Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 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 February/March 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.

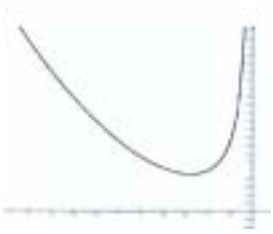
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Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless 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.

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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)	184	**2**	**M1** for $\frac{852-300}{300}[\times 100]$ oe or for $\frac{852}{300}\times 100[-100]$ oe
1(b)	497	**2**	**M1** for $\frac{852}{5+7}\times k$ oe where $k = 1$, 5 or 7
1(c)(i)	Forty thousand six hundred	**1**	
1(c)(ii)	4.06×10^4	**1**	
1(d)	435	**3**	**M2** for $3000\times\left(1-\frac{48}{100}-\frac{3}{8}\right)$ oe or **B2** for 2565, or 1440 **and** 1125 or 1875 **and** 1440 or 1560 **and** 1125 or **M1** for $1-\frac{48}{100}-\frac{3}{8}$ or $3000\times\left(\frac{48}{100}+\frac{3}{8}\right)$ oe or **B1** for 1440 or 1125 or 1560 or 1875 If 0 scored **SC1** for answer 975
1(e)	35.7	**3**	**M2** for $\frac{100+15}{100}\times\frac{100+18}{100}$ [–1] oe or better or **M1** for $k\times\frac{100+15}{100}\times\frac{100+18}{100}$ oe
2(a)	1[.0] 0.9	**2**	**B1** for each
2(b)	correct curve 	**4**	**B3 FT** for 6 or 7 points **B2 FT** for 4 or 5 points **B1 FT** for 2 or 3 points

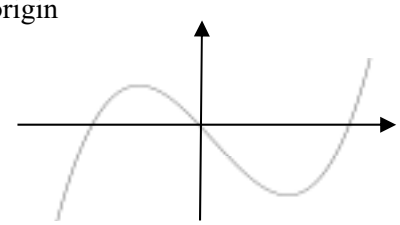
Question	Answer	Marks	Partial Marks
2(c)	ruled line at $y = -1$	**B1**	
	0.3 to 0.32	**B1**	
3(a)(i)	169	**2**	**M1** for g(13) or $(1+4x)^2$ or better
3(a)(ii)	$1+4x^2$ final answer	**1**	
3(a)(iii)	x	**1**	
3(b)	3.5 or $\frac{7}{2}$	**2**	**M1** for $1+4x=15$
4(a)(i)	40.9 or 40.91…	**3**	**M2** for [sin ABC=] $\frac{29.5\sin 51.6}{35.3}$ oe or for [cos ABC =] $\frac{35.3^2+45^2-29.5^2}{2\times35.3\times45}$ or **M1** for $\frac{29.5}{\sin ABC}=\frac{35.3}{\sin 51.6}$ oe or for correct implicit cosine rule
4(a)(ii)	520 or 520.0 to 520.2…	**2**	**FT** *their* (a)(i) if used provided working shown **M1** for $0.5\times29.5\times45\times\sin 51.6$ oe or for $0.5\times35.3\times45\times\sin(\textit{their}(a)(i))$ or for 0.5 × 35.3 × 29.5sin (180–51.6–*their*(a)(i))
4(b)(i)	41.2 or 41.21 to 41.23	**4**	**M1** for $SQ = 2\times32\times\sin\left(\frac{1}{2}\times56\right)$ oe or $\sqrt{32^2+32^2-2\times32\times32\times\cos 56}$ oe or $\frac{32\sin 56}{\sin((180-56)\div2)}$ oe **M2** for $SR^2=47^2+\left(\textit{their}\ SQ^2\right)-2\times47\times\textit{their}\ SQ\times\cos 60$ or **M1** for implicit form
4(b)(ii)	28.3 or 28.25 to 28.29…	**3**	**M2** for 32 × sin62 oe or **M1** for recognition that line from P is perpendicular to SQ
5(a)	121 or 120.8… or 120 $\frac{5}{6}$	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ with x in correct interval including both boundaries but **not** if x is 50, 50, 100 and 300 **M1** (dep on 2nd M1) for $\sum fx \div 120$

