Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 70

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

© UCLES 2019

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).

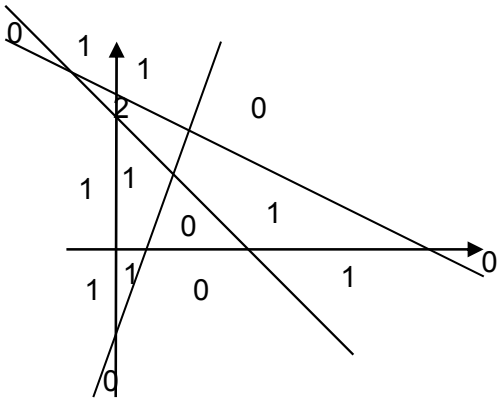
GENERIC MARKING PRINCIPLE 6:

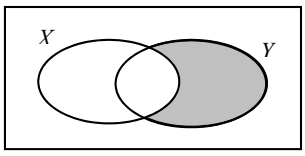
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

© UCLES 2019

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	53 or 59	**1**	
2	0.839 or 0.8386 to 0.8387	**1**	
3	$\frac{7}{9}$	**1**	
4(a)	Trapezium	**1**	
4(b)	Obtuse	**1**	
5	56.4 or 56.44…	**2**	**M1** for $\frac{254}{their\,4.5}$ or $\frac{254}{their\,270}[\times 60]$
6	2	**2**	**M1** for $9f - 3f$ oe or $23 - 11$ oe
7	14.7	**2**	**M1** for $\frac{1}{2}\times 8.4\times 3.5$ oe
8(a)	0.048 cao	**1**	
8(b)	5.27×10^{-3}	**1**	
9	6	**2**	**M1** for $2 \times 3^2 \times 5$ or $2^4 \times 3$ or for 2×3 as final answer or **B1** for 2 or 3 as final answer
10	2.1	**2**	**M1** for $\frac{33.6\times 25000^2}{100000^2}$ oe or answer figs 21
11	$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$	**2**	**B1** for one row or one column correct in a 2 by 2 matrix in the final answer or **SC1** for $\begin{pmatrix} 0 & 3 \\ 3 & 0 \end{pmatrix}$
12(a)	$10m^5$ final answer	**2**	**B1** for $10m^k$ or km^5 as final answer
12(b)	x^{24} final answer	**1**	

Question	Answer	Marks	Partial Marks
13	$\frac{9}{4}\times\frac{7}{3}$ or $\frac{63}{28}\div\frac{12}{28}$ oe with common denominator	**M2**	**B1** for $\frac{9}{4}$ oe seen or **M1** for *their* $\frac{9}{4}\times\frac{7}{3}$
	$5\frac{1}{4}$ cao	**A1**	
14	Correctly eliminating one variable	**M1**	
	$[x =] -4$ $[y =] 3$	**A2**	**A1** for one correct If **M0** scored, **SC1** for 2 values satisfying one of the original equations
15	495	**3**	**M2** for $435.6 \div \frac{100-12}{100}$ oe or **B1** for recognising 435.6 as 88[%]
16(a)	*R* identified correctly	**2**	**B** marks 
16(b)	7	**1**	
17	$\frac{3x^2-4x+9}{(x+3)(x-5)}$ final answer	**3**	**B1** for common denominator $(x+3)(x-5)$ oe isw **M1** for $2x(x-5)+(x+3)(x+3)$ or better
18	12.8 4.4 0.8	**3**	**B2** for 2 correct heights or 3 correct freq densities or **B1** for 1 correct height or 2 correct freq densities

Question	Answer	Marks	Partial Marks
19	$m = \frac{k}{P-1}$ final answer	**4**	**B3** for final answer $\frac{k}{P-1}$ OR **M1** for multiplying or dividing by m correctly **M1** for term(s) in m on one side correctly and terms not in m on the other side correctly **M1** for correctly factorising m with a 2-term bracket oe **M1** for correct division by *their* 2-term bracket with m as the subject To a maximum of **M3** for an incorrect answer
20	$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-10)}}{2 \times 3}$	**B2**	**B1** for $\sqrt{(-2)^2 - 4(3)(-10)}$ or better and if in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ then **B1** for $p = -(-2)$ and $r = 2(3)$
	−1.52 and 2.19 final ans cao	**B1B1**	If B0B0, **SC1** for −1.5 and 2.2 or −1.523 to −1.522... and 2.189.... or 1.52 and −2.19 or −1.52 and 2.19 seen in working
21(a)		**1**	
21(b)(i)	$\frac{9}{16}$ oe	**2**	**B1** for $\frac{9}{k}$ or $\frac{k}{16}$ provided fraction is less than 1
21(b)(ii)	46	**1**	
22(a)	$\begin{pmatrix} 6 & 15 \\ 3 & 7 \end{pmatrix}$	**2**	**B1** for 2 correct elements
22(b)	$\begin{pmatrix} -3 & 7 \\ 1 & -2 \end{pmatrix}$ oe isw	**2**	**B1** for $k\begin{pmatrix} 3 & -7 \\ -1 & 2 \end{pmatrix}$ soi or det = – 1 soi

Question	Answer	Marks	Partial Marks
23(a)	$\frac{5}{3}\mathbf{p}-2\mathbf{q}$ oe simplified	**2**	**M1** for correct unsimplified answer or $c\mathbf{p}-2\mathbf{q}$ or $\frac{5}{3}\mathbf{p}+c\mathbf{q}$ $c \neq 0$ or for a correct route
23(b)	$\frac{5}{6}$	**2**	**B2FT** for $\frac{\textit{their } c}{2}$ if *their* **(a)** is $c\mathbf{p}-2\mathbf{q}$ oe **M1** for $\overrightarrow{MX} = \frac{5}{6}\mathbf{p}-\mathbf{q}$ or $\overrightarrow{MX} = \frac{1}{2}$ *their* **(a)** or $\overrightarrow{BX} = \frac{1}{2}\overrightarrow{AN}$ or $\mathbf{q} + \frac{1}{2}$ *their* **(a)** or $\mathbf{q} + \overrightarrow{MX} - k\mathbf{p} = 0$ oe
24	31.9 or 31.85...	**4**	**M3** for $\tan = \frac{12}{\sqrt{18^2+7^2}}$ oe or **M2** for $\sqrt{18^2+7^2}$ or **M1** for 18^2+7^2 or **B1** for identifying correct angle *CAG*
25(a)	Rotation 90° clockwise oe (1, 0)	**3**	**B1** for each
25(b)	Enlargement – 2 (0, 2)	**3**	**B1** for each