Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **March 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.

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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)	295	**2**	**M1** for [87 +] 4×52 oe
1(a)(ii)	29.5 or 29.49…	**1**	**FT** $\frac{87}{\textit{their}\textbf{(a)(i)}} \times 100$
1(b)	11	**2**	**M1** for 18×4 [± 61] oe
1(c)	4160 cao nfww	**2**	**M1** for $64 \div 0.0154$ or **B1** for rounding *their* answer to nearest 10
1(d)	2.4[0] nfww	**2**	**M1** for $\left(1+\frac{12.5}{100}\right)x = 2.7[0]$ oe
1(e)	53 : 36	**3**	**M2** for 265 : 180 oe or for answer 36 : 53 or 53 min: 36 min or **M1** for 4h 25 [mins] or 265 [mins] seen
1(f)	6[.00] or 5.999…	**3**	**M2** for $\sqrt[5]{\frac{736}{550}}$ or **M1** for $736 = 550 \times (x)^5$
2(a)(i)	3 2.25 1	**3**	**B1** for each
2(a)(ii)	Fully correct smooth curve	**4**	**B3FT** for 7 or 6 correct plots **B2FT** for 5 or 4 correct plots **B1FT** for 3 correct plots
2(a)(iii)	–0.6 to –0.51, 0.75 to 0.85, 1.7 to 1.85	**3**	**B1** for each If 0 scored, **SC1** for $y = 1.5$ drawn
2(a)(iv)	–3 or –2 or –1 or 0	**1**	
2(b)(i)	Tangent ruled at $x = 1$	**1**	
2(b)(ii)	4.4 to 5.6	**2**	Dep on tangent at $x = 1$ or close attempt **M1** for rise/run for *their* line

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Question	Answer	Marks	Partial Marks
2(b)(iii)	y = (4.4 to 5.6)x – (1.8 to 2.2) or [y =] *their* **(b)(ii)**x + *their*(y-intercept)	**2**	**FT** for any line but not horizontal or vertical line for 2 marks or **B1** **B1FT** for [m =] *their* 5 or for *their* y-intercept
3(a)	187	**2**	**M1** for $220 \times \left(1 - \frac{15}{100}\right)$ oe or **B1** for 33 seen
3(b)	19.8	**3**	**M2** for $29.7 \times \sqrt[3]{\frac{0.4}{1.35}}$ oe or **M1** for $\sqrt[3]{\frac{0.4}{1.35}}$ or $\sqrt[3]{\frac{1.35}{0.4}}$ oe seen or for $\frac{29.7^3}{x^3} = \frac{1.35}{0.4}$ oe
3(c)	12.4 or 12.44…	**3**	**M1** for $90 \times 75 \times h = 7 \times$ figs 12 **B1** for 1000 cm^3 = 1 litre soi
4(a)	32.9 or 32.91 to 32.92…	**2**	**M1** for $\pi \times 1.65 \times 4.7 + \pi \times 1.65^2$
4(b)	69.4 or 69.44 to 69.45	**2**	**M1** for cos = 1.65 ÷ 4.7 oe
4(c)(i)	12.5 or 12.54 to 12.55	**4**	**M3** for $\frac{1}{3} \times \pi \times 1.65^2 \times \sqrt{4.7^2 - 1.65^2}$ oe or **M2** for $\sqrt{4.7^2 - 1.65^2}$ oe or for $4.7 \times \sin($*their* **(b)**$)$ oe or **M1** for $1.65^2 + h^2 = 4.7^2$ oe or for $\frac{h}{4.7} = \sin($*their* **(b)**$)$ oe
4(c)(ii)	41 nfww	**4**	**B3** for 41.7… to 41.9 or **M2** for $\frac{4}{3} \times \pi \times 5^3 \div$ *their* 12.5 or **M1** for $\frac{4}{3} \times \pi \times 5^3$ After **M2** scored, **M1** for truncating *their* decimal number of cones seen to an integer answer
5(a)	$\frac{10x}{(x-3)(x+2)}$ or $\frac{10x}{x^2 - x - 6}$ final answer	**4**	**M1** for common denominator $(x-3)(x+2)$ isw **M1** for $(x+3)(x+2) - (x-2)(x-3)$ isw **B1** for correct numerator in terms of x only

