Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2021**

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 2021 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.

Abbreviations

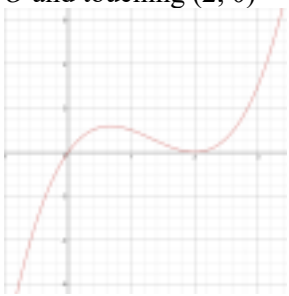
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	11.61 final answer	**2**	**M1** for $13.5[0] \times \left(1 - \frac{14}{100}\right)$ oe or **B1** for 1.89
1(a)(ii)	197.37 final answer	**2**	**FT** 17 × *their* (a)(i) exact or correct to nearest cent **M1** for 42.5 ÷ 2.5
1(b)(i)	53.3 or 53.33…	**1**	
1(b)(ii)	7.5	**2**	**M1** for 22.5 ÷ (2 + 8 + 5) oe soi
1(c)	20.55×2.45 oe	**M2**	**M1** for 20.5 + 0.05 oe seen or 2.4 + 0.05 oe seen If 0 scored, **SC1** here for 20.45×2.35 oe
	3 nfww	**A2**	**M1** for *their* area ÷ 10 ÷ 2.5 oe
2(a)(i)	1, –0.5 oe	**2**	**B1** for each
2(a)(ii)	Correct curve	**4**	**B3FT** for 6 or 7 correct plots or **B2FT** for 4 or 5 correct plots or **B1FT** for 2 or 3 correct plots
2(b)	$y = 2.5 - 2x$ ruled	**B2**	**B1** for $y = k - 2x$ or $y = px + 2.5$ ruled ($p \neq 0$) or for [$y =$] $2.5 - 2x$ oe identified
	1.3 to 1.4	**B1**	
2(c)	–1	**B1**	
	$y = -1$	**B1**	**FT** *their k* (must be negative)
3(a)(i)	7^{11} cao	**1**	
3(a)(ii)	7^{10} cao	**1**	
3(a)(iii)	7^2 cao	**1**	If answers 11, 10 and 2 in **(a)** then allow **SC1** in this part
3(b)	$1000x^9y^{12}$ final answer	**3**	**B2** for correct answer seen or answer of the form $1000x^9y^k$ or $1000x^ky^{12}$ or kx^9y^{12} or **B1** for answer with one correct element in product or $(10x^3y^4)^{[3]}$ seen
3(c)(i)	108	**2**	**M1** for [540 =] 2^2 [×] 3^3 [×] 5 or **B1** for 108 oe not in prime factor form e.g. $2^2 \times 3 \times 9$

Question	Answer	Marks	Partial Marks
3(c)(ii)	30 240	**2**	**M1** for $(540 \times 2^5 \times 3^3 \times 7) \div$ *their* **(c)(i)** oe or **B1** for answer 30 240 oe not in prime factor form e.g. $2^5 \times 3^3 \times 35$
3(c)(iii)	98	**2**	**B1** for 592 704 seen or $2^6 \times 3^3 \times 7^3$ seen or 2×7^2 oe seen
3(d)(i)	$(x - 7)(x + 4)$ final answer	**2**	**M1** for $x(x - 7) + 4(x - 7)$ or $x(x + 4) - 7(x + 4)$ or better or for $(x + a)(x + b)$ where $ab = -28$ or $a + b = -3$
3(d)(ii)	$(a + 2b)(11a + 14b)$ final answer	**2**	**M1** for $(a + 2b)(7(a + 2b) + 4a)$ or $(a + pb)(11a + qb)$ where $pq = 28$ or $11p + q = 36$ If 0 scored, **SC1** for $a + 2b$ $(11a + 14b)$
3(e)	$[y =]\frac{5x-1}{2}$ oe final answer	**4**	**B2** for $2x - 1 = -2x + 2y - x$ oe or **B1** for $9^x = 3^{2x}$ or better **M1dep** for correct rearrangement of *their* 5 term 'linear' equation in y and x to make y the subject
4(a)(i)	Correct histogram	**3**	**B1** for each correct block If 0 scored**, SC1** for any two of fds 7.5, 3.33…, 0.8 oe soi
4(a)(ii)	3.7875 or 3.79 or 3.787 or 3.788	**4**	**M1** for 0.75, 1.5, 3, 5.5, 9.5 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 40$
4(a)(iii)	$\frac{11}{40}$ oe	**1**	
4(a)(iv)	$\frac{30}{203}$ oe	**3**	**M2** for $[2 \times]\frac{4}{29} \times \frac{15}{28}$ oe or **M1** for $\frac{4}{29}$ or $\frac{15}{29}$ oe seen After 0 scored, **SC1** for $[2\times]\left(\frac{4}{40} \times \frac{26}{39}\right)$ oe or for answer $\frac{120}{841}$ oe
4(b)(i)	4.6	**1**	
4(b)(ii)	3.2	**1**	

