Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/43**

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

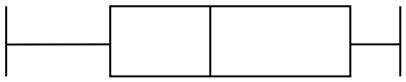
Abbreviations

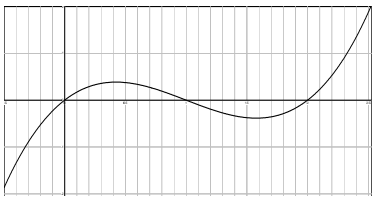
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	Rotation 90° clockwise oe [centre] (5, 2)	**3**	**B1** for each
1(b)(i)	Translation $\begin{pmatrix}-1\\4\end{pmatrix}$	**2**	**B1** for each
1(b)(ii)	4.12 or 4.123...	**2**	**M1** for (*their* (–1))^2 + (*their* 4)^2
2(a)	52°	**3**	**M1** for $180 - 2 \times 38$, implied by 104 **M1** for *their AOB* ÷ 2
2(b)(i)	80°	**2**	**B1** for *FEC* =50 or *FCE* = 50
2(b)(ii)	100°	**1**	**FT** 180 – *their* **(i)**
3(a)(i)	4.095	**2**	**B1** for figs 4095 or **M1** for $\frac{525\times7.8}{1000}$
3(a)(ii)	15	**3**	**B2** for 35 OR **M2** for $\frac{1}{2}(10+4)\times5 \times L = 525$ oe **M1** for $\frac{1}{2}(10+4)\times5$ oe
3(a)(iii)	455 or 454.9...	**6**	**M3** for *their* [*BD* =] $\sqrt{3^2+5^2} \times$ (*their* 15) [× 2] or **B2** for $\sqrt{34}$ or 5.83 or 5.830 to 5.831 or **M1** for $5^2 + \left(\frac{1}{2}(10-4)\right)^2$ and **M1** for *their* 35×2 **M1** for (*their* 15) × 10 and (*their* 15) × 4
3(a)(iv)	4200	**3**	**M2** for $525 \times \left(\frac{10}{5}\right)^3$ oe or **M1** for $\left(\frac{10}{5}\right)^3$ or $\left(\frac{5}{10}\right)^3$ oe

Question	Answer	Marks	Partial Marks
3(b)	182.875 ... 307.125 final answer	**3**	**B2** for either seen or **M1** for 10 ± 0.5 or 6 ± 0.5 or 4 ± 0.5 oe
4(a)	Correctly eliminate one variable	**M1**	
	$p = 3$ $q = -1$	**A2**	**A1** for each If M0, **SC1** for 2 values satisfying one of original equations If 0 scored **SC1** for correct answers with no working
4(b)	$1\frac{1}{11}$ or $\frac{12}{11}$ 1.09 or 1.090 to 1.091	**2**	**M1** for $\frac{3x}{12}+\frac{8x}{12}=1$ or better
4(c)(i)	$-2 < x \leqslant 3$	**3**	**B2** for $-2 < x$ or $x \leqslant 3$ or **M1** for $-8 + 2 < 3x$ or $3x \leqslant 7 + 2$
4(c)(ii)	–1, 0, 1, 2, 3	**1**	**FT** dep on –ve and +ve values in *their* **(c)(i)**
4(d)	$4a(4-a)$ final answer	**2**	**B1** for any correct partial factorisation
4(e)(i)	$\frac{2b}{3a}$ final answer	**2**	**M1** for $\frac{1}{2a}\times\frac{4b}{3}$ or better
4(e)(ii)	$\frac{x-2}{x-1}$ final answer nfww	**2**	**B1** for $2(x-1)-x$ oe seen.
5(a)(i)	105	**2**	**M1** for $\frac{3}{100}\times 500[\times 7]$
5(a)(ii)	115 or 114.9...	**3**	**M2** for $500\times\left(1+\frac{3}{100}\right)^{7}[-500]$ or **M1** for $500\times\left(1+\frac{3}{100}\right)^{k}$, k integer $\geqslant 2$
5(b)	8600	**3**	**M2** for $\frac{6269.4}{\left(1-\frac{10}{100}\right)^{3}}$ oe or **M1** for $C\times\left(1-\frac{10}{100}\right)^{3}=6269.4$ oe
6(a)	9.33 or 9.334...	**3**	**M2** for $\frac{12\sin 50}{\sin 100}$ or **M1** for $\frac{\sin 100}{12}=\frac{\sin 50}{AD}$ oe

