Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2019**

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.

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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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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)	6h 27 mins	**2**	**B1** for answer .....h 27 mins
1(a)(ii)	150 km/h	**3**	**M2** for $\frac{90}{36} \times 60$ or **M1** for $\frac{90}{\textit{their}\ \text{time}}$ or **B1** for 36 [mins] seen
1(a)(iii)	780	**4**	**M3** for $\left(90 \times \frac{35}{3600}\right) \times 1000 - 95$ oe or **M2** for $\left(90 \times \frac{35}{3600}\right) \times 1000$ oe or **B1** for figs 875 or **M1** for $90 \times \frac{35}{3600}$ seen or for $90 \times \frac{1000}{3600}$ oe If 0 scored, **SC1** for *their* distance (> 95) – 95
1(b)(i)	7 : 5	**1**	
1(b)(ii)	66.7 or 66.66 to 66.67	**3**	**M2** for $\frac{140-84}{84}$ [× 100] oe or for $\frac{140}{84} \times 100$ oe or **M1** for $\frac{140}{84}$ oe
1(b)(iii)	24 576	**5**	**M4** for complete method, $40 \times 60 + 0.7 \times 220 \times 84 + 0.3 \times 220 \times 140$ oe OR **B1** for 40 [children] **M1** for $0.7 \times 220 \times 84$ oe **M1** for $0.3 \times 220 \times 140$ oe **B1** for 2400 or 12936 or 9240 nfww

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Question	Answer	Marks	Partial Marks
1(c)	3.5×10^5 nfww	**3**	**M2** for $3.08 \times 10^5 \div \left(\frac{100-12}{100}\right)$ oe or **M1** for 3.08 [$\times 10^5$] associated with (100–12)%
2(a)	–10	**2**	**M1** for $-17 - 3 = 7x - 5x$ oe or better
2(b)	−1, 0, 1, 2 final answer	**3**	**B2** for 3 correct values and no incorrect values or 4 correct values and one incorrect value or **M2** for $-\frac{7}{4} < n \leqslant 2$ oe or **M1** for $-\frac{7}{4} < n \leqslant k$ or $k < n \leqslant 2$ oe
2(c)(i)	a^9	**1**	
2(c)(ii)	$125x^3y^6$ final answer	**2**	**B1** for 2 correct elements if in form kx^ny^m
2(c)(iii)	$\frac{4y^{[1]}}{3x^4}$ final answer	**3**	**B2** for $\left(\frac{3x^4}{4y^{[1]}}\right)^{[-1]}$ oe seen OR **B1** for $3x^4$ or $4y^{[1]}$ **and** **M1** for $\left(\frac{64y^3}{27x^{12}}\right)^{\left[\frac{1}{3}\right]}$ oe If 0 scored, **SC1** for $\frac{64y^{[1]}}{27x^4}$ or $\frac{0.333x^{-4}}{0.25y^{-1}}$ seen
3(a)(i)	Image at (–5, 4), (–2, 4), (–4, 6)	**2**	**B1** for translation by $\begin{pmatrix}-3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\2\end{pmatrix}$
3(a)(ii)	Image at (2, 1), (4, –1), (2, –2)	**2**	**B1** for reflection in $y = -x$ or $y = x$ drawn
3(b)	Rotation 90°[anticlockwise] oe (1, –1)	**3**	**B1** for each
3(c)(i)	$\begin{pmatrix}-2 & 0\\0 & -2\end{pmatrix}$	**2**	**B1** for 2 by 2 matrix with one correct row or column
3(c)(ii)	Strict **FT** *their* **(c)(i)**	**1**	Answer not equal to zero **FT** *their* **(c)(i)** only if 2 by 2