Question	Answer	Marks	Partial Marks
5(b)	12.4 5 1.4	**3**	**B1** for each If 0 scored **SC1** for fd's [0.86,] 0.62, 0.25 and 0.07 oe
5(c)	43 74 99 120	**2**	**B1** for 2 or 3 correct
5(d)	Correct diagram	**3**	**B1** for correct horizontal placement for 4 plots **B1FT** for correct vertical placement for 4 plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 4 points If 0 scored **SC1 FT** for 3 out of 4 points correctly plotted
5(e)(i)	Strict FT *their* **median** reading	**1**	
5(e)(ii)	Strict FT *their* **UQ** reading	**1**	
5(e)(iii)	Strict FT *their* reading at **40th percentile**	**2**	**B1** for 48 written or mark at cf = 48 on graph
5(e)(iv)	Strict FT *their* reading at 400 – *their* reading at 250	**2**	**B1** for either correct reading at 250 or 400
6(a)	15	**2**	**M1** for $\frac{360}{180-156}$ or for $\frac{180(n-2)}{n}=156$ oe
6(b)	38	**2**	**B1** for $AOB = 76$
6(c)	68	**2**	**B1** for $RSP = 68$ or $RQP = 112$

Question	Answer	Marks	Partial Marks
6(d)	Two pairs of equal angles identified with fully correct reasons	**M3**	**M2** for one pair of equal angles identified with fully correct reasons *KMG* = 90 angle in semicircle and *OGH* = 90 angle between tangent and radius OR *KMG* = *OGH* alternate segment OR *GOH* = *MGK* alternate angles OR Angle *FGM* = angle *GHO* corresponding **and** angle *FGM* = *GKM* alternate segment **and** angle *H* = angle *K* **or M1** for *KMG* = 90, angle in semicircle **or** *OGH* = 90, angle between tangent and radius
	Two or three pairs of angles equal [so similar] oe	**A1**	Dep on M3 with no incorrect work seen
7(a)	31.5	**3**	**M2** for $17.5\times\sqrt{\frac{1134}{350}}$ oe or **M1** for $\sqrt{\frac{1134}{350}}$ oe isw or $\sqrt{\frac{350}{1134}}$ oe isw or for $\frac{1134}{350}=\left(\frac{x}{17.5}\right)^2$ oe
7(b)	163.9375 or $163\frac{15}{16}$ final answer	**2**	**B1** for 15 + 0.25 or 10.5 + 0.25 or better seen
7(c)	40.5[0]	**2**	**M1** for $x\times\left(1-\frac{18}{100}\right)=\frac{166.05}{[5]}$ oe
7(d)	\$2.23 final answer	**3**	**B2** for 2.227… or 2.23 seen OR **M2** for $57-\frac{48.2}{0.88}$ oe or **M1** for $\frac{48.2}{0.88}$ oe If 0 scored **SC1** for 57 × 0.88 oe seen

Question	Answer	Marks	Partial Marks
8(a)	$\frac{12}{x}+\frac{26}{x+10}=2.8$ oe isw	**3**	**B2** for $\frac{12}{x}+\frac{26}{x+10}$ oe isw OR **B1** for $\frac{26}{x+10}$ seen **B1** for time = 2.8 or $\frac{168}{60}$ or $2\frac{48}{60}$ oe
8(b)	$12(x+10)+26x=2.8x(x+10)$ or better	**M2**	**FT** *their* time, provided 2 algebraic fractions one in x and other in $\pm x \pm 10$ **M1** for $12(x+10)+26x$ seen or better
	$12x+120+26x=2.8x^2+28x$	**M1**	**FT** *their* equation dep on M2
	$2.8x^2-10x-120=0$ oe or $30x + 300 + 65x = 7x^2 + 70x$ or better leading to $7x^2-25x-300=0$	**A1**	with no errors or omissions
8(c)	$\frac{[--]25\pm\sqrt{([-]25)^2-4\times7\times-300}}{2\times7}$ oe	**B2**	**B1** for $\sqrt{([-]25)^2-4(7)(-300)}$ or better or for $\frac{[--]25+\sqrt{q}}{2\times7}$ or $\frac{[--]25-\sqrt{q}}{2\times7}$
	− 5 and 8.57 or 8.571…	**B2**	**B1** for each or **SC1** for final answers 5 and –8.57
8(d)	84 to 84.01…	**2**	**FT** $\frac{720}{\textit{their}\text{ positive answer}}$ to 3 sf or better **M1** for $\frac{12}{\textit{their}\text{ positive answer}}$ [× 60] oe
9(a)	54[.0] or 53.99 to 54.03…	**6**	**M2** for [h =] 95.4 × 3 ÷ (π × 2.4^2) oe or **M1** for $95.4=\frac{1}{3}\times\pi\times2.4^2\times h$ **M2** for [slant ht , l =] $\sqrt{(\textit{their}\ h)^2+2.4^2}$ or **M1** for (*their* h)^2 + 2.4^2 **M1** for $\frac{x}{360}\times2\times\pi\times\textit{their}\ l=2\times\pi\times2.4$ oe or $\frac{x}{360}\times\pi\times(\textit{their}\ l)^2=\pi\times2.4\times\textit{their}\ l$