Question	Answer	Marks	Partial Marks
5(b)	14	**2**	**M1** for $12-\frac{k}{2}=5$ or $2^{\frac{k}{2}}=\frac{2^{12}}{2^5}$ oe or $\frac{4096}{32}$ or $12-5$ or $2^{12}\div 2^{\frac{14}{2}}$ [= 32] seen
5(c)	$2y^3-3y^2-23y+12$ final answer	**3**	**B2** for correct unsimplified expanded expression or for simplified four-term expression of correct form with 3 terms correct or **B1** for correct expansion of 2 of the brackets with at least 3 terms correct
5(d)	$[x=]\frac{3}{y-1}$ final answer	**3**	**M1** for $xy = 3 + x$ **M1** for $xy - x = 3$ or $x - \frac{x}{y}=\frac{3}{y}$ **M1** for factorising and dividing
6(a)(i)	$\frac{1}{3}$ oe	**1**	
6(a)(ii)	100	**1**	**FT** *their* **(a)(i)** × 300 to at least 3 sf or rounded to the nearest integer
6(b)(i)	$\frac{2}{15}$ oe	**3**	**M2** for $4\times\frac{1}{6}\times\frac{1}{5}$ oe or **M1** for $k\left(\frac{1}{6}\times\frac{1}{5}\right)$ oe or list or indication of 4 correct pairs
6(b)(ii)	$\frac{3}{5}$ oe	**3**	**M2** for $1-\frac{4}{6}\times\frac{3}{5}$ or $2\left(\frac{2}{6}\times\frac{4}{5}\right)+\frac{2}{6}\times\frac{1}{5}$ oe or $\frac{2}{6}+\left(\frac{4}{6}\times\frac{2}{5}\right)$ oe or **M1** for $\frac{4}{6}\times\frac{3}{5}$ oe seen or $\frac{2}{6}\times\frac{4}{5}[\times 2]$ oe seen or $\frac{2}{6}\times\frac{1}{5}$ oe seen or correct identification of 18 pairs or space diagram oe
7(a)	$n - 5 + 3n + 10 > 105$ or better	**B1**	
	$n > 25$ final answer	**B2**	**M1** for $4n > 100$

Question	Answer	Marks	Partial Marks
7(b)	4.8	**3**	**M1** for $y = \frac{k}{x^2}$ or better **M1** for $[y =]\frac{their\ k}{5^2}$ OR **M2** for $y \times 5^2 = 7.5 \times 4^2$
7(c)(i)	$6 - 2n$ oe final answer	**2**	**B1** for answer $6 - kn$ $(k \neq 0)$ oe or answer $j - 2n$ oe or for correct expression shown in working and then spoilt
7(c)(ii)	$2n^2 - 1$ oe final answer	**2**	**B1** for 2nd diff = 4 or a quadratic expression or for correct expression shown in working and then spoilt
8(a)(i)	2.67 or 2.666…	**3**	**M2** for $\frac{6 \times \sin 25}{\sin 72}$ or **M1** for implicit version
8(a)(ii)	4.14 or 4.140…	**3**	**M1** for $6^2 + 7.4^2 - 2 \times 6 \times 7.4 \times \cos 34$ **A1** for 17.1 to 17.2
8(a)(iii)	20.4 or 20.35 to 20.36…	**4**	**B1** for angle *SQR* = 83 **M1** for $\frac{1}{2} \times 6 \times$ *their* **(a)(i)** $\times \sin$ *their* (180–72–25) oe **M1** for $\frac{1}{2} \times 6 \times 7.4 \times \sin 34$ oe
8(b)(i)	8.7[0] or 8.695…	**4**	**B3** for $\sqrt{980}$ oe or 31.3 or 31.30… or **M3** for $40 - \sqrt{20^2 + 18^2 + 16^2}$ oe or **M2** for $20^2 + 18^2 + 16^2$ oe or **M1** for any correct attempt at 2-dimensional Pythagoras' e.g. $18^2 + 16^2$
8(b)(ii)	30.7 or 30.73 to 30.74…	**3**	**M2** for $[\sin =]\frac{16}{\sqrt{20^2 + 18^2 + 16^2}}$ oe or **B1** for identifying angle *GAC*

