Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/43**

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.

[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.

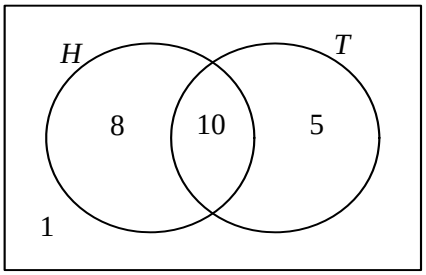
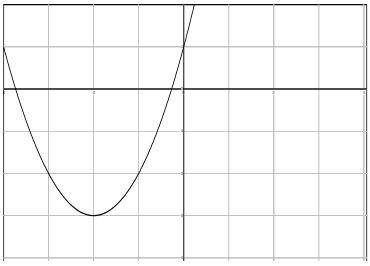
Abbreviations

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)	120	**2**	**M1** for $6 \div (21 - 19)$ oe soi or for $\frac{2x}{40} = 6$
1(a)(ii)(a)	34	**2**	**M1** for $40 - \frac{15}{100} \times 40$ oe or better or **B1** for 6
1(a)(ii)(b)	35	**2**	**M1** for $\left(1 - \frac{15}{100}\right) \times p = 29.75$ or better
1(b)(i)	44 274 cao	**3**	**B2** for 44273 to 44274 or 44270 or **M1** for $40100 \times \left(1 + \frac{2}{100}\right)^5$ oe
1(b)(ii)	2019 nfww	**3**	**M2** for one correct trial of $n = 8$ or $n = 9$ either to find a salary or, if working with 1.02^n and $47\,500 \div 40\,100$ [= 1.1845], to find a value of 1.02^n or **B2** for final answer 9 or 4 nfww or **M1** for *their* $44\,274 \times \left(1 + \frac{2}{100}\right)^n = 47\,500$ oe or $40\,100 \times \left(1 + \frac{2}{100}\right)^n = 47\,500$ oe or for at least one trial giving a value greater than *their* 44 274
1(c)	2.9 [increase]	**2**	**M1** for $\left(1 + \frac{5}{100}\right) \times \left(1 - \frac{2}{100}\right)$ oe implied by 1.029 or 102.9[%]
2(a)(i)	–1	**2**	**M1** for $3 \times 2^2 - 13$ oe
2(a)(ii)	$[\pm]\sqrt{\frac{y-t}{p}}$ oe final answer	**3**	**M1** for correct rearrangement to isolate x^2 term **M1** for correct division by p **M1** for correct square root Incorrect answer scores a maximum of M2 If 0 scored, SC1 for a correctly rearranged formula with $p = 3$ and $t = -13$ substituted

Question	Answer	Marks	Partial Marks
2(b)(i)	$(5x-4)(3x+2)$ oe final answer	**2**	**B1** for $(ax+b)(cx+d)$ where either $ac = 15$ and $bd = -8$ or $ad + bc = -2$ or $5x(3x + 2) - 4(3x + 2)$ or $3x(5x - 4) + 2(5x - 4)$ or correct factors seen and spoiled
2(b)(ii)	$\frac{4}{5}$ oe and $-\frac{2}{3}$ oe	**1**	**FT** a factorised quadratic
2(c)	$x(x+4y)(x-4y)$ final answer	**3**	**B2** for $(x^2+4xy)(x-4y)$ or $(x+4y)(x^2-4xy)$ or answer in the form $x(a + b)(a - b)$ or correct answer seen and spoiled or **B1** for $x(x^2-16y^2)$ oe or $(x+4y)(x-4y)$
2(d)	$\frac{1-2a}{x}$ oe final answer	**4**	**B2** for $(2x - 1)(1 - 2a)$ oe or **B1** for $2x - 1 - 2a(2x - 1)$ or $2x(1 - 2a) - (1 - 2a)$ **B1** for $x(2x - 1)$
3(a)(i)	4	**1**	
3(a)(ii)	7	**1**	
3(a)(iii)	8	**1**	
3(b)(i)	14	**1**	
3(b)(ii)	4	**2**	**B1** for [l.q. =] 11 or [u.q =] 15
3(c)	8.09	**3**	**M1** for $5 \times 3 + 10 \times 6 + 43 \times 7 + 75 \times 8 + 48 \times 9 + 21 \times 10$ **M1 dep** ÷ 200
3(d)	30, 70, 40, 36, 24 seen	**B2**	**B1** for 3 or 4 correct or **M1** for $1 \times (80 - 50)$, $3.5 \times (100 - 80)$, $4 \times (110 - 100)$, $3.6 \times (120 - 110)$ and $0.6 \times (160 - 120)$ oe
	(their 30×65 + *their* 70×90 + *their* 40×105 + *their* 36×115 + *their* $24 \times 140) \div 200$	**M3**	**M1** for midpoints soi **M1** for Σfx, x in interval or boundary of interval **M1 dep on second M1** for ÷ 200
	99.75	**A1**	
4(a)(i)	(2, 7)	**2**	**B1** for each coordinate

