Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/41**

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.

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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

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Question	Answer	Marks	Partial Marks
1(a)	Image at (4, –1) (4, –4) (5, –4)	**2**	**B1** for translation by $\begin{pmatrix}8\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-6\end{pmatrix}$ or for correct vertices not joined
1(b)	Image at (–4, –4) (–4, –7) (–3, –4)	**2**	**B1** for reflection in $x = -1$ or $y = k$ or for correct vertices not joined
1(c)	Enlargement 3 (–5, 5)	**3**	**B1** for each
1(d)	Rotation 90º clockwise oe (1, 1)	**3**	**B1** for each
2(a)	1 : 5 : 12	**2**	**M1** for 2 : 10 : 24 or 7 : 35 : 84 or $\frac{1}{18}:\frac{5}{18}:\frac{12}{18}$
2(b)(i)	266 and 95	**3**	**B2** for 266 or 95 or 266 and 95 reversed or **M1** for $\frac{114}{6}$
2(b)(ii)	15	**2**	**M1** for $\frac{114-96.9}{114}$ [× 100] oe or $\frac{96.9}{114}\times 100$
2(c)(i)	2h 50min	**1**	
2(c)(ii)	636	**2**	**M1** for 1802 ÷ *their* 2h 50min
3(a)	Disagree: the median for the women is greater (than the median for the men) oe Disagree: the men have a smaller [interquartile] range of times oe	**2**	**B1** for each correct statement oe
3(b)(i)	87.4 nfww	**4**	**M1** for mid-points **soi** (30, 80, 130, 190, 270) **M1** for use of Σ*fm* with *m* in correct interval including both boundaries **M1** (dep on 2nd M1) for Σ*fm* ÷ (41 + 24 + 23 + 8 + 4)
3(b)(ii)(a)	90	**1**	
3(b)(ii)(b)	8	**2**	**B1** for 92 seen

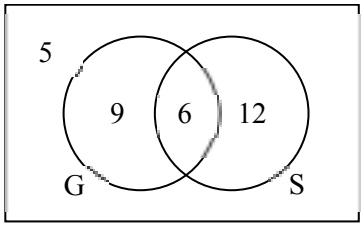
Question	Answer	Marks	Partial Marks
3(b)(iii)	2.4	**2**	**M1** for $\frac{24}{40}$ or $\frac{8}{60}$ Or **B1** for [multiplier] 18 or $\frac{1}{18}$
4(a)	38.6	**3**	**M2** for [2 ×] (8.5 + 0.05 + 10.7 + 0.05) or **M1** for 8.5 + 0.05 or 10.7 + 0.05
4(b)(i)	8.86 or 8.863…	**2**	**M1** for $\frac{h}{9}$ = sin 80 or better oe
4(b)(ii)	∠CDF = 100 leading to $\angle DCF = 40$ Or ∠EDF = 80 leading to $\angle DCF = 40$	**M1**	Implied by 180-(100 + 40) = 40 or 80 – 40
	'two equal angles'	**A1**	With no incorrect work seen
4(b)(iii)	66.5 or 66.45 to 66.47…	**3**	**M2** for 0.5(3 + 12) × *their* **(b)(i)** or 12 × *their* **(b)(i)** – 0.5 × 9 × 9 × sin 100 oe or **B1** for $DC = 9$ or $BC = 3$

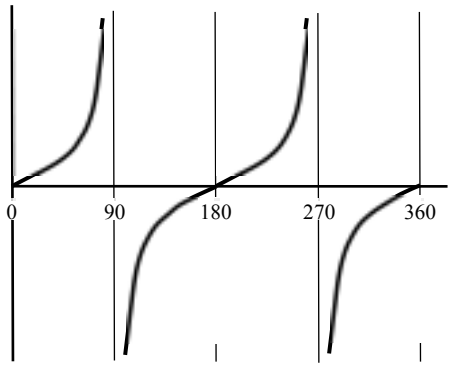
Question	Answer	Marks	Partial Marks
4(c)	130 nfww or 129.6 to 129.8	**5**	**B1** for $\angle ACD = 21°$ or $\angle CAD = 69°$ **Method 1** **M2** for $\cos 21 = \frac{12}{AC}$ oe or **M1** for $\angle ADC = 90$ soi **M1** for $\pi(\textit{their } AC/2)^2$ OR **Method 2** **M2** for $\frac{12}{\sin 138} = \frac{r}{\sin 21}$ oe or **M1** for $\angle COD = 138$ soi **M1** for $\pi(\textit{their } r)^2$ OR **Method 3** **M2** for $\cos 21 = \frac{6}{OC}$ oe or **M1** for $\angle CXO = 90$ soi where X is the point where the perpendicular from O meets the chord CD **M1** for $\pi(\textit{their } OC)^2$
4(d)	78.4 or 78.37 to 78.41	**3**	**M2** for $\frac{x}{360} \times 2 \times \pi \times 9.5 + 2 \times 9.5 = 4 \times 8$ oe or **M1** for $\frac{x}{360} \times 2 \times \pi \times 9.5$ After **M0, SC1** for $9.5x + 19 = 32$ oe
5(a)(i)	2.7 to 2.8	**1**	