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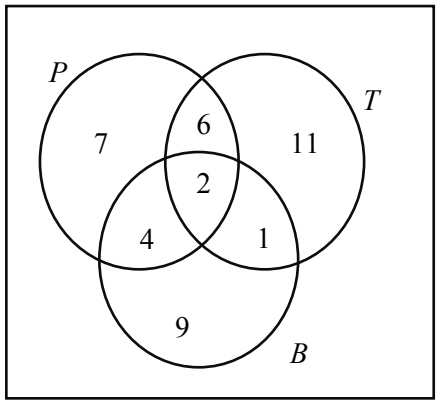
Question	Answer	Marks	Partial Marks
9(a)		**3**	**B2** for 5 correct entries including '2' correctly placed at the intersection of the 3 sets or **M1** for $k+8-k+3-k+6-k=40-(7+9+11)$ oe or for k, $8-k$, $3-k$, $6-k$, seen correctly placed on diagram with 7, 11 and 9 correctly placed
9(b)	11	**1**	
9(c)	Ø or { }	**1**	
9(d)	$\frac{7}{260}$ oe	**2**	**M1** for $\frac{7}{40}\times\frac{6}{39}$ oe
9(e)	$\frac{14}{95}$ oe	**2**	**FT** *their* Venn diagram **M1** for $\frac{8}{20}\times\frac{7}{19}$
10(a)(i)	$4x-13$ final answer	**1**	
10(a)(ii)	$25x^2$ final answer	**1**	
10(b)	$\frac{x+1}{4}$ or $\frac{x}{4}+\frac{1}{4}$	**2**	**M1** for correct first step $x=4y-1$ or $y+1=4x$ or $\frac{y}{4}=x-\frac{1}{4}$
10(c)	0.6934 final answer	**3**	**B2** for 0.69336… or $3^{-\frac{1}{3}}$ oe or 0.693 or **M1** for $3^{-3^{-x}}$ oe
10(d)(i)	$(3x-2)^2-3^{-(-3)}$	**M1**	
	$9x^2-6x-6x+4-27$ or $9x^2-12x+4-27$ leading to $9x^2-12x-23$	**A1**	with no errors seen

Question	Answer	Marks	Partial Marks
10(d)(ii)	$\frac{-(-12)\pm\sqrt{(-12)^2-4(9)(-23)}}{2\times9}$ or better	**B2**	**B1** for $\sqrt{(-12)^2-4(9)(-23)}$ oe or $\frac{-(-12)+\sqrt{q}}{2\times9}$ oe or $\frac{-(-12)-\sqrt{q}}{2\times9}$ oe or both
	– 1.07, 2.40 final answers	**B2**	**B1** for each If **B0, SC1** for answers – 1.1 or –1.06 or –1.065… to – 1.065 **and** 2.4 or 2.39 or 2.398 to 2.398… or – 1.07 **and** 2.40 seen in working or for –2.40 and 1.07 as final answer
10(e)	-5 final answer	**2**	**M1** for $243 = 3^{-x}$
11(a)	(1, 2) $(-1, 6)$	**5**	**B2** for **[**derivative oe = **]** $3x^2-3$ or **B1** for [derivative oe =] $3x^2$ or $f(x)-3$ **M1** for *their* derivative = 0 or recognition of $\frac{dy}{dx}=0$ oe **B1** for $[x =] -1, 1$ or for one coordinate pair
11(b)	(1, 2) minimum with reason $(-1, 6)$ maximum with reason	**3**	Reasons could be e.g. a reasonable sketch correct use of 2nd derivative = $6x = 6$, $6 > 0$, so (1, 2) minimum oe 2nd derivative = $6x = –6$, $–6 < 0$ so (–1, 6) maximum oe, or finds gradient on each side of both correct stationary points with correct conclusion **B2** for 1 correct with reason or **M1** for showing [2nd derivative =] $6x$ or gradients for one value on either side of one correct stationary point or for reasonable sketch of cubic

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