Question	Answer	Marks	Partial Marks
6(b)	[cos =] $\frac{11^2+12^2-8^2}{2\times11\times12}$	**M2**	**M1** for $8^2 = 11^2+12^2-2\times11\times12\cos(BAC)$
	40.415...	**A2**	**A1** for 0.761... or $\frac{201}{264}$ or $\frac{67}{88}$
6(c)	70.8 or 70.77 to 70.79...	**3**	**M1** for $\frac{1}{2}\times12\times$ *their* **(a)** $\times\sin(180-100-50)$ **M1** for $\frac{1}{2}\times12\times11\times\sin(40.42)$
6(d)	7.13 or 7.131 to 7.132...	**3**	**M2** for $\frac{\text{dist}}{11}=\sin(40.42)$ or **M1** for recognition that shortest distance is perpendicular to AC
7(a)	87	**3**	**M2** for $3c + 4c = 587 + 22$ or better or **M1** for $3c + 2(2c - 11)$ [= 587 or 5.87]
7(b)	1.1[0]	**3**	**M2** for $22w + 22 = 42w$ or better or **M1** for $\frac{22}{w} = \frac{42}{w+1}$ oe OR **B2** for number of bottles = 20 or **M1** for $Nw = 22$ and $N(w+1) = 42$
7(c)(i)	$\frac{9}{x}+\frac{5}{2x+1}=2.5$ oe	**M2**	**M1** for $\frac{9}{x}$ or $\frac{5}{2x+1}$
	$9(2x+1)+5x=2.5x(2x+1)$ oe or $\frac{9(2x+1)+5x}{x(2x+1)}$ [= 2.5 oe]	**M1**	Correctly clearing fractions, or correctly collecting into a single fraction FT *their* expression dep on two fractions both with algebraic denominators
	All brackets expanded leading to $10x^2-41x-18=0$ with no errors or omissions	**A1**	

Question	Answer	Marks	Partial Marks
7(c)(ii)	$(2x-9)(5x+2)$ or $\frac{-(-41)\pm\sqrt{(-41)^2-4(10)(-18)}}{2(10)}$	**M2**	**B1** for $(ax+b)(cx+d)$ with $ac = 10$ and $bd = -18$ or $ad + bc = -41$ or $\sqrt{(-41)^2-4(10)(-18)}$ or $\frac{-(-41)+\sqrt{q}}{2(10)}$ oe or $\frac{-(-41)-\sqrt{q}}{2(10)}$ oe or both or **M1** for $\left(x-\frac{41}{20}\right)^2-\frac{18}{10}-\left(\frac{41}{20}\right)^2=0$ or better
	10	**A2**	**A1** for $[x =]\ \frac{9}{2}$ oe or **M1** for $2 \times$ *their* positive root + 1
8(a)(i)	$\frac{60}{360}\times 600$ oe	**1**	
8(a)(ii)	45	**2**	**M1** for $\frac{27}{360}\times 600$ oe
8(a)(iii)	Correct straight line on the pie chart	**2**	**B1** for 75
8(b)	Correct diagram  0.6 3.4 5.2 7.5 8.7	**3**	**B1** for any three of 0.6, 3.4, 5.2, 7.5, 8.7 correctly placed **B1** for 7.5 and 8.7 seen
8(c)(i)	5	**1**	
8(c)(ii)	2	**1**	
8(c)(iii)	3	**1**	
8(d)	39.2	**4**	**M1** for mid-values soi **M1** for Σfx with x in correct interval including boundaries **M1 dep** for $\frac{\Sigma fx}{50}$ dep on second M1
9(a)	(0, 0), (1, 0), (2, 0)	**2**	**B1** for any two correct If 0 scored, SC1 for all three x values clearly identified

