Cambridge International AS & A Level

THINKING SKILLS   **9694/33**

Paper 3 Problem Analysis and Solution   **October/November 2023**

MARK SCHEME

Maximum Mark: 50

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.

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.

NOTES FOR MARKERS

Working

Where a final answer is underlined in the mark scheme, full marks are awarded for a correct answer, regardless of whether there is any supporting working, unless an exception is noted in the mark scheme.

Supporting working is **not** needed to gain full marks, unless otherwise stated in the mark scheme.

If working clearly shows, beyond any doubt, that a correct answer derives purely from incorrect reasoning, that answer may be invalidated, unless otherwise stated in the mark scheme.

For partial credit, the evidence needed to award the mark will usually be shown on its own line in the mark scheme, or else will be defined in italic text.

For explanations and verbal justifications, apply the principle of 'words to that effect'.

Incorrectly labelled work

If the candidate has labelled their work with the wrong Question/part number, highlight the label(s) and add a comment to flag it. This will help avoid confusion for anyone checking the script later on.

No response

If there is any attempt at a solution award 0 marks not NR. '-' or '?' constitute no attempt at a solution.

Abbreviations

The following abbreviations may be used in a mark scheme:
AG	answer given (on question paper)
awrt	answer which rounds to
dep	mark depends on earlier, asterisked (*), mark
ft	follow through (from earlier error)
oe	or equivalent
SC	special case
soi	seen or implied

Annotations

Where the answer is underlined in the mark scheme, and a candidate's correct final answer is both clear and clearly identified (encircled, underlined etc.), it is not necessary to annotate that item; nor is it necessary to annotate when there is No Response.

Where there is a response that scores 0, either SEEN should be used, or some other annotation(s) to indicate why no marks can be awarded (Caret, TE, NGE, Cross).

Partial credit should be indicated with a 1 (or, occasionally, a 2) at the point at which that mark has been earned.

The highlighter should be used anywhere it is helpful to clarify the marking.

✔	Correct item
✘	Incorrect item
1	Individual mark of partial credit
2	Double mark of partial credit
∧	Essential element of answer/working missing
NGE	Judged to be not good enough to earn the relevant credit
BOD	Benefit of doubt
FT	Correct follow through
TE	Transcription error
SC	Special case
SEEN	Working seen but no credit awarded; blank page checked
Highlight	Use anywhere it is helpful to clarify the marking

There must be at least one annotation on each page of the answer booklet.

Question	Answer	Marks
1(a)	93 were from B, so 1603 from others, **[1]** each max 100, so 17 others and thus 18 **[1]** *SC: 1 mark for final answer 17 (rounding up but not noting 93 separate)*	**2**
1(b)	Been to A&C, W&Y are closed, D and G do not have enough slots left, so <u>F,K,T</u>	**1**
1(c)	W had at least 2 visits **[1]** so Y must have had at least 3 Two could have been singletons, so at most <u>44</u>	**2**
1(d)	B visits K and F S visits D and F *OR* B visits K and T S visits D and F *OR* B visits K and F S visits D and T *1 mark for B visits K OR S visits D* *OR for correct pairings but not necessarily going to both sites* *OR not specifying ships.*	**2**
1(e)	*Sensible assumption in line with the information given* **[1]** *Calculation using data relevant to assumption (possibly rounded)* **[1]** *Consistent final answer that is at least 1863 and at most 3000* **[1]** *Allow substantial rounding anywhere* For example: Assume: 4 sites per cruise Total expected landings this season = 8644 2161 tourists Assume: Proportion landing from B and S are typical 150 tourists: $2 \times (187+103) = 580$ landings So 3.89 landings per visitor Other ships landings $8344 - (187 + 103) = 8054$ $150 + 8054/3.89 = 2233$ tourists *SC: 1 mark for* *Minimum possible: 1863 + 150 = 2013.*	**3**

Question	Answer	Marks
2(a)	Nathan. He has fewer fails. (7, Matt has 8)	1
2(b)	For example: (see table below) Quentin must have 9 fails **[1]** Matt has at most 4 fails OR Ollie has at most 7 fails **[1]** Nathan (5), Pete(8) and both of Matt/Ollie correct **[1]** *Each row must be valid (✗) (✗)✓ then ✗✗✗*	3
2(c)	B E A H D *1 mark for 3 or 4 names in correct positions* *OR 4 in correct order*	2
2(d)(i)	5.8 m with all of 8, 9, 10, 11, 12, 13 fails *1 mark for 5.8 m with at least one of 8,9,10,11,12,13 fails*	2
2(d)(ii)	5.6 m with all of 3, 4 or 5 fails *1 mark for 5.6 m with at least one of 3, 4 or 5 fails* *SC: 2 marks 5.6 with 3 (ways) if 5.8 and 6 (ways) in 2(d)(i)* *SC2: 5.8 with 3-5 fails if 2(d)(i) 6.0 with 8–13 fails*	2
2e	Den had 9 fails. 3 at 5.4 m, **[1]** 2 at each of 5.2 m, 5.0 m and 4.8 m makes 4.8 m the maximum possible starting distance **[1]** *SC: 1 mark for 4.6 m with first 3 fails at 5.2 m*	2