Question	Answer	Marks	Partial Marks
5(a)(ii)	tangent ruled at $x = -2$	**B1**	
	6 to 10	**2**	**dep on B1** or a close attempt at tangent at $x = -2$ or **M1** for rise/run for *their* tangent, or close attempt, at any point Must see correct or implied calculation from a drawn tangent After **M0, SC1** for gradient of tangent (or close attempt) in range embedded in $y = mx + c$
5(a)(iii)	$y = 2x - 2$ ruled and $x = -2.9$ to -2.8 cao	**3**	**B2** for correct ruled line or **B1** for short line or for freehand line or broken line or ruled line with gradient 2 or with y-intercept at –2 (but not $y = -2$)
5(b)	A (4, 17) B (–1.5, 0.5)	**5**	**B4** for (–1.5, 0.5) and (4, 17), or for $x = 4$ and $x = -1.5$ OR **B3** for A(4, 17) or B(–1.5, 0.5) OR **M1** for $2x^2 - 2x - 7 = 3x + 5$ oe AND either **M2** for $(2x + 3)(x - 4)$ or **M1** for $2x(x - 4) + 3(x - 4)$ or $x(2x + 3) - 4(2x + 3)$ or $(2x + c)(x + d)$ where $cd = -12$ or $c + 2d = -5$ [c and d are integers] OR **M2** for $\frac{-\text{their } b \pm \sqrt{(\text{their } b)^2 - 4(\text{their } a)(\text{their } c)}}{2(\text{their } a)}$ or **M1** for $\sqrt{(\text{their } b)^2 - 4(\text{their } a)(\text{their } c)}$ or for $p = -\text{their } b$, $r = 2(\text{their } a)$ if in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$

Question	Answer	Marks	Partial Marks
6(a)(i)	106.01 to 106.02	**4**	**M2** for $[\cos[\angle CBD] =] \frac{192^2 + 168^2 - 287.9^2}{2 \times 192 \times 168}$ oe or **M1** for the implicit form **A1** for –0.276 to – 0.275
6(a)(ii)	292.0 or 291.98 to 291.99	**1**	
6(a)(iii)	310.0 or 310.03 to 310.04	**5**	**M2** for $[\sin A =] \frac{168 \times \sin(90-38)}{205.8}$ or **M1** for $\frac{\sin A}{168} = \frac{\sin(90-38)}{205.8}$ **A1** for [*A* =] 40.0 or 40.03 to 40.04 **M1 dep** for 270 + *their* angle *DAB* oe
6(b)(i)	15 500 or 15 501 to 15 503. …	**2**	**M1** for $0.5 \times 192 \times 168 \times \sin(106)$ oe
6(b)(ii)	55 400	**2**	**FT** $3.575 \times$ *their* **(b)(i)** oe rounded to nearest 100 **M1** for figs 35 75 × figs *their* **(b)(i)** or figs 554 or figs 5541 to figs 5543
7(a)	25 36 10 15 35 51	**2**	**B1** for 3, 4 or 5 correct
7(b)	n^2	**1**	
7(c)(i)	92	**1**	
7(c)(ii)	$\frac{1}{2}(n^2 - n)$ oe	**2**	**M1** for $\frac{1}{2}(3n^2 - n) - n^2$ oe or for final quadratic answer with $\frac{1}{2}n^2$ oe or $-\frac{1}{2}n^2$ oe but not both

