Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2020**

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 October/November 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

[Turn over

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.

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)	$5.101[00\ldots] \times 10^8$ final answer	**1**	
1(a)(ii)	361 150 800 oe	**2**	**FT** *their* **(a)(i)** **M1** for $\frac{70.8}{100} \times 510\,100\,000$ or for $\frac{70.8}{100} \times$ *their* **a(i)**
1(b)(i)	6070 oe	**1**	
1(b)(ii)	32 000 oe	**2**	**B1** for figs 32
1(b)(iii)	6.68 or 6.677 …	**2**	**M1** for $\frac{6.41\times10^5}{9.6[0]\times10^6}$ [× 100] oe
1(b)(iv)	1250 or 1248 to 1249 oe	**2**	**B1** for figs 125 or figs1248 to figs 1249
1(c)(i)	25.1 or 25.08…	**2**	**M1** for $\frac{7.53[\times10^9] - 6.02[\times10^9]}{6.02[\times10^9]}$ oe or $\frac{7.53[\times10^9]}{6.02[\times10^9]} \times 100$
1(c)(ii)	1.33 or 1.325…	**3**	**M2** for $\sqrt[17]{\frac{7.53[\times10^9]}{6.02[\times10^9]}}$ or $\sqrt[17]{1+\frac{\textit{their}\ \textbf{(c)(i)}}{100}}$ or **M1** for $6.02[\times10^9] \times p^{17} = 7.53[\times10^9]$ or $p^{17} = 1+\frac{\textit{their}\ \textbf{(c)(i)}}{100}$
2(a)(i)	Triangle at (–3, 2) (–3, 3) (–5, 2)	**2**	**B1** for correct rotation about incorrect point or for rotation 90 clockwise around (0, 0)
2(a)(ii)	Triangle at (5, –2) (6, –2) (5, 0)	**2**	**B1** for translation by $\begin{pmatrix}3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-5\end{pmatrix}$
2(b)	Enlargement [SF] 3 [Centre] (1, 4)	**3**	**B1** for each
3(a)(i)	43	**1**	
3(a)(ii)	65	**1**	
3(a)(iii)	13	**1**	

Question	Answer	Marks	Partial Marks
3(b)	80	**3**	**M2** for $\frac{400}{18}\times\frac{60\times60}{1000}$ oe Or **M1** for $\frac{400}{18}$ or for *their* speed in m/s $\times\frac{60\times60}{1000}$ or for $\frac{400}{1000}$ and $\frac{18}{60\times60}$ soi
4(a)(i)	$\frac{1}{11}$ oe	**1**	
4(a)(ii)	$\frac{1}{110}$ oe	**2**	**M1** for $\frac{1}{11}\times\frac{1}{10}$ oe
4(a)(iii)	$\frac{4}{55}$ oe	**3**	**M2** for $\left(\frac{2}{11}\times\frac{1}{10}\right)+\left(\frac{3}{11}\times\frac{2}{10}\right)$ oe **or M1** for $\left(\frac{2}{11}\times\frac{1}{10}\right)$ or $\left(\frac{3}{11}\times\frac{2}{10}\right)$ seen oe
4(b)(i)	$\frac{1}{165}$ oe	**2**	**M1** for $\frac{3}{11}\times\frac{2}{10}\times\frac{1}{9}$ oe
4(b)(ii)	$\frac{1}{5}$ oe	**5**	**M4** for $3\left(\frac{2}{11}\times\frac{1}{10}\times\left[\frac{9}{9}\right]\right)+3\left(\frac{3}{11}\times\frac{2}{10}\times\frac{8}{9}\right)$ oe or **M3** for $3\left(\frac{3}{11}\times\frac{2}{10}\times\frac{8}{9}\right)$ or **M2** for $3\left(\frac{2}{11}\times\frac{1}{10}\times\left[\frac{9}{9}\right]\right)$ or $\frac{3}{11}\times\frac{2}{10}\times\frac{8}{9}$ oe or **M1** for $\frac{2}{11}\times\frac{1}{10}\times\left[\frac{k}{9}\right]$ where k is 3, 6 or 9
4(b)(iii)	$\frac{131}{165}$ oe	**2**	**M1** for 1 – (*their* **(b)(i)** + *their* **(b)(ii)**) oe
5(a)(i)	81° Angle at centre is twice angle at circumference oe	**2**	**B1** for 81°
5(a)(ii)	81° Alternate segment [theorem] oe	**2**	**FT** *their* **(a)(i)** **B1FT** for 81°

