Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/22**

Paper 22 (Extended) **March 2018**

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.

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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	Positive	**1**	
2	5.23×10^{-5}	**1**	
3	2.29 or 2.292…	**1**	
4	$\frac{8}{9}$ oe, must be fraction	**1**	
5(a)	5	**1**	
5(b)	1	**1**	
6	$5m\left(3k^2 - 4m^3\right)$ final answer	**2**	**B1** for $5\left(3k^2m - 4m^4\right)$ or $m\left(15k^2 - 20m^3\right)$ or for $5m\left(3k^2 - 4m^3\right)$ with one error in a number
7	2**q** + **p**	**2**	**B1** for $CF = 2(\mathbf{q} + \mathbf{p})$ or $BA = \mathbf{q} + \mathbf{p}$ or $DE = \mathbf{q} + \mathbf{p}$ or $DA = 2\mathbf{q}$ or for correct route
8	21400 or 21430 or 21434.[…]	**2**	**M1** for $23000 \times \left(1 - \frac{1.4}{100}\right)^5$ oe
9	–12	**2**	**B1** for 2^3, 2^{-3}, 2^{12} or 2^{-12}
10	12	**3**	**M2** for $9 \times 8 = 6y$ oe OR **M1** for $y = \frac{k}{x}$ oe **M1** for [y =] *their* $\frac{k}{6}$
11	92	**3**	**M2** for $[600-](0.18 \times 600 + \frac{2}{3} \times 600)$ or **M1** for 108 or 400 seen

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Question	Answer	Marks	Partial Marks
12	common denominator 24	**B1**	accept 24*k*
	$\frac{21}{24}$ and $\frac{4}{24}$ oe	**M1**	
	$1\frac{1}{24}$	**A1**	
13	correctly eliminating one variable	**M1**	
	[*x* =] 7 [*y* =] – 2	**A2**	**A1** for each If **M0** scored **SC1** for 2 values satisfying one of the original equations or **SC1** if no working shown, but 2 correct answers given
14(a)	similar	**1**	
14(b)	11.61	**3**	**M2** for $8.6 \times \sqrt{\frac{65.61}{36}}$ or **M1** for $\sqrt{\frac{65.61}{36}}$ or $\sqrt{\frac{36}{65.61}}$ or $\left(\frac{8.6}{BX}\right)^2 = \frac{36}{65.61}$ oe
15	63 corresponding [angles] 59 angles [in a] triangle [add up to] 180 oe	**4**	**B1** for [*a* =] 63 **B1** for corresponding angles **B1FT** for [*b* =] 59 or *their a* + *their b* = 122 **B1** for angles [in a] triangle [add up to] 180 oe
16(a)	2.24	**2**	**M1** for $0.5 \times 1.6 \times 2.8$
16(b)	3.22 or 3.224 to 3.225	**2**	**M1** for $[AC^2 =] 1.6^2 + 2.8^2$

Question	Answer	Marks	Partial Marks
17	$\frac{-7 \pm \sqrt{(7)^2 - 4(2)(-3)}}{2 \times 2}$	**B2**	**B1** for $\sqrt{(7)^2 - 4(2)(-3)}$ or better **B1** for $p = -7$ and $r = 2 \times 2$ if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ Completing the square method: **B1** for $(x + 1.75)^2$ oe **B1** for $-1.75 \pm \sqrt{1.5 + 1.75^2}$ oe
	0.39 and – 3.89 final ans cao	**B2**	**B1** for each If **B0**, **SC1** for 0.4 and – 3.9 or 0.386...and – 3.886... or 0.39 and – 3.89 seen in working or – 0.39 and 3.89
18(a)	Correct ruled perpendicular bisector of *AB* with correct pairs of arcs	**2**	**B1** for correct perpendicular bisector without correct arcs or for correct arcs, with no/wrong line
18(b)	Correct ruled bisector of angle *ABC* with 2 correct pairs of arcs	**2**	**B1** for correct angle bisector without correct arcs or for correct arcs, with no/wrong line
19(a)(i)	$\in$	**1**	
19(a)(ii)	$X \cap Y$ oe	**1**	
19(a)(iii)	$\varnothing$	**1**	
19(b)	*u, v, w*	**1**	
19(c)	5	**1**	
20(a)	Rotation [centre] origin oe 90°[anti-clockwise] oe	**3**	**B1** for each
20(b)	Enlargement [centre] (0, 3) [sf] – 2	**3**	**B1** for each
21(a)	2	**2**	**M1** for f(5) or 7– (7 – *x*) or better
21(b)	$30 - 4x$ final answer	**2**	**M1** for $4(7 - x) + 2$ or better or for correct answer then spoilt
21(c)	$15 - 4x^2$ final answer	**2**	**M1** for $15 - (2x)^2$ or better or for correct answer then spoilt

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Question	Answer	Marks	Partial Marks
22(a)	$\frac{9}{20}$ oe	**1**	
22(b)(i)	$\frac{6}{20}\times\frac{5}{19}$	**M1**	
	$\frac{30}{380}$ oe	**A1**	
22(b)(ii)	$\frac{258}{380}$ oe	**4**	**M3** for $1-\frac{3}{38}-\frac{5}{20}\times\frac{4}{19}-\frac{9}{20}\times\frac{8}{19}$ oe or **M2** for $\frac{3}{38}+\frac{5}{20}\times\frac{4}{19}+\frac{9}{20}\times\frac{8}{19}$ oe or $\frac{5}{20}\times\frac{9}{19}+\frac{6}{20}\times\frac{9}{19}+\frac{6}{20}\times\frac{5}{19}$ oe or **M1** for one correct product other than $\frac{6}{20}\times\frac{5}{19}$

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