Question	Answer	Marks	Partial Marks
9(b)	14500 or 14470 to 14480	**4**	**M3** for $200 \times 60 \times 24 \times \pi \times 4^2$ [÷1000] or $2 \times 60 \times 24 \times \pi \times 0.04^2$ [×1000] or **M2** for $200 \times \pi \times 4^2$ or for $2 \times \pi \times 0.04^2$ or **M1** for $\pi \times 4^2$ oe or $\pi \times 0.04^2$ seen oe isw or 1000 cm^3 = 1 litre soi or 1 m^3 = 1000 litres soi or for 24×60 seen oe
10(a)	$x^3 + 2x^2 - 5x - 6$ final answer	**3**	**B2** for correct expansion of three brackets unsimplified or for simplified expression of correct form with 3 out of 4 terms correct or **B1** for correct expansion of 2 of the 3 given brackets with at least 3 terms out of four correct
10(b)	$\frac{Mc}{M-2f}$ or $\frac{-Mc}{2f-M}$ final answer	**4**	**M1** for clearing $g - c$ from denominator e.g. $M(g - c) = 2fg$ **M1** for correctly isolating terms in g in numerator on one side **M1** for correctly factorising or simplifying, to single term in g in an equation **M1** for correctly dividing by bracket to final answer
10(c)	$\frac{4x}{x+4}$ final answer	**3**	**B1** for $4x(x - 4)$ **B1** for $(x + 4)(x - 4)$
11(a)(i)	$\frac{1}{6}$ oe on all late branches $\frac{5}{6}$ oe on all not late branches	**2**	**B1** for one correct vertical pair $\frac{1}{6}$ oe and $\frac{5}{6}$ oe
11(a)(ii)	$\frac{5}{36}$ oe	**2**	FT *their* tree **M1** for $their\frac{1}{6} \times their\frac{5}{6}$
11(b)(i)	$(G \cup T \cup M)'$ oe	**1**	
11(b)(ii)	28	**1**	
11(b)(iii)	$\frac{17}{50}$ oe	**1**	

Question	Answer	Marks	Partial Marks
11(b)(iv)	$\frac{4}{7}$ oe	**3**	**M2** for $\frac{16}{21}\times\frac{15}{20}$ or **M1** for $\frac{n}{21}\times\frac{n-1}{20}$ or for $\frac{16}{21}$ and $\frac{15}{20}$ seen If 0 scored **SC1** for answer $\frac{256}{441}$ oe
12(a)	85[.0], 265[.0] and no others	**2**	**B1** for each If 0 scored **SC1** for two values in the range with a difference of 180 but not multiples of 90
12(b)	correct shape and passes through origin 	**3**	**B1** for any positive cubic shape **B1** for sketch with one max and one min and with 3 roots including zero If 0 scored, **SC1** for $x(x + 2)(x – 2)$ soi
12(c)	$a = –12$ $b = 5$ $k = –11$	**6**	**B5** for 2 correct OR **B2** for $3x^2 + a$ or **B1** for $3x^2$ isw **M1dep** on at least B1 for *their* $\frac{dy}{dx} = 0$ **M1dep** on at least B1M1 for $x = 2$ or $x = – 2$ substituted in *their* $\frac{dy}{dx} = 0$ equation **M1** for $k = 2^3 + 2\times \textit{their}\, a + b$ **and** $10 – k = (–2)^3 + (–2)\times \textit{their}\, a + b$