Question	Answer	Marks	Partial Marks
5(a)(iii)	123° Angles on a straight line [= 180] Opposite angles in a cyclic quadrilateral are supplementary oe	3	**FT** *their* acute **(a)(ii)** + 42 **B1** for each element
5(b)(i)	Angle *PTU* = angle *PRQ* corresponding Angle *PUT* = angle *PQR* corresponding Angle *RPQ* is common oe	**M2**	Accept in any order **M1** for one correct pair with reason If 0 scored, **SC1** for two correct pairs of equal angles identified with incorrect/no reasons
	Corresponding angles are equal oe	**A1**	
5(b)(ii)(a)	4 : 7 oe	1	
5(b)(ii)(b)	41.25 oe	3	**M2** for $20\times\left(\frac{7}{4}\right)^2$ oe or $20\times\frac{7^2-4^2}{4^2}$ oe or **M1** for $\left(\frac{7}{4}\right)^2$ or $\left(\frac{4}{7}\right)^2$ or $\frac{7^2-4^2}{4^2}$ or $\frac{4^2}{7^2-4^2}$
6(a)	440	2	**M1** for $8\times5\times11$
6(b)	$\sqrt{8^2+5^2+11^2}$ oe or $8^2 + 5^2 + 11^2$ and 13^2 ALTERNATIVE $\sqrt{8^2+11^2}$ or $8^2 + 11^2$ and 13^2	**M3**	**M2** for $8^2 + 5^2 + 11^2$ or $8^2 + 11^2$ oe or **M1** for $8^2 + 5^2$ or $5^2 + 11^2$ oe
	Yes and 14.5 or 14.4 or 14.49… or Yes and 13.6[0…]	**A1**	Accept equivalent conclusion
6(c)(i)	32.0[…]	2	**M1** for tan[..] = $\frac{5}{8}$ oe
6(c)(ii)	49.4 or 49.38 to 49.39	2	**M1** for sin[..] = $\frac{11}{\textit{their AG}}$ oe
7(a)(i)	$(8-x)(3+x)$	2	**M1** for $8(3+x)-x(3+x)$ or $3(8-x)+x(8-x)$ or $(a-x)(b+x)$ where $ab = 24$ or $a-b=5$

Question	Answer	Marks	Partial Marks
7(a)(ii)	[a =] –3 [b =] 8 [c =] 24	**3**	**FT** *their* **(a)(i)** for a and b **B1FT** for each of a and b or both correct but reversed **B1** for [c =] 24
7(a)(iii)	8	**3**	**M2** for $5 - 2x$ or **M1** for $-2x$ or $5 - kx$, $k \neq 0$
7(b)(i)	Correct sketch: positive cubic shape and max on the y-axis or to the right of y-axis with one root at (–1, 0) and turning point at (3, 0) and y-intercept at (0, 9) all labelled	**4**	**B1** for positive cubic shape with max on the y-axis or to the right of y-axis **B1** for root at (–1, 0) **B1** for turning point at (3, 0) **B1** for y-intercept (0, 9) If 0 score **SC1** for all three intercepts on axes identified
7(b)(ii)	$x^3 - 5x^2 + 3x + 9$ final answer	**3**	**B2** for correct expansion of three brackets unsimplified **B1** for correct expansion of two brackets with at least 3 terms correct
8(a)(i)	$\begin{pmatrix} 4 \\ 4 \end{pmatrix}$	**2**	**B1** for $\begin{pmatrix} 4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$
8(a)(ii)	$\begin{pmatrix} -4 \\ 8 \end{pmatrix}$	**2**	**B1** for $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 8 \end{pmatrix}$
8(a)(iii)	5.39 or 5.385..	**2**	**M1** for $(-2)^2 + 5^2$ oe
8(b)(i)	$\mathbf{a} + \mathbf{b}$	**1**	
8(b)(ii)	$\frac{3}{2}\mathbf{a} + \mathbf{b}$	**2**	**M1** for a correct route, e.g. $\overrightarrow{OA} + \overrightarrow{AE}$
8(b)(iii)	$2\mathbf{a} + \frac{4}{3}\mathbf{b}$	**3**	**M2** for unsimplified $\overrightarrow{OD}$ or for $\frac{4}{3}\mathbf{b}$ or **M1** for $\overrightarrow{OD}$ attempted in terms of **a** and **b** or for $\overrightarrow{CD} = \frac{1}{3}\mathbf{b}$ or $\overrightarrow{DB} = \frac{2}{3}\mathbf{b}$ seen
9(a)	2, 3, 4, 5	**2**	**B1** for 3 correct and no extra or 4 correct and one extra or **M1** for $1 < x \leqslant 5$
9(b)(i)	$3y\,(2y - 5x)$	**2**	**B1** for $3(2y^2 - 5xy)$ or $y\,(6y - 15x)$ or for the correct answer seen and then spoiled