Question	Answer	Marks	Partial Marks
7(d)	$a = \frac{1}{2}$, $b = \frac{1}{2}$	**5**	**B2** for 2 correct equations eg $a + b = 1$, $8a + 4b = 6$ or **B1** for 1 correct equation **B2** for one correct value or **M1** (dep on at least B1) for correctly eliminating one variable from two linear equations in a and b OR **B2** for $a = \frac{1}{2}$ or **B1** for $6a = 3$ or for 3rd difference = 3 **B2** for $b = \frac{1}{2}$ or **M1** for substituting *their* a into a correct equation of first differences
8(a)	$ab(3a - b)$ final answer	**2**	**B1** for $a(3ab - b^2)$ or $b(3a^2 - ab)$ or $ab(3a - b)$ seen
8(b)	$x > 7.5$ final answer	**2**	**B1** for $12+3 < 5x - 3x$ oe
8(c)	$27x^6y^{12}$	**2**	**B1** for two of 27, x^6 and y^{12} correct
8(d)	0.5 or $\frac{1}{2}$	**3**	**M2** for $4 = 6x + 2x$ or better or **M1** for $2(2 - x) = 6x$ oe
8(e)	$2x^3 + 5x^2 - 23x + 10$ 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(f)(i)	$200\left(1+\frac{r}{100}\right)^2 = 206.46$ oe	**M1**	
	$1 + \frac{2r}{100} + \frac{r^2}{100^2}$ oe	**M1**	
	$r^2 + 200r - 323 = 0$	**A1**	Correct solution reached with no errors or omissions seen If 0 scored, **SC1** for $200(n)^2 = 206.46$

Question	Answer	Marks	Partial Marks
8(f)(ii)	$\frac{-200+\sqrt{200^2-4(1)(-323)}}{2\times1}$	**B2**	**B1** for $\sqrt{200^2-4(1)(-323)}$ or $(r+100)^2$ **B1** for $\frac{-200+\sqrt{q}}{2\times1}$ or $r=\sqrt{323+100^2}-100$ OR **B2** for $100\left(\sqrt{\frac{206.46}{200}}-1\right)$ or **B1** for $\sqrt{\frac{206.46}{200}}$
	1.60 cao final answer	**B1**	
9(a)(i)		**2**	**B1** for two correct values Or **B1** 5 outside and total in G = 15 and total in S = 18
9(a)(ii)	$\frac{3}{8}$ oe	**1**	**FT** $\frac{\textit{their}\ 12}{32}$
9(a)(iii)	$\frac{2}{5}$ oe	**1**	**FT** $\frac{\textit{their}\ 6}{15}$
9(b)	96	**2**	**M1** for $\frac{36}{64}=\frac{54}{x}$ oe or $36=\frac{54}{(54+b)}\times100$ oe If 0 scored **SC**1 for answer 150
9(c)(i)	$\frac{9}{25}$ oe	**2**	**M1** for $\frac{15}{25}\times\frac{15}{25}$ oe
9(c)(ii)	$\frac{16}{25}$ oe	**1**	**FT** 1 – *their* **(c)(i)**
9(d)	$\frac{17}{20}$ oe	**3**	**M2** for $1-\frac{10}{25}\times\frac{9}{24}$ oe or for $\frac{15}{25}\times\frac{14}{24}+\frac{15}{25}\times\frac{8}{24}+\frac{15}{25}\times\frac{2}{24}+\frac{8}{25}\times\frac{15}{24}+\frac{2}{25}\times\frac{15}{24}$ oe or **M1** for one correct relevant product

Question	Answer	Marks	Partial Marks
10(a)(i)	$A(-4, 0)$ $B(1, 0)$ $C(0, -4)$	**4**	**B3** for A and B correct Or **B2** for B (–4, 0) and A (1, 0) Or **B1** for $(x + 4)(x - 1)$ or for $\frac{-3 \pm \sqrt{3^2 - 4\times1\times-4}}{2}$ oe and **B1** for A or B correct **B1** for C(0, –4) OR **SC2** for –4, 1 and –4 in correct positions on the graph
10(a)(ii)	$2x + 3$ [± 0] final answer	**2**	**B1** for answer $2x + c$ or for $ax + 3$, $a \neq 0$ or for correct answer seen
10(a)(iii)	$y = 7x - 8$ oe	**3**	**B2** for answer $7x - 8$ OR **M1** for [gradient =] 2(2) + 3 FT *their* part **(a)(ii)** of the form $ax + b$ **M1dep** for substitution of (2, 6) into $y = \textit{their } mx + c$ oe
10(b)(i)	Correct sketch  	**2**	**B1** for one correct section out of 4 OR **B1** for two properties correct from • Crosses x-axis at (0, 0) (180, 0) and (360, 0) only • Correct curvature in each section of 90° • Asymptotes at $x = 90$ and $x = 270$
10(b)(ii)	125.5 or 125.53 to 125.54 and 305.5 or 305.53 to 305.54	**3**	**B2** for one correct angle or **B1** for –54.5 or –54.46… or for 2 angles with a difference of 180.