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Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2023**

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 October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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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Mathematics-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, non-integer 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 or sign 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 A or B 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.

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

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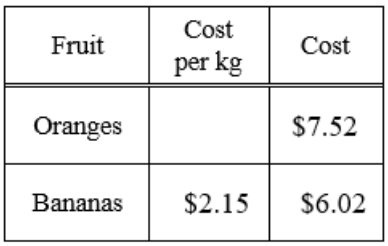
Question	Answer	Marks	Partial Marks
1	98	**2**	**M1** for $x + 41 + 41 = 180$ oe or better
2(a)	27	**1**	
2(b)	15	**1**	
2(c)	25	**1**	
3(a)	5	**1**	
3(b)	90	**1**	
4		**3**	**B1** for 7.52 **B1** for 6.02 or **B1FT** for 13.54 – *their* 7.52 correctly evaluated provided *their* 7.52 < 13.54 **B1FT** for *their* 6.02 ÷ 2.8 correctly evaluated
5(a)	$7m(6k – 5)$ final answer	**2**	**B1** for $7(6mk – 5m)$ or $m(42k – 35)$ as final answer or $7m(6k – 5)$ seen and then spoiled
5(b)	$(h + 12)(h – 12)$ final answer	**1**	
6(a)	4800	**1**	
6(b)	Point plotted at (54 000, 6100)	**1**	
6(c)	Positive	**1**	
7	260	**1**	
8	24 cao	**1**	
9	14	**2**	**B1** for answer 2 or 7 or **M1** for 2×7 as final answer or [140 =] $2 \times 2 \times 5 \times 7$ and [126 =] $2 \times 3 \times 3 \times 7$ or 2 correct factor trees or tables
10(a)	n^6 final answer	**1**	
10(b)	$4x^4$ final answer	**2**	**B1** for kx^4 or $4x^k$ as final answer or correct answer seen and then spoiled
10(c)	$9y^8$ final answer	**2**	**B1** for ky^8 or $9y^k$ final answer or correct answer seen and spoiled

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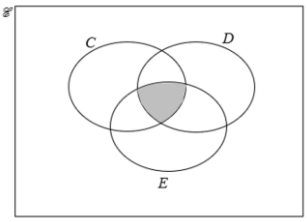
Question	Answer	Marks	Partial Marks
11	$x \geqslant 11$ final answer	**3**	**M1** for $8x - 12 \geqslant 43 + 3x$ or better **M1** for e.g. $8x - 3x \geqslant 43 + 12$ oe OR **M1** for $2x - 3 \geqslant \frac{43}{4} + \frac{3x}{4}$ **M1** for $2x - \frac{3x}{4} \geqslant \frac{43}{4} + 3$
12	$42.22\ldots - 4.22\ldots$ oe	**M1**	**M1** for correct working shown
	$\frac{19}{45}$ cao	**A2**	**A1** for $\frac{38}{90}$ oe seen If **M0** scored **SC1** for $\frac{k}{90}$ or for answer $\frac{19}{45}$ with insufficient working.
13	23 903 cao	**3**	**B2** for answer 23900, 23902, 23902.9… or 23 903 seen then rounded OR **M1** for $27\,000 \times \left(1 - \frac{3}{100}\right)^4$ oe **B1** for *their* more accurate value seen and correctly rounded to the nearest whole number
14(a)	9	**3**	**B2** for $x = 4$ or **B1** for answer 4 (without $x = 4$ in working) OR **M1** for $5x + x + 5 + 12 - x + 15 = 52$ oe or better **B1FT** for identifying the correct region $A \cap B$
14(b)		**1**	

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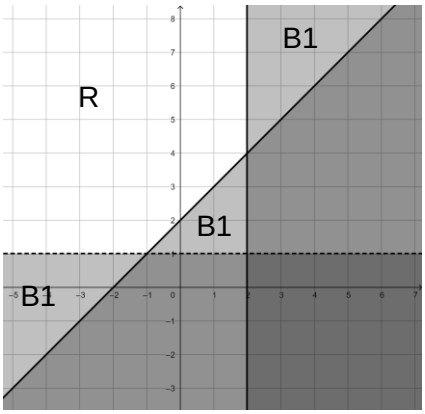
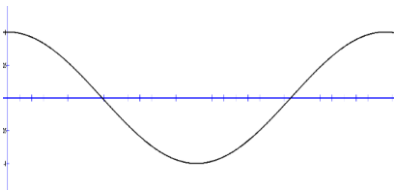
Question	Answer	Marks	Partial Marks
15		5	**B1** for $y = 1$ dashed line **B1** for $x = 2$ solid line **B1** for $y = x + 2$ solid line **B2** for region identified satisfying all 3 inequalities or **B1** for region identified satisfying only 2 of these inequalities with $y = 1$, $x = 2$ and $y = x + 2$ all drawn
16	[Lower bound =] 39.9 nfww [Upper bound =] 42.1 nfww	3	**B2** for one correct or **M1** for 11 + 0.5 or 9.5 + 0.05 or 11 – 0.5 or 9.5 – 0.05
17	33	3	**B2** for $254 + 20 + x + 53 = 360$ oe or better or $53 + 20 + x + 37 + 37 = 180$ oe or better or $OAB = 33$ or $AOB = 114$ or 70 and 37 correctly identified or 53 and 20 correctly identified or **B1** for any correct relevant angle identified
18	29.7 or 29.66[...]	3	**M2** for $[\sin y =] \dfrac{8.3\sin 105}{16.2}$ or **M1** for $\dfrac{16.2}{\sin 105} = \dfrac{8.3}{\sin y}$ oe
19(a)	 Correct sketch to go through (0, 1), close to (360, 1) and reasonably close to (180, –1)	2	**B1** for correct cosine curve shape through (0,1)
19(b)	282.1 or 282.12…	2	**B1** implied by 77.9 or 77.87 to 77.88 or 282.13 or **M1** for 360 – *their* acute angle
20(a)	$\dfrac{10x}{x+5}$ final answer	3	**B1** for $10x(x – 6)$ **B1** for $(x – 6)(x + 5)$

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Question	Answer	Marks	Partial Marks
20(b)	$\frac{61x+8}{(x+3)(8x-1)}$ final answer	**3**	**B1** for common denominator of $(x + 3)(8x – 1)$ isw **B1** for $7(8x – 1) + 5(x + 3)$ or better isw
21	55.9 or 55.85…	**4**	**M3** for $\tan[\ldots] = \frac{15.1}{\sqrt{4.5^2 + 9.2^2}}$ oe or **M2** for $[AH^2 =] 4.5^2 + 9.2^2$ or $[BH^2 =] 4.5^2 + 9.2^2 + 15.1^2$ or **M1** for recognising angle *BHA* if 0 scored **SC1** for [angle *BHD* =] 59.7[1…] or 59.72
22	110 or 110.3…	**4**	**M3** for $[2 \times] (2(\frac{1}{2} \times 13.6^2 \times \sin 41) – (\frac{41}{360} \times \pi \times 13.6^2))$ oe OR **M1** for $\left[\frac{1}{2}\times\right] 13.6^2 \times \sin 41$ oe **M1** for $[2\times] \frac{41}{360} \times \pi \times 13.6^2$ oe