Question	Answer	Marks	Partial Marks
9(b)	$x\left(x^2-x-2x+2\right)$ or $\left(x^2-x\right)(x-2)$ or $(x-1)\left(x^2-2x\right)$ leading to x^3-3x^2+2x with no errors or omissions	**2**	**B1** for $x\left(x^2-x-2x+2\right)$ or $\left(x^2-x\right)(x-2)$ or $(x-1)\left(x^2-2x\right)$
9(c)	$3x^2-6x+2$	**B2**	**B1** for 2 correct terms
	their $\frac{\mathrm{d}y}{\mathrm{d}x}=0$	**M1**	
	their $\frac{-(-6)\pm\sqrt{(-6)^2-4(3)(2)}}{2(3)}$	**M2**	**M1** for $\sqrt{(-6)^2-4(3)(2)}$ or for $p=-(-6)$ and $r=2(3)$ if in form $\frac{p\pm\sqrt{q}}{r}$
	(0.4, 0.4) (1.6, –0.4)	**B3**	**B2** for 0.4 or 0.42... **and** 1.6 or 1.57 to 1.58 or for one correct pair of coordinates or **B1** for 0.4 or 0.42... **or** 1.6 or 1.57 to 1.58 If 0 scored **SC1** for $1+\sqrt{\frac{1}{3}}$ and $1-\sqrt{\frac{1}{3}}$ or better or for one correct pair of coordinates in any form
9(d)	Correct sketch 	**2**	**FT** *their* **(c)** but must be cubic i.e. correct shape cubic through origin and max and min in correct quadrants **B1** for cubic shape sketch
10(a)(i)	1	**1**	
10(a)(ii)	$\frac{1}{4}$ oe **nfww**	**2**	**M1** for $\frac{2}{4}\times\frac{2}{4}$ oe
10(a)(iii)	7	**2**	**M1** for trials with $\left(\frac{3}{4}\right)^k\times\frac{1}{4}$ soi
10(b)(i)	0.72 oe	**2**	**M1** for 0.9×0.8
10(b)(ii)	0.26 oe	**3**	**M2** for $0.9\times0.2+0.1\times0.8$ or 1 – *their* **(b)(i)** – 0.1×0.2 or **M1** for 0.9×0.2 or 0.1×0.8 or 1 – *their* **(b)(i)** or $1-0.1\times0.2$
11(a)(i)	64	**1**	

Question	Answer	Marks	Partial Marks
11(a)(ii)	127	**1**	**FT** 2 × *their* **(a)(i)** – 1
11(b)	$\pm\frac{1}{2}$ oe nfww	**4**	**M1** for $(2x-1)^2+2(2x-1)$ **B1** for $4x^2-2x-2x+1$ or $(2x-1)(2x-1+2)$ **B1** for $4x^2-1$ [= 0] or $(2x-1)(2x+1)$ [= 0] OR **M1** for $x(x+2)=0$ (solving g(x) = 0) **A1** for $x = 0$ or –2 **B1** for $2x-1=0$ or $2x-1=-2$
11(c)	$\frac{x+1}{2}$ oe final answer	**2**	**M1** for $y+1=2x$ or $\frac{y}{2}=x-\frac{1}{2}$ or $x=2y-1$
11(d)	$-\frac{1}{6}$ oe nfww	**3**	**B2** for $3x=-\frac{1}{2}$ oe OR **M1** for $2^{2x}\times2^{x}$ oe or $4^{\frac{1}{2}x}\times4^{x}$ oe or 8^{x} oe **M1** for $2^{-\frac{1}{2}}$ or $4^{-\frac{1}{4}}$ or $8^{-\frac{1}{6}}$ soi