Question	Answer	Marks	Partial Marks
4(a)(ii)	$-\frac{1}{2}x+8$ oe	**4**	Correct equivalent in different form scores 3 marks. **M1** for gradient of $AB = \frac{9-5}{3-1}$ or $\frac{4}{2}$ or 2 **M1 dep** for gradient $p = -\frac{1}{\textit{their grad of AB}}$ **M1 (dep** on previous M1) for substitution of *their* midpoint into $y = (\textit{their } p)x + c$ oe where *their* $p \neq 0$
4(b)(i)	$\begin{pmatrix}0\\2\end{pmatrix}$	**2**	**B1** for $\begin{pmatrix}0\\k\end{pmatrix}$ or $\begin{pmatrix}k\\2\end{pmatrix}$
4(b)(ii)	$\begin{pmatrix}-2\\9\end{pmatrix}$	**2**	**FT** *their* $\overrightarrow{PQ}$ **B1FT** for $\begin{pmatrix}0\\6\end{pmatrix}$
4(c)(i)	$\frac{2}{3}\mathbf{t} + \frac{1}{3}\mathbf{u}$ or $\frac{1}{3}(2\mathbf{t}+\mathbf{u})$ final answer	**2**	**M1** for $\overrightarrow{UY} = \frac{2}{3}(\mathbf{t}-\mathbf{u})$ oe or $\overrightarrow{TY} = \frac{1}{3}(\mathbf{u}-\mathbf{t})$ oe or correct route soi
4(c)(ii)	$\frac{2}{3}\mathbf{t}$ cao	**1**	
5(a)	[x =] 7 [y =] 3	**2**	**B1** for each
5(b)	[x =] 0, [y =] 2 [x =] –3, [y =] 5	**4**	**B3** for $x = 0$ and $x = -3$ or **B2** for $x^2 + 3x = 0$ or **M1** for $2 - x = x^2 + 2x + 2$ If 0 scored award **B1** for $x = 0$, $y = 2$ or $x = -3$, $y = 5$ from no/incorrect working ALTERNATIVE **B3** for $y = 2$ and $y = 5$ or **B2** for $y^2 - 7y + 10 = 0$ or **M1** for $y = (2-y)^2 + 2(2-y) + 2$ If 0 scored award **B1** for $x = 0$, $y = 2$ or $x = -3$, $y = 5$ from no/incorrect working

Question	Answer	Marks	Partial Marks
6(a)		**2**	i.e. 8, 10 and 5 correctly placed **B1** for 10 correctly placed or **M1** for $18 - x$, x and $15 - x$ correctly placed on diagram and $x = 10$ seen
6(b)	10	**1**	**FT** *their* Venn diagram
6(c)	5	**1**	**FT** *their* Venn diagram
6(d)	$\frac{5}{24}$ oe	**1**	**FT** *their* 5 on the Venn diagram
6(e)	0	**1**	
6(f)	$\frac{5}{17}$ oe	**3**	**M2** for $\frac{their10}{18} \times \frac{their9}{17}$ or **B1FT** for $\frac{their10}{18}$ or $\frac{their9}{17}$ seen After 0 scored, **SC1** for answer $\frac{25}{81}$ oe
7(a)	$-2 < x \leqslant 1$	**2**	**B1** for $-2 < x$ or $x \leqslant 1$
7(b)(i)	$(x+2)^2 - 3$	**2**	**M1** for $(x+2)^2 + k$
7(b)(ii)	$(x+2)^2 = 3$	**M1**	**FTdep** *their* **(b)(i)** for $k < 0$
	–3.73 or –3.732... and –0.268 or –0.2679...	**B1**	
7(b)(iii)	(–2, –3)	**2**	**FT** *their* $(x+2)^2 - 3$ **B1** for each coordinate
7(b)(iv)	Correct sketch 	**2**	Parabola with minimum point in correct quadrant and both x-intercepts negative and positive y-intercept **B1** for parabola with minimum point.

