CAMBRIDGE
International Education

Cambridge International AS & A Level

THINKING SKILLS **9694/33**

Paper 3 Problem Analysis and Solution **October/November 2024**

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 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **9** printed pages.

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 descriptions 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'.

Units

Unless required by the question or mark scheme, units such as $ do not need to be seen to award the marks.

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.

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>On average 6 arrivals. 1 assessment per 20 minutes = 3 per Assessor per hour. 6 ÷ 3 = 2 Assessors needed.</td><td>1</td></tr>
<tr><td>1(b)</td><td>2 marks for any example with the correct totals AND values within the limits AND must be at least cumulative 6,12,18…..
1 mark for any example with two of these features
1 mark for an example in which any one type of appointment has the correct total and values within the limits

<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>total</td></tr>
<tr><td>U</td><td>8</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>8</td></tr>
<tr><td>S</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>2</td><td>2</td><td>8</td></tr>
<tr><td>H</td><td>2</td><td>2</td><td>5</td><td>5</td><td>5</td><td>5</td><td>5</td><td>3</td><td>32</td></tr>
</table></td><td>2</td></tr>
<tr><td>1(c)</td><td>Supervision: 1 an hour for 24 hours, but they start leaving (one in one out) after 6: 6 beds needed [1]
Urgents: 1 an hour for 24 hours = 24 beds needed
If (at any point in time) the Urgent case classified 24 hours ago was not assessed immediately upon arrival, then 1 more bed is needed
Total = <u>31</u>

SC: 2 marks for final answer 30</td><td>2</td></tr>
<tr><td>1(d)</td><td>min = 8 × 2 homes = 16 arrivals [1]
max = (8 × 5 homes) + (2 × 3 supervision) = 46 arrivals [1]

SC: If 0 scored, award 1 mark for max = 44. (from 2 × 2 supervision)</td><td>2</td></tr>
<tr><td>1(e)</td><td>If all 15 (max of each) came at the same time then they would take 5 Assessor–hours to be seen
If this happened every hour for 8 hours, 40 Assessor–hours needed [1]
If there were only 3 Assessors, this would take 13 h 20 m to complete [1]
Someone arriving at the beginning of the 8th hour could have to wait (13 h 20 m – 7 h – 20 m =) 6 hours [1] oe

OR

Only 9 patients can be assessed within an hour, so if 15 arrive there will be an overflow of 6
At the start of the 8th hour there could be 7 × 6 = 42 patients [1]
from earlier hours still waiting, plus 15 arrivals for the 8th hour
The total number of patients waiting to be seen at the start of the 8th hour could be 57
57 assessments takes 19 hours [1], so with 3 assessors 6 hours 20 minutes are required
The assessment takes 20 minutes, so the longest wait would be
6 hours 20 minutes – 20 minutes = 6 hours [1]</td><td>3</td></tr>
</table>

Question	Answer	Marks
2(a)	$(15 \times 4) + (2 \times 8) + (12 \times 1) =$ <u>88</u> minutes **oe** *1 mark for 12 intervals of 1 minute each between flytes* ***soi*** *SC: 1 mark for a final answer of 89 minutes*	**2**
2(b)	For the scores to be level with both teams having scored the same number of taps, they would need to have scored the same number of holds, which is not possible as there is an odd number of flytes	**1**
2(c)	<u>The Pentads beat the Treys</u> (33 – 21)	**1**
2(d)	The Hexyls: The Treys did not win any matches *OR* the Hexyls won one match, but lost to the Aces and the Quartos	**1**
2(e)	The total number of points scored was 30 (18 + 12) **[1]** (which means that all the scores were holds,) so every flyte lasted 4 minutes / the maximum possible time **[1]** *OR* It was the only match in which there were no taps scored **[1]** so it lasted the maximum amount of time **[1]** *1 mark for associating fewer points with more time*	**2**
2(f)	The Aces' 31 could be scored by 5 taps and 3 holds, 3 taps and 8 holds, or 1 tap and 13 holds The Deuces' 23 could be scored by 3 taps and 4 holds or 1 tap and 9 holds *1 mark for identifying all possibilities for one of the teams* The only pair which constitutes 15 flytes is <u>Aces: 5 taps and 3 holds</u> <u>Deuces: 3 taps and 4 holds</u> *OR* *1 mark* for noting 31 + 23 = 54 = 30 + 3t total, 8 taps, so 7 holds. *SC: 1 mark for full answer but with names swapped*	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(g)</td><td>63 points scored by the Quartos must be from 63/(5 + 2) = 9 taps (+ 9 holds) [1]
They must have scored 6 taps (and 2 holds) against the Aces, so they scored 3 taps [1] (and 7 holds) against the Hexyls

OR

34 against the Aces could be scored by 6 taps and 2 holds, 4 taps and 7 holds, or 2 taps and 12 holds
29 against the Hexyls could be scored by 5 taps and 2 holds, 3 taps and 7 holds, or 1 tap and 12 holds
1 mark for either