Question	Answer	Marks	Partial Marks
4(a)(i)	$\frac{1}{2}\times\frac{4}{3}\times\pi\times5.6^3$	**M1**	
	367.8... to 367.9	**A1**	
4(a)(ii)	3.06 or 3.060 to 3.061...	**4**	**M1** for 0.8×368 [= 294.4] **M2** for [r^2 =] $\frac{their\ 294.4}{10\pi}$ oe or **M1** for $\pi r^2 \times 10 = their$ 294.4 oe
4(b)(i)	44[.0] or 43.98 to 43.99 nfww	**5**	**B2** for [slant height =] $\frac{25}{4}$oe or **M1** for [l^2 =] $6^2 + 1.75^2$ oe **M2** for $\pi\times1.75\times their\ l+\pi\times1.75^2$ or **M1** for $\pi\times1.75\times their\ l$ or $\pi\times1.75^2$
4(b)(ii)(a)	SF = $\frac{1}{4}$ oe soi	**B1**	
	$\frac{1}{3}\pi\times1.75^2\times6-\frac{1}{3}\pi\times their\ 0.4375^2\times1.5$ **OR** $\frac{1}{3}\pi\times1.75^2\times6\times\left(1-\left(\frac{1}{4}\right)^3\right)$ oe	**M2**	**M1** for $\frac{1}{3}\pi\times1.75^2\times6$ or $\frac{1}{3}\pi\times their\ 0.4375^2\times1.5$ **OR** **M1** for $1-\left(\frac{1}{4}\right)^3$ oe
	18.94 or 18.939 to18.944…	**A1**	
4(b)(ii)(b)	95 final answer	**3**	**B2** for 94.5 or 94.69 to 94.722 OR **M2** for $18.9\times10^3\div200$ oe or **M1** for 18.9×10^3 or $200\div10^3$ or figs 189..÷ 200 or 18.9.. ÷ figs 2
5(a)(i)	–3	**1**	
5(a)(ii)	6.2 to 6.4 oe	**2**	**M1** for 3 seen or used
5(b)	$y = 5 – 3x$ ruled	**2**	**B1** for $y = 5 – 3x$ soi or ruled line with gradient – 3 or with y – intercept at 5 (but not $y = 5$) or **B1FT** for incorrect line equation/expression shown in working and *their* line correctly drawn
	– 0.3 to – 0.2 1.65 to 1.8	**2**	**B1** for each, dep on $y = 5 – 3x$ drawn or **FT** *their* line provided equation/expression shown in working, dep on B1FT for line

Question	Answer	Marks	Partial Marks
5(c)	Tangent ruled at $x = –2$	**1**	**B1** for correct tangent
	–4.5 to –2.5	**2**	**Dep** on B1 for tangent or close attempt at tangent at $x = –2$ **M1** for rise/run **also dep on** tangent drawn or close attempt at correct tangent Must see correct or implied calculation from a drawn tangent
5(d)(i)	8, 4, 0.25 oe	**3**	**B1** for each
5(d)(ii)	Correct graph	**3**	**B2FT** for 6 or 7 correct plots or **B1FT** for 4 or 5 correct plots
5(d)(iii)	1.8 to 1.9	**1**	
6(a)	40.5 or 40.45[8..] or 40.46 nfww	**4**	**M1** for 25, 32.5, 37.5, 50, 80 soi **M1** for Σft **M1 dep** for their $\Sigma ft \div 120$
6(b)	Fully correct histogram	**4**	**B1** for each correct bar If 0 scored, **SC1** for frequency densities of 5.4, 4.2, 0.8 and 0.45 seen
7(a)	$[y =] 4x + 5$	**3**	**B2** for answer $[y =] 4x + c$ oe (c can be numeric or algebraic) OR **M2** for $\frac{y-9}{x-1} = \frac{9-(-3)}{1-(-2)}$ oe OR **M1** for $\frac{9--3}{1--2}$ oe or for **M1** for correct substitution of (–2, –3) or (1, 9) into $y = (\textit{their } m)x + c$ oe
7(b)	76[.0] or 75.96...	**2**	**M1** for tan[ ] = 4 oe