Question	Answer	Marks	Partial Marks
4(b)(iii)	[median] remains the same oe and one is below [the median/middle] and one is above oe	**2**	**B1** for each statement
5(a)(i)(a)	$\begin{pmatrix} 5 \\ -13 \end{pmatrix}$ final answer	**1**	
5(a)(i)(b)	$\begin{pmatrix} -4 \\ 11 \end{pmatrix}$ final answer	**2**	**B1** for answer $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 11 \end{pmatrix}$ or $\begin{pmatrix} -6 \\ 16 \end{pmatrix}$ seen
5(a)(i)(c)	5.39 or 5.385…	**2**	**M1** for $2^2 + ([-]5)^2$
5(a)(ii)	$[k =]$ 8 $[m =] -32$	**3**	**B2** for $k = 8$ or $m = -32$ or **M1** for $-3 + 2k = 13$ oe or for $m = -5 \times$ *their* $k + 8$ correctly evaluated
5(b)(i)(a)	$\mathbf{p} + \mathbf{q}$ final answer	**1**	
5(b)(i)(b)	$\frac{1}{2}\mathbf{p} - \frac{1}{2}\mathbf{q}$ **or** $\frac{1}{2}(\mathbf{p} - \mathbf{q})$ or $\frac{\mathbf{p} - \mathbf{q}}{2}$ final answer	**2**	**M1** for unsimplified answer or any correct vector route for $\overrightarrow{CM}$, e.g. $-\mathbf{q} + \frac{1}{2}$ *their* **(b)(i)(a)**
5(b)(i)(c)	$\frac{1}{2}\mathbf{p} + \frac{1}{10}\mathbf{q}$ or $\frac{5\mathbf{p} + \mathbf{q}}{10}$ final answer	**2**	**M1** for unsimplified answer or any correct vector route for $\overrightarrow{MN}$
5(b)(ii)	$\frac{5}{3}\mathbf{p} + \mathbf{q}$ or $\frac{5\mathbf{p} + 3\mathbf{q}}{3}$ final answer	**3**	**B2** for unsimplified correct answer OR **M1** for $\mathbf{p} + \frac{3}{5}\mathbf{q}$ seen **B1** for final answer of form $k\mathbf{p} + \mathbf{q}$ $(k > 1)$ or final answer $\frac{5}{3}\mathbf{p} + j\mathbf{q}$ oe (any j)
6(a)	$\sqrt{16^2 + 19^2 - 2\times16\times19\cos 57}$ oe	**M2**	or **M1** for $16^2 + 19^2 - 2\times16\times19\cos 57$ **A1** for 285.8 to 285.9
	16.90 to 16.91	**A1**	