Only one pair of these is consistent with the opponents' scores, so they must have scored 6 taps against the Aces and 3 taps [1] against the Hexyls</td><td>2</td></tr>
<tr><td>2(h)</td><td>5 flytes won with taps would give them 30 points; if the Pentads won the remaining five with holds they would have 27

1 mark for establishing that either 4 or 3 would not be enough:
4 taps would give the Deuces 25 points, but the other six flytes would give the Treys at least 29 points.3 taps would give the Quartos 20 points, but the other seven flytes would give the Pentads at least 31 points</td><td>2</td></tr>
<tr><td>2(i)</td><td>Any one of the solutions shown in the table:

<table>
<tr><td>A v T
D v Q
P v H
T v Q
A v P
D v H</td><td>A v T
D v Q
P v H
T v Q
D v H
A v P</td><td>A v T
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A v T
D v Q</td><td>D v H
A v P
T v Q
P v H
D v Q
A v T</td></tr>
</table>

1 mark for a schedule which includes each team twice, but has at most one instance of any of the following:
Either Pentads or Quartos in the first match
A team name appearing on two consecutive lines
A team name not appearing in the last three lines
1 mark for correct answer with final game missing</td><td>2</td></tr>
</table>

Question	Answer	Marks
3(a)	Maximum is 3 one way and 5 the other, so 8°	**1**
3(b)	Whatever J does, there's a 1 in 11 chance that it will match	**1**
3(c)	J has the smaller spread **[1]** And it is known that his estimate will always be too high **[1]** (whereas P's could be higher or lower) *OR* His estimate can be corrected (by subtracting 2) **[1]**	**2**
3(d)	(Either J or H shows that) T must be –12°, –11° or –10° **[1]** *OR* Any one of J, H and S shows that the minimum possible value is –12 **[1]** –12° **[1]** is the only one consistent with P	**2**
3(e)	Must include H or J, (neither of which include T) *OR* Triple can only be one of T–2, T–1, T + 1 or T + 2 *OR* Only two include T in range (S & P)	**1**
3(f)	Gentoo day: the order of H and J is fixed. Each order PHJ HPJ HJP can have S inserted in any position except PSH and JSP, so 10. *If 3 not awarded then 1 mark each for (max 2):* • H must be to the left of J • If S could be in any position then there would be 12 possibilities • (But) PSHJ and HJSP are not possible *OR* *1 mark for SHPJ, HSPJ, HPSJ, HPJS* *1 mark for SPHJ, PHSJ, PHJS AND **not** PSHJ* *1 mark for SHJP, HSJP, HJPS AND **not** HJSP* *OR* *1 mark for any four correct, with no more than two incorrect*	**3**

Question	Answer	Marks
4(a)(i)	2 [barge enters] + 1 [gate closes] + 5 [lock fills] + 1 [gate opens] + 2 [barge exits] = 11 **AG**	**1**
4(a)(ii)	1 [gate closes] + 5 [lock empties] + 1 [gate opens] + 11 = 18 **AG**	**1**
4(a)(iii)	Lock empty, other barge in, gate just about to close: (11 – 2) + 18 = 27 minutes	**1**
4(b)	9:00 arrive 9:11 four barges reach higher canal section 9:18 lock gates open for Johanna **[1]** 9:29 Johanna reaches higher canal section *OR* **ft** *their* **(a)(iii)** + 2 minutes past 09:00 *SC: 1 mark for final answer 09:28 (omits one gate) or 29 minutes.* *SC: 1 mark for final answer 09:35 if 4 shown leaving separately.*	**2**
4(c)(i)	It takes the others: 9 km @ 5 km/h = 1.8 hours = 108 minutes **oe [1]** Johanna starts 18 minutes behind them: 9 km @ 10 km/h = 0.9 hours = 54 minutes; + 18 minutes = 72 minutes **oe [1]**	**2**
4(c)(ii)	To equal Johanna's arrival time, the other barge would have to travel the 9 km in 72 minutes **[1]** at 7.5 km/h **[1]**	**2**
4(d)	At 10 km/h it takes 54 minutes At 4 km/h it takes 135 minutes Within this difference of 81 minutes **[1]** 81/18 → 4 sets of 4 barges can catch up with the first set, so 20 barges **[1]** *OR* 135 minutes for the slow barge in the first set of 4 to reach the end Further sets of 4 will leave at 18 minute intervals At 10km/h the journey takes 54 minutes 135 – 4 × 18 = 63 minutes 135 – 5 × 18 = 45 minutes **[1]** Since the journey takes 54 minutes at 10 km/h, the maximum is 5 sets of 4 barges, so 20 **[1]**	**2**
4(e)	17th barge is in the fifth group so will be 4 × 18 = 72 minutes behind **[1]** At 4 km/h, this is a 4.8 km head start **[1]** At maximum speed of 10 km/h, this can be caught up at a rate of 6 km/h **[1]** 4.8/6 × 10 = 8 km **[1]** *Algebraically:* 17th barge is in the fifth group so will be 4 × 18 = 72 minutes behind **[1]** $d/4 - d/10 = 72/60$ **[2]** $d = 8$ km **[1]**	**4**