Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/41**

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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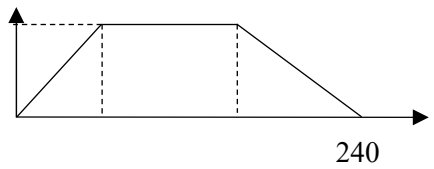
Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, 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)	28	**2**	**M1** for $32 \times 0.50 + 30 \times 0.40$
1(a)(ii)	$98 - 100 \times 0.5$ $48 \div 0.4 = 120$ [minutes] = 2 [hrs]	**M3**	**M1** for $100 \times 0.50 + x \times 0.40 = 98$ **M1** for $50 + 0.4x = 98$ or $0.4x = 48$ **M1** for $x = \frac{48}{0.4}$ $x = 120$ [min] = 2 [hr] OR **M1** for $100 \times 0.5 [= 50]$ **M1** for $98 - 50 [= 48]$ **M1** for $48 \div 0.4 = 120$ [min] $= 2$ [hr]
1(b)	2925 1170 4095	**3**	**B2** for one correct answer or **M1** for $8190 \div (5 + 2 + 7)$
1(c)	58	**2**	**M1** for $\left(1 + \frac{45}{100}\right)k = 84.1$ oe
2(a)	0.18 or $\frac{9}{50}$	**1**	
2(b)	$1944 \times \frac{1000}{3600 \times 3600}$	**M1**	
	$9 \div 0.15 = 60$	**M1**	
2(c)		**1**	ruled line to axis with point of contact at 240
2(d)	6.9375	**4**	**M2** for area = $\frac{1}{2} \times (130 + 240) \times 9$ oe or **M1** for one correct partial area **M1dep** for *their* total area ÷ 240
3(a)	2.64 or 2.638…	**4**	**M3** for $[R^2 =] \frac{\pi \times 2.4^2 + \pi \times 2.4 \times 6.3}{\pi + 2\pi}$ oe or **M2** for $\pi \times 2.4^2 + \pi \times 2.4 \times 6.3 = \pi R^2 + \frac{1}{2} \times 4\pi R^2$ or **M1** for $[\pi \times 2.4^2] + \pi \times 2.4 \times 6.3$ oe or $[\pi R^2] + \frac{1}{2} \times 4\pi R^2$ oe

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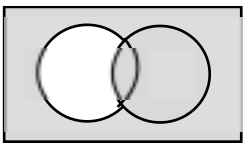
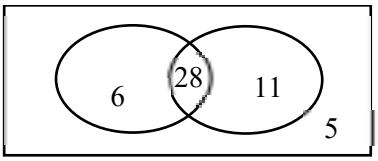
Question	Answer	Marks	Partial Marks
3(b)	953 or 952.6 to 952.8	**4**	**M3** for $\frac{1}{3}\times\pi\times7.6^2\times16\times\left(1-\left(\frac{16-12}{16}\right)^3\right)$ or $\frac{1}{3}\times\pi\times7.6^2\times16-\frac{1}{3}\times\pi\times1.9^2\times(16-12)$ OR **B1** for top radius = 1.9 or $\left(\frac{16-12}{16}\right)^3$ oe **M2** for $\frac{1}{3}\times\pi\times7.6^2\times16-\frac{1}{3}\times\pi\times(their1.9)^2\times(16-12)$ or $\frac{1}{3}\times\pi\times7.6^2\times16\times\left(1-their\left(\frac{16-12}{16}\right)^3\right)$ or **M1** for $\frac{1}{3}\times\pi\times7.6^2\times16$ or for $\frac{1}{3}\times\pi\times(their1.9)^2\times(16-12)$
4(a)(i)	438 cao	**2**	**M1** for $\frac{500}{1.142}$
4(a)(ii)	14.95	**2**	**M1** for [329 –] 275×1.142 oe
4(b)	14	**2**	**M1** for $5.25\times\frac{8}{3}$ oe
4(c)	1.7[0] or 1.699…	**3**	**M2** for $\sqrt[5]{\frac{6669}{6130}}$ or **M1** for $6669 = 6130\ (k)^5$
5(a)	13.5 or 13.47…	**4**	**B1** for angle 102 seen **M2** for $\sqrt{10.6^2+6.4^2-2\times10.6\times6.4\times\cos(180-78)}$ OR **M1** for $10.6^2+6.4^2-2\times10.6\times6.4\times\cos(180-78)$ **A1** for 181.5…
5(b)	8.68 or 8.682 to 8.683 nfww	**4**	**B1** for angle = 44 **M2** for $\sin(180-58-78)\times\frac{10.6}{\sin58}$ oe or **M1** for $\frac{\sin(180-58-78)}{x}=\frac{\sin58}{10.6}$ oe

