Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

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

MARK SCHEME

Maximum Mark: 120

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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MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation '**dep**' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

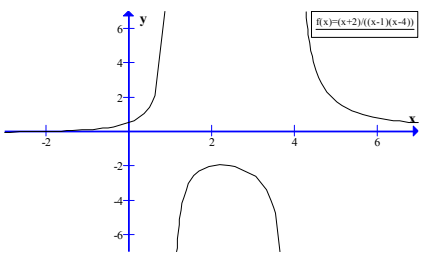
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Question	Answer	Marks	Partial Marks
1(a)	535.5[0] final answer	**2**	**M1** for $630 \times \left(1-\frac{15}{100}\right)$ oe
1(b)	\$1120	**3**	**M2** for $952 \div \left(1-\frac{15}{100}\right)$ oe or **M1** for 85% associated with 952
1(c)	12 nfww	**4**	**M3** for $n\log\left(1-\frac{5}{100}\right) = \log\left(\frac{\frac{1}{2}(630)}{their 535.50}\right)$ oe soi by 10.3 or 10.4 or 10.34 to 10.36… or correct trials as far as 10 and 11 or suitable sketch(es) e.g. $y = 535.5 \times 0.95^x$ and $y = 315$ or **M2** for $\left(1-\frac{5}{100}\right)^n = \left(\frac{\frac{1}{2}(630)}{their 535.50}\right)$ oe or at least 3 correct trials or final answer 11 nfww or **M1** for *their* $535.5 \times \left(1-\frac{5}{100}\right)^n = \frac{1}{2}(630)$ soi oe
2(a)	Reflection $y = -1$	**2**	**B1** for each
2(b)	Triangle at (6, –3), (11, –3), (10, –1)	**2**	**B1** for translation $\begin{pmatrix} k \\ -3 \end{pmatrix}$ or $\begin{pmatrix} 6 \\ k \end{pmatrix}$
2(c)(i)	63.4 or 63.43 to 63.44	**3**	**B2** for $\tan[\theta] = \frac{4}{2}$ oe or **B1** for correct angle clearly identified and no other angle seen.
2(c)(ii)	5	**3**	**M2** for $\frac{\sqrt{125}}{5}$ or $\frac{10}{\sqrt{20}}$ or $\frac{5}{\sqrt{5}}$ or **M1** for $\sqrt{10^2+5^2}$ or $\sqrt{4^2+2^2}$ or $\sqrt{1^2+2^2}$ or $\sqrt{125}$ or $\sqrt{20}$ or $\sqrt{5}$
3(a)	1, 2, 3, 4, 6, 8, 12, 24	**B2**	**B1** for 7 correct and 1 incorrect or 6 or 7 correct and none incorrect or 8 correct and 1 extra
	$(3 + 1) \times (1 + 1) = 8$	**B1**	soi by $4 \times 2 = 8$

Question	Answer	Marks	Partial Marks
3(b)	$360 = 2^3 \times 3^2 \times 5$	**B2**	**M1** for two steps in a factor ladder or tree oe or listing all factors of 360 with no extras or omissions.
	$(3 + 1) \times (2 + 1) \times (1 + 1)$	**M1**	soi by $4 \times 3 \times 2$ **FT** dep on factors being prime
	24	**B1**	
4(a)	27.7 or 27.70 to 27.71	**2**	**M1** for at least 3 midpoints soi
4(b)	Correct cf curve	**5**	Curve/polygon through (10, 0), (20, 16), (25, 44), (30, 76), (35, 100), (40, 114), (50, 120) or **B4** for curve through 5 or 6 points or 7 points with no curve or **B3** for 'correct curve' through all other consistent points in interval or **B2** for all correct cfs or **B1** for 4 or 5 correct cfs. If 0 scored **SC1** for any cumulative frequency diagram.
4(c)(i)	26 to 28	**1**	Dep on increasing curve **FT**
4(c)(ii)	9 to 11.5	**2**	Dep on increasing curve **FT** **B1** for lq = 22 to 23.5 or uq = 32.5 to 33.5
4(c)(iii)	10 to 15	**2**	Dep on increasing curve **FT** **B1** for 105 to 110 seen
4(d)(i)	5.6, 6.4, 4.8, 2.8, 0.6	**2**	**B1** for 3 or 4 correct
4(d)(ii)	Correct histogram	**3**	**B2 FT** for bars with *their* heights or **B1FT** for 3 or 4 bars with *their* heights or bars with all correct widths
5(a)	72	**2**	**M1** for $\frac{12}{60} \times 360$
5(b)	$\frac{1}{4}$ oe	**1**	
5(c)(i)	$\frac{4}{59}$ oe	**3**	**M2** for $\frac{12}{60} \times \frac{10}{59} + \frac{10}{60} \times \frac{12}{59}$ oe or **M1** for $\frac{12}{60} \times \frac{10}{59}$ or $\frac{10}{60} \times \frac{12}{59}$ soi $\frac{2}{59}$