Table for 2(b):

	5.0	5.2	5.4	5.6	5.8
M	✓	✓	✗✓	✓	✗✗✗
N	✓	✓	✓	✗✗✓	✗✗✗
O	✗✓	✗✗✓	✓	✗✗✗	(–)
P	✗✓	✗✗✓	✗✗✓	✗✗✗	(–)
Q	✗✗✓	✗✗✓	✗✗✓	✗✗✗	(–)

Question	Answer	Marks
2f	(table below)	3

Adi	Ben	Cal	Den	Eric	Fran	Greg	Haz	Ido	Josh	Ken
3rd	1st	8th	5th	2nd	9th	11th	4th	7th	10th	6th
6th	5th	8th	11th	7th	9th	4th	2nd	3rd	10th	1st
9	11	4	7	10	3	1	8	5	2	6
6	7	4	1	5	3	8	10	9	2	11
15	**18**	**8**	**8**	**15**	**6**	**9**	**18**	**14**	**4**	**17**

Haz & Ben have equal maximum points (18) **[1]**
Haz has (6 + 5 =) 11 fails; Ben has (8 + 8 =) 16 fails **[1]**
Ken has 17 points OR in third place behind Haz & Ben. **[1]**

Question	Answer	Marks
3(a)(i)	<u>75</u>	**1**
3(a)(ii)	<u>13</u>	**1**
3(b)	15 **[1]** *2 marks for a complete correct explanation, clearly expressed, e.g.* 5 swifts in each of the overlapping regions at 11:02 would mean that each observer would see 10 swifts *1 mark for a vague or incomplete explanation, e.g.* They could be counting some of the same birds *1 or 2 marks can be scored for explanation with wrong (or omitted) number*	**3**
3(c)	<u>12</u>	**1**

3(d)	*1 mark for each deductive step from the list*
	Maximum 3 if Carla not identified as the one with binoculars AND Barbara not identified as the one unable to distinguish a swift from a swallow
	
	• It cannot be Alana who had binoculars, or else she would have recorded at least 12 swifts at 11:03
	• It cannot be Barbara who had binoculars, or else she would have recorded at least 9 swifts at 11:05
	• (Therefore) Carla must have been the one with binoculars **[dep A&B]**
	• (Given this,) it must be Barbara who cannot distinguish a swift from a swallow
	  or she would not have recorded more than 3 swifts at 11:01
	
	OR
	
	Alana cannot be the one who cannot distinguish a swift from a swallow,
	• because the data at 11:01 and 11:05 is inconsistent with either Barbara or Carla being the one who had binoculars
	  Carla cannot be the one who cannot distinguish a swift from a swallow,
	• because the data at 11:03 and 11:05 is inconsistent with either Alana or Barbara being the one who had binoculars
	• (Therefore) it must be Barbara who cannot distinguish a swift from a swallow **[dep A&C]**
	• (Given this,) Carla must have been the one with binoculars
	  because at 11:03 she recorded more swifts than Alana
		4

Question	Answer	Marks
4(a)	Total costs: $44 + $6 = $50 Add 20%: $60	**1**
4(b)(i)	Greatest profit would be from a puzzle made by Tom without errors: Total costs: $44 + $5 = $49 Profit = $16	**1**
4(b)(ii)	Least profit would be from a puzzle made by Tom with errors: Total costs: $44 + $5 + $10 + $3 = $62 Profit = $3 **ft** *4(b)(i) – $13*	**1**
4(c)	If Tom keeps making puzzles that need to be corrected, then they are finished at 08:25, 08:50, 09:15, 09:40, 10:05, … **[1]** Graham starts correcting puzzles at 09:00, 09:15, 09:30, 09:45 and then at 10:00 there are no other puzzles to be corrected, so he will start on a new puzzle	**2**
4(d)	Tom will make 19 puzzles in 475 minutes (7 hours 55 minutes), **[1]** so will have to start a 20th, which will take him until 17:20	**2**
4(e)(i)	Most profit is if Tom does not make any errors: Tom produces 20 at a profit of $16 each = $320 Graham produces 16 at a profit of $15 each = $240 *1 mark for profit from either calculated correctly* *OR total income ($2340) OR total cost ($1780)* Total profit: $560 **ft** *19 puzzles in 4(d) leading to $543*	**2**
4(e)(ii)	Least profit will be if Tom makes errors on every puzzle: Tom produces 20 at a profit of $3 each = $60 Graham needs 5 hours to correct errors, so has 3 hours to work on new puzzles **[1]** Graham produces 6 at a profit of $15 each = $90 Total profit: $150 **ft** *19 puzzles in 4(d) leading to $143*	**2**
4(f)	Tom will produce 20 puzzles and 10 will need correction 10 puzzles not needing correction will give a profit of 10 × $16 = $160 profit generated by Tom **[1]** On his current rate of pay, Graham will correct these 10 puzzles, each generating a profit of $3, and also make 11 of his own, generating a profit of $15 each. So he generates a profit of $195 **[1]** Thus Graham will need to be paid $35 more on such a day to make the profits equal, **[1]** so he must be paid $12 + $35/8 = $16.375 per hour	**4**