Question	Answer	Marks	Partial Marks
6(b)	74.3 or 74.30 to 74.33	**4**	**M2** for [sin ... =] $\frac{16.9\times\sin 75}{32}$ oe or **M1** for $\frac{16.9}{\sin C}=\frac{32}{\sin 75}$ oe **B1** for [angle *BCD* =] 30.7 or 30.67 to 30.69… or **M1dep** for 105 – *their* angle *BCD*
6(c)	388 or 387.7 to 387.9… nfww	**3**	**M1** for $\frac{1}{2}\times 16\times 19\times\sin 57$ oe **M1** for $\frac{1}{2}\times 16.9\times 32\times\sin$ *their* **(b)** oe
6(d)	13.4 or 13.41 to 13.42 nfww	**3**	**M2** for $\frac{x}{16}=\sin 57$ oe or **M1** for distance required is perpendicular to *AD* soi
7(a)(i)	Triangle at (4, 0) (4, 3) (6, 3)	**2**	**B1** for translation by $\begin{pmatrix}2\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-1\end{pmatrix}$ If 0 scored **SC1** for triangle at (3, 0.5) (3, 3.5) (5, 3.5)
7(a)(ii)	Triangle at (1, –2) (4, –4) (4, –2)	**2**	**B1** for rotation 90 clockwise wrong centre or for rotation 90 anticlockwise about the origin
7(a)(iii)	Triangle at (–4, 4) (–4, 2.5) (–5, 2.5)	**2**	**B1** for enlargement SF $-\frac{1}{2}$ with wrong centre or for enlargement SF $\frac{1}{2}$ with centre (–2, 3)
7(b)	Reflection $y = -x$ oe	**2**	**B1** for each
8(a)	[*L* =] 11.8 [*W* =] 5.9 [*H* =] 7.1	**5**	**M1** for $L = 2W$ oe soi **M1** for $W + 2H = 20.1$ oe **M1** for $2L + 2H = 37.8$ oe **B1** for at least one correct answer
8(b)(i)	0.559 to 0.56[0…]	**B4**	**M2** for $\frac{1}{3}\times 18\times 15\times\sqrt{24^2-18^2}$ isw conversion or **M1** for $h^2 + 18^2 = 24^2$ oe or better **M1** for figs 800 ÷ figs *their* volume isw
	g/cm^3 or g cm^{-3} final answer	**B1**	

Question	Answer	Marks	Partial Marks
8(b)(ii)	34.1 or 34.11 to 34.12	**4**	**M3** for tan [ ] = $\frac{\sqrt{24^2 - 18^2}}{\sqrt{18^2 + 15^2}}$ oe or **M2** for $\sqrt{18^2 + 15^2}$ isw or $\sqrt{24^2 + 15^2}$ isw or **M1** for $18^2 + 15^2$ isw or $24^2 + 15^2$ isw or **M1** for indicating required angle is *EBD*
9(a)(i)	2	**2**	**M1** for $x(x^2 - 4x + 4)$ or $x(x - 2)^2$ or $(x^2 - 2x)(x - 2)$ or $x^3 - 2ax^2 + a^2x$
9(a)(ii)	Correct sketch with curve passing through *O* and touching (2, 0) 	**4**	**B1** for any positive cubic **B1** for sketch through or touching *O* **B1** for sketch with min or max touching *x*-axis once only but not at (0, 0) **B1FT** *their* **(a)(i)** for sketch with min or max touching *x*-axis at (*their* 2, 0) and *their* 2 is labelled or clearly indicated
9(b)	$y = 20x - 64$ final answer nfww	**7**	**B6** for equivalent correct equation OR **B2** for $3x^2 - 8x + 4$ isw or **B1** for $3x^2$ or $-8x$ seen **M2dep** for [grad =] 20 soi nfww or **M1dep** for substituting 4 into *their* derivative isw **B1** for (4, 16) soi **M1dep** for $16 =$ *their* $20 \times 4 + c$ oe
10	125 n^3 oe final ans	**B2**	**B1** for 125 **B1** for n^3
	29 $6n - 1$ oe final ans	**B3**	**B1** for 29 **B2** for $6n - 1$ oe or **B1** for $6n + k$ or $an - 1$ ($a \neq 0$)
	2^{n-3} oe final ans	**B2**	**B1** for $2^{n\,[+\,k]}$ oe
	25 $6n - 1 - 2^{n-3}$ oe final ans OR 25.25 $-\frac{1}{24}n^3 + \frac{1}{8}n^2 + \frac{17}{3}n - 1$ oe final ans	**B2**	**FT** *their* 29 – 4 and *their* $6n - 1$ – *their* 2^{n-3} **B1FT** for each OR **B1** for each