Question	Answer	Marks	Partial Marks
9(b)(ii)	$(y - 3x)(y + 3x)$	**2**	**B1** for $(y + 3)(y - 3)$
9(c)	$\frac{4x+5}{(x-1)(2x+1)}$ or $\frac{4x+5}{2x^2-x-1}$ final answer	**3**	**M1** for $3(2x + 1) - 2(x - 1)$ oe isw **M1** for $(x - 1)(2x + 1)$ oe isw
9(d)	(1.74 , 7.21 to 7.24) and (–3.74 , –9.20 to –9.22) cao	**6**	For the y values accept any value rounded to 2 decimal places in the given range **B5** for (1.74 , 7.21 to 7.24) or (–3.74 , –9.20 to –9.22) or $x = 1.74$ and $x = -3.74$ OR **M2** for $2x^2 + 4x - 13 = 0$ or $2y^2 + 4y - 133 = 0$ or **M1** for $2x^2 + 7x - 11 = 3x + 2$ or $y = 2\left(\frac{y-2}{3}\right)^2 + 7\left(\frac{y-2}{3}\right) - 11$ AND **FT** *their* quadratic expression (not $2x^2 + 7x - 11$) **M2FT** for $\frac{-4 \pm \sqrt{4^2 - 4\times2\times-13}}{2\times2}$ or $-1 \pm \sqrt{\frac{15}{2}}$ oe or **M1FT** for $\sqrt{4^2 - 4\times2\times-13}$ oe or for $\frac{-4+\sqrt{k}}{2\times2}$ or $\frac{-4-\sqrt{k}}{2\times2}$ or $(x + 1)^2$ [– 13/2 – 1 = 0]
10(a)	–23	**2**	**M1** for $4 - 3(3^x)$ oe soi
10(b)	$\frac{4-x}{3}$ oe final answer	**2**	**M1** for $x = 4 - 3y$ or $y + 3x = 4$ or $x + 3y = 4$ or $\frac{y}{-3} = \frac{4}{-3} + x$ oe or $\frac{x}{-3} = \frac{4}{-3} + y$ oe
10(c)(i)	$1 + 6x$ final answer	**2**	**M1** for $4 - 3(1 - 2x)$

Question	Answer	Marks	Partial Marks
10(c)(ii)	$20 - 36x$ or $4(5 - 9x)$ final answer	**4**	**B3** for $20 - 36x$ seen in working then spoiled OR **M1** for $(4 - 3x)^2 + 4 - 3x - 9(x^2 + x)$ or better **B1** for $[(4 - 3x)^2 =] 16 - 12x - 12x + 9x^2$ or better **B1** for answer $20 - kx$ or $k - 36x$ oe or answer $20 - 36x + kx^2$ $k \neq 0$
10(d)	$-\frac{1}{2}$ oe	**2**	**M1** for $(3^2)^{kx}$ or $9^{kx} = 9^{-\frac{1}{2}x}$ oe
11A	24	**B1**	
	$5n - 1$ oe	**B2**	**B1** for $5n - k$ or $jn - 1$ oe $j \neq 0$
11B	127	**B1**	
	$n^3 + 2$ oe	**B2**	**B1** for n^3 oe
11C	256	**B1**	
	$4^{(n-1)}$ oe	**B2**	**B1** for 4^k oe