Question	Answer	Marks	Partial Marks
5(c)	78.2 or 78.17 to 78.19…	**3**	**M2** for $\frac{1}{2}\times 10.6\times(6.4+\textit{their}\ 8.68)\times\sin(78)$ oe OR **M1** for $\frac{1}{2}\times 10.6\times 6.4\times\sin(180-78)$ oe **M1** for $\frac{1}{2}\times 10.6\times\textit{their}\ 8.68\times\sin 78$ oe
6(a)		**1**	
6(b)		**2**	**B1** for 2 or 3 correct elements or **M1** for $34-x$, x and $39-x$ correctly placed on diagram and $x = 28$
6(c)(i)	8	**1**	
6(c)(ii)	11	**1**	
6(c)(iii)	2	**1**	
6(c)(iv)	$C\cap S\cap B'$ oe	**1**	
6(c)(v)	$\frac{19}{30}$ oe	**1**	
6(c)(vi)	$\frac{2}{57}$ oe	**3**	**M2** for $\frac{4}{19}\times\frac{3}{18}$ or **M1** for $\frac{4}{19}$ seen
6(c)(vii)	Equal numbers 15 or equal probability $\frac{15}{30}$ oe	**1**	
7(a)	$\frac{x+5}{x+4}$ final answer	**3**	**B1** for $(x-5)(x+5)$ **B1** for $(x-5)(x+4)$
7(b)	$\frac{2x^2+12x-5}{x(x-1)}$ or $\frac{2x^2+12x-5}{x^2-x}$ final answer	**3**	**B1** for common denominator $x(x-1)$ oe **B1** for $(x-1)(x+5)+x(x+8)$ or better
7(c)(i)	$6x^2-8x$ final answer	**2**	**B1** for each term in final answer or **M1** for correct answer seen and spoilt

Question	Answer	Marks	Partial Marks
7(c)(ii)	64	**2**	**FT** *their* **(c)(i)** correctly evaluated provided at least 2 terms but not the original equation **M1** for substituting $x = 4$ into *their* **(c)(i)**
7(c)(iii)	(0, 6) $\left(\frac{4}{3}, \frac{98}{27}\right)$ oe	**4**	**M1** for *their* derivative = 0 or $\frac{dy}{dx} = 0$ soi **B1** for $x = 0$ and $x = \frac{4}{3}$ **M1dep** for substituting one of *their x* values into $y = 2x^3 - 4x^2 + 6$ soi
8(a)(i)	3 22 43 48 50	**2**	**B1** for 4 correct or **M1** for one error in adding.
8(a)(ii)	correct diagram	**3**	**B1FT** *their* **(a)(i)** for 5 correct heights **B1** for 5 points at upper ends of intervals on correct vertical line **B1FT dep on at least B1** for increasing curve through *their 5* points After 0 scored, **SC1** for 4 of *their* points correctly plotted
8(a)(iii)	35 to 38	**1**	
8(b)	Correct box-and-whisker diagram 1.45 1.57 1.64 1.71 1.83	**4**	**B1** for median 1.64 drawn **B1** for LQ 1.57 drawn **B1** for UQ 1.71 drawn If 0 scored **SC1** for 1.64, 1,57 or 1.71 seen
9(a)	1350 or 1354….	**6**	**M2** for $20^2 - 13^2$ or **M1** for $BC^2 + 13^2 = 20^2$ **A1** for $\sqrt{231}$ or 15.2 or 15.19 to 15.20 **M1** for 20×24 and 13×24 and *their* 15.2×24 **M1** for [½ ×] *their* 15.2×13
9(b)	2370 or 2369 to 2371… cao	**1**	
9(c)	24.6 or 24.58 to 24.59	**4**	**M3** for $\sin[...] = \frac{13}{\sqrt{20^2 + 24^2}}$ oe or **M2** for $\sqrt{20^2 + 24^2}$ or $\sqrt{24^2 + 20^2 - 13^2}$ or **M1** for $AF^2 = 20^2 + 24^2$ or $24^2 + 20^2 - 13^2$ or **M1** for correct angle identified
10(a)	0.75 3 7 3 0.75	**3**	**B2** for 4 or 3 correct or **B1** for 2 correct