Question	Answer	Marks	Partial Marks
8(a)(i)	1200	**1**	
8(a)(ii)(a)	800	**3**	**M2** for [2 ×] (20 × 12 + 20 × 5 + 12 × 5) or **M1** for 20 × 12 or 20 × 5 or 12 × 5
8(a)(ii)(b)	0.19	**1**	**FT** 152 ÷ *their* 800
8(b)	$\frac{3x}{2}$ or 1.5x	**3**	**B2** for $r^3 = \frac{27x^3[\pi]}{8[\pi]}$ or better or **M1** for $\frac{4}{3}\pi r^3 = \pi x^2 \times \frac{9x}{2}$
8(c)	13.6 or 13.59 to 13.61	**7**	If chord is *AB* and *O* is centre of the cross section **M2** for $2 \times \quad \cos^{-1}\left(\frac{20-5}{20}\right)$ oe or **M1** for cos = $\frac{20-5}{20}$ oe **M1** for $\frac{theirAOB}{360} \times \pi \times 20^2$ or $\frac{1}{2}(20)^2\left(\frac{82.8\pi}{180}\right)$ **M1** for $\frac{1}{2} \times 20^2 \times \sin(their\ AOB)$ oe **M1** for *their* area × 150 **M1** for *their* volume ÷ 1000
9(a)	42.3 or 42.28 to 42.30...	**7**	**M1** for $\frac{AB}{14} = \cos 35$ oe **M1** for $\frac{AD}{14} = \sin 35$ oe **B1** for [*C* =] 75 **M3** for [BC =] $\frac{14\sin 60}{\sin their 75}$ oe **and** [DC] $\frac{14\sin 45}{\sin their 75}$ oe or **M2** for $\frac{14\sin 60}{\sin their 75}$ **or** $\frac{14\sin 45}{\sin their 75}$ oe or **M1** for $\frac{\sin their 75}{14} = \frac{\sin 60}{BC}$ oe or $\frac{\sin their 75}{14} = \frac{\sin 45}{CD}$ oe

Question	Answer	Marks	Partial Marks
9(b)(i)	4.91 or 4.907...	**3**	**B2** for [l^2 =] 24.1 or 24.08... or M2 for $\sqrt{3}\,l = 8.5$ or [l =] $\sqrt{\frac{8.5^2}{3}}$ oe or **M1** for $l^2 + l^2 + l^2 = 8.5^2$ oe
9(b)(ii)	35.3 or 35.26 to 35.3 nfww	**3**	**M2dep** for sin (angle) = $\frac{\textit{their}\ \textbf{(b)(i)}}{8.5}$ oe or **M1** for clear recognition of correct angle
10(a)(i)	4	**1**	
10(a)(ii)	3	**1**	
10(a)(iii)	13	**1**	**FT** $5 \times$ *their* **(a)(i)** $- 7$
10(b)	$\frac{x+2}{3}$ final answer	**2**	**M1** for $y + 2 = 3x$ or for $\frac{y}{3} = x - \frac{2}{3}$ or for $x = 3y - 2$
10(c)	$9x^2 - 9x + 2$ final answer	**3**	**M1** for $(3x-2)^2 + 3x - 2$ **B1** for $(3x-2)^2 = 9x^2 - 6x - 6x + 4$
10(d)	$2x + 1$	**1**	
10(e)(i)	81	**1**	
10(e)(ii)	x	**1**	Not $y = x$
11(a)(i)	–5	**1**	
11(a)(ii)	Subtract 4 oe	**1**	
11(a)(iii)	$15 - 4n$ oe final answer	**2**	**B1** for $k - 4n$ or $15 - jn$ $j \neq 0$
11(b)(i)	$\frac{1}{21}$ or equivalent fraction	**2**	**B1** for $\frac{12}{7}$ and $\frac{10}{6}$
11(b)(ii)	$n = \frac{3}{5}$ oe or $2n \geqslant n + 1$ but $3 < 4$.	**M2**	**M1** for $\frac{3}{4} = \frac{2n}{n+1}$ oe or **M1** for $2n > n + 1$ but $3 < 4$
	No, n is not an integer oe or No, $\frac{3}{4}$ is less than 1, oe	**A1**	