−7	**1**	
10(a)(ii)	$\frac{x-5}{2}$ oe final answer	**2**	**M1** for correct first step e.g. $x = 2y + 5$ or $2x = y - 5$ or $\frac{y}{2} = x + \frac{5}{2}$
10(a)(iii)	$2x^3 - 11x^2 - 8x + 80$ final answer	**4**	**M1** for $(x-4)(2x+5)(x-4)$ oe **B2** for $2x^3 - 8x^2 - 8x^2 + 5x^2 - 20x - 20x + 32x + 80$ or for simplified 4 term expression of the correct form with 3 terms correct in final answer or **B1** for 3 terms correct out of 4 from $x^2 - 4x - 4x + 16$ or $2x^2 - 8x + 5x - 20$

Question	Answer	Marks	Partial Marks
10(b)	0	**2**	**M1** for g(− 2) or $2(x - 4) + 5$ oe or $3^x = 1$ or $g\left(f\left(2\right)\right) = 1$