Question	Answer	Marks	Partial Marks
10(b)	correct curve 	**4**	**B3FT** for 8 or 9 correct plots **B2FT** for 6 or 7 correct plots **B1FT** for 4or 5 correct plots
10(c)	Accept any integer ≥ 8	**1**	
10(d)	line $y = 4 - \frac{1}{2}x$ ruled	**B3**	**B2** for $[y =]4 - \frac{1}{2}x$ identified or **B1** for ruled line with gradient $-\frac{1}{2}$ or **B1** for ruled line through (0, 4) but not $y = 4$
	0.2 to 0.3 4.2 to 4.3	**B1**	
11(a)	20	**2**	**M1** for $\frac{360}{18}$ or $180 - \frac{16\times180}{18}$
11(b)	4.5	**2**	**M1** for $\frac{BE}{6.75} = \frac{5.2}{5.2+2.6}$ oe
11(c)	5.8[0] or 5.798 to 5.799	**3**	**M2** for $2\times\sqrt[3]{\frac{780}{32}}$ oe or **M1** for $\sqrt[3]{\frac{780}{32}}$ or $\sqrt[3]{\frac{32}{780}}$ or $\frac{2^3}{l^3} = \frac{32}{780}$
11(d)	$QN = NR$ [given]	**B1**	
	Two correct pairs of angles with reasons from angle PQN = angle SRN alternate angle QPN = angle RSN alternate angle PNQ = angle SNR [vertically] opposite	**B2**	**B1** for any correct pair of angles with reason or two correct pairs of angles with no/wrong reasons
	ASA [implies congruent]	**B1**	dep on B1 B2

Question	Answer	Marks	Partial Marks
12(a)	13	**1**	
12(b)	$4x - 3$ final answer	**2**	**M1** for $3 - 2(3 - 2x)$
12(c)	-7 5	**4**	**M1** for $x^2 + 2x - 35\ [= 0]$ or $x^2 + 2x = 35$ **M2** for $(x + 7)(x - 5)$ or $x(x - 5) + 7(x - 5)$ or $x(x + 7) - 5(x + 7)$ or **M1** for $(x + a)(x + b)$ where a, b are integers with $ab = -35$ or $a + b = 2$
12(d)	$\frac{3 - x}{2}$ oe final answer	**2**	**M1** for a correct first step: $x = 3 - 2y$ or $y - 3 = -2x$, $2x = 3 - y$ or $\frac{y}{2} = \frac{3}{2} - x$
12(e)	$32 - 54x + 37x^2 - 8x^3$ final answer	**5**	**B4** for $27 - 36x - 18x + 24x^2 + 12x^2 - 8x^3 + x^2 + 5$ oe OR **B1** for $(3 - 2x)^3 + x^2 + 5$ and **B2** for expansion of the 3 brackets, allow one error or **B1** for correct expansion of 2 of the brackets with at least 3 terms correct