Question	Answer	Marks	Partial Marks
7(c)(i)	$[y =] -\frac{1}{4}x + \frac{23}{8}$ oe	**3**	**B2FT** for $[y =] -\frac{1}{\textit{their}\text{ gradient from }\textbf{(a)}}x + c$ oe (c can be numeric or algebraic) OR **M2** for $\frac{y-2}{x-3.5} = -\frac{1}{\textit{their}\text{ gradient from }\textbf{(a)}}$ oe OR **M1** for $-\frac{1}{\textit{their}\text{ gradient from }\textbf{(a)}}$ soi **M1** for correct substitution of (3.5, 2) into $y = (\textit{their } m)x + c$ oe
7(c)(ii)	(–4.5, 4)	**2**	**B1** for each value or for $\begin{pmatrix}-8\\2\end{pmatrix}$ seen
8(a)(i)	$\frac{x-1}{x+2}$	**2**	**B1** for either numerator or denominator correct
8(a)(ii)(a)	$\frac{x}{x+3} \times \frac{x-1}{x+2} = \frac{7}{15}$	**B1**	**FT** *their* **(a)(i)** = $\frac{7}{15}$
	$15x(x – 1) = 7(x + 3)(x + 2)$	**M1**	Removes all algebraic fractions **FT** *their* equation if in comparable form
	$15x^2 – 15x = 7x^2 + 21x + 14x + 42$	**M1**	Correctly expands all brackets **FT** *their* equation if in comparable form
	$[8x^2 – 50x – 42 = 0]$ $4x^2 – 25x – 21 = 0$	**A1**	With no errors or omissions seen and one further stage seen after final M1
8(a)(ii)(b)	$(4x + 3)(x – 7)$ [= 0]	**M2**	**M1** for $4x(x – 7) + 3(x – 7)$ or $x(4x + 3) – 7(4x + 3)$ or for $(4x + a)(x + b)$ where either $ab = –21$ or $4b + a = –25$ If 0 scored, **SC1** for $4x + 3$ **and** $x – 7$ seen but not in factorised form
	7 and $-\frac{3}{4}$	**B1**	
8(a)(ii)(c)	7	**1**	**FT** *their* positive solution

Question	Answer	Marks	Partial Marks
8(b)	$\frac{1}{6}$ oe	**4**	**M3** for $\frac{5}{9}\times\frac{4}{8}\times\frac{3}{7}+\frac{4}{9}\times\frac{3}{8}\times\frac{2}{7}$ or **M2** for $\frac{5}{9}\times\frac{4}{8}\times\frac{3}{7}$ or $\frac{4}{9}\times\frac{3}{8}\times\frac{2}{7}$ or **M1** for $\frac{5}{9},\frac{4}{8},\frac{3}{7}$ seen or $\frac{4}{9},\frac{3}{8},\frac{2}{7}$ seen If 0 scored, **SC1** for $\frac{5^3+4^3}{729}$ oe
9(a)(i)	$\angle ACD = 46$ soi or $\angle CDE = 44$ soi	**B2**	**B1** for angle $ADC = 108$ or angle $DCB = 18$
	$\frac{58\sin 108}{\sin \textit{their} 46}$	**M2**	**M1** for $\frac{\sin 108}{x}=\frac{\sin \textit{their} 46}{58}$ oe
	76.68… nfww	**A1**	
9(a)(ii)	10.9 or 10.91 to 10.94	**3**	**B2** for [AB =] 68.9 or 68.91 to 68.94 or **M2** for a correct explicit statement for AB or BD or **M1** for $\frac{AB}{76.7}$ = cos26 oe
9(b)(i)	10.4 or 10.43 to 10.44	**4**	**M3** for $\sqrt{\frac{70}{\sin 40}}$ oe or **M2** for $x^2 \times \sin 40 = 70$ oe or **M1** for $\frac{1}{2}x \times 2x \times \sin 40 = 70$
9(b)(ii)	140	**1**	
10(a)(i)	3, –1	**2**	**B1** for each
10(a)(ii)	23 – 4n oe final answer	**2**	**M1** for $k - 4n$ or $23 - jn$ ($j \neq 0$)
10(a)(iii)	22	**2**	**M1** for *their* **(a)(ii)** = –65
10(b)	23	**2**	**B1** for 37 or 60