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Question	Answer	Marks	Partial Marks
5(c)(ii)	$\frac{303}{590}$ oe	**3**	**M2** for $1 - \left(\frac{42}{60} \times \frac{41}{59}\right)$ oe or $\frac{18}{60} \times \frac{42}{59} + \frac{42}{60} \times \frac{18}{59} + \frac{18}{60} \times \frac{17}{59}$ or **M1** for $\frac{18}{60} \times \frac{42}{59}$ or $\frac{42}{60} \times \frac{18}{59}$ or $\frac{18}{60} \times \frac{17}{59}$ or $\frac{42}{60} \times \frac{41}{59}$
6(a)(i)	$y = \frac{18}{\sqrt{x}}$ oe	**2**	**M1** for $y = \frac{k}{\sqrt{x}}$ oe
6(a)(ii)	3.29 or 3.286...	**1**	**FT** wrong k only
6(a)(iii)	1.44 oe	**2**	**M1** for $\sqrt{x} = \frac{their18}{15}$ or $225 = \frac{(their18)^2}{x}$
6(b)	$z = 3\left(\frac{18}{\sqrt{x}} + 5\right)$ oe	**2**	**M1** for $z = K\left(their\left(a(i)\right) + 5\right)$ $K \neq 1$ or for $z = 3(y + 5)$
7(a)	Vector $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$ drawn Vector $\begin{pmatrix} 2 \\ 5 \end{pmatrix}$ drawn Vector $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$ drawn	**3**	**B1** for each with arrows If 0 scored **SC1** for all three without arrows or all incorrect arrows
7(b)	[**p** =] –3**b** oe [**q** =] 3**a** + 3**b** oe [**r** =] 2**b** – **a** oe	**3**	**B1** for each
8(a)	Correct Pythagoras statement leading to $11^2 - 6^2$ or 121 – 36 or 85	**M2**	or **M1** for **[**BD**]**$^2 + 6^2 = 11^2$ oe
	9.219…	**A1**	9.219… implies M1 A1
8(b)	43.8 or 43.80... nfww	**3**	**M2** for $\cos[ABD] = \frac{9.22^2 + 13^2 - 9^2}{2 \times 9.22 \times 13}$ or better or **M1** for $9^2 = 9.22^2 + 13^2 -$ $2 \times 9.22 \times 13 \cos[ABD]$ oe

Question	Answer	Marks	Partial Marks
8(c)	69.1 or 69.13 to 69.14... nfww	**3**	**M1** for $0.5 \times 9.22 \times 6$ oe **M1** for $0.5 \times 9.22 \times 13 \times \sin$ (*their* 43.8) oe
8(d)	17.7 or 17.69...	**3**	**M1** for $6^2 + 13^2 -$ $2 \times 6 \times 13 \cos (90 +$ *their* 43.8) **A1** for 313 or 312.9 to 313.0
9(a)	$(45 + 4x)(20 + 2x) = 2208$	**M1**	
	$900 + 90x + 80x + 8x^2$	**B1**	For expansion
	Completion to $4x^2 + 85x - 654 = 0$ with no errors or omissions	**A1**	
9(b)	$\frac{-85 \pm \sqrt{85^2 - 4(4)(-654)}}{2 \times 4}$	**M1**	or $(x - 6)(4x + 109)$ or sketch of parabola $(+x^2)$ with one positive zero and one negative
	6, –27.25 oe	**B2**	**B1** for each
9(c)	Length = 69 Height = 32	**B2**	**B1FT** for each
10(a)(i)	11	**1**	
10(a)(ii)	–23	**2**	**M1** for $5 - 2(3 \times 4 + 2)$ soi or $5 - 2(3x + 2)$
10(a)(iii)	$\frac{1}{8}$ oe	**3**	**M1** for $5 - 2x = 2(3x + 2)$ oe **M1FT** for $5 - 4 = 6x + 2x$ or better
10(a)(iv)	$\frac{5-x}{2}$ oe final answer	**2**	**M1** for $2x + y = 5$ or better or $x = 5 - 2y$ or $\frac{y}{2} = \frac{5}{2} - x$
10(a)(v)	$17 - 6x$ oe final answer	**2**	**M1** for $3(5 - 2x) + 2$
10(a)(vi)	$\frac{5x+16}{(5-2x)(3x+2)}$ or $\frac{5x+16}{10+11x-6x^2}$ final answer	**3**	**M1** for common denominator $(5 - 2x)(3x + 2)$ oe **M1** for $3(3x + 2) + 2(5 - 2x)$ oe
10(b)	x	**1**	
11(a)	Correct sketch 	**3**	**B1** for each branch

Question	Answer	Marks	Partial Marks
11(b)	(2.24, –1.94)	**2**	or (2.242 to 2.243, –1.943 to –1.942) **B1** for each co-ordinate
11(c)	$x = 1$, $x = 4$, $y = 0$	**3**	**B1** for each
11(d)(i)	1.34 or 1.344 to 1.345 2.79 or 2.789... 5.87 or 5.866...	**3**	**B1** for each If 0 scored, **SC1** for 1.3, 2.8 and 5.9
11(d)(ii)	$x < 1$ $1.34 < x < 2.79$ $4 < x < 5.87$	**3**	**B1** for each **FT** dep on two solutions to **(i)** between 1 and 4. **FT** dep on solution to **(i)** > 4
12(a)	(5) (6) 37 37 24 54 (61) 91	**5**	**B1** for each
12(b)	[p =] –3 [q =] 1	**2**	**B1** for each