

Cambridge International AS & A Level

THINKING SKILLS**9694/31**

Paper 3 Problem Analysis and Solution

May/June 2025**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 May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **10** 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.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

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.

Annotation	Meaning
	Correct item
	Incorrect item
	Individual mark of partial credit
	Double mark of partial credit
	Essential element of answer/working missing
	Judged to be not good enough to earn the relevant credit
	Benefit of doubt
	Correct follow through
	Transcription error
	Special case
	Working seen but no credit awarded; blank page checked
Highlighter	Use anywhere it is helpful to clarify the marking

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

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

Question	Answer	Marks
1(a)	Total time is $4 \times 12 \times 40$ minutes = 32 hours. 6 hours a day, so 5 days and 2 hours, giving <u>Saturday at 15:00</u>	1
1(b)	\$32 [1] Monday: rent set 1 for 2 days Tuesday: rent set 2 for 2 days Wednesday: rent set 3 for 2 days (Thursday: none) Friday: rent set 4 for 2 days <i>1 mark for all four days</i> <i>SC: 1 mark for \$96 AND Monday Wednesday Friday</i>	2
1(c)	\$32 [1] Tuesday, Friday, Sunday [2] <i>1 mark for any two of the correct days and no incorrect</i> <i>SC: 1 mark for Monday, Tuesday, Friday and Saturday with \$34</i>	3
1(d)	<i>1 mark for the total viewing time is 3510 minutes</i> <i>OR</i> <i>the time available is 3510 minutes (so she must fit episodes exactly into each day)</i> <i>1 mark for any combination of episodes that completely fills one day</i> <i>1 mark for a schedule of complete days (270 minutes each) which accounts exactly for all of the episodes of at least one show</i> <i>1 mark for a fully correct schedule with Yes</i>	4

Question	Answer	Marks
2(a)	Bc; Ba; Bd; [1*] Ed; Ee; Eb; Db [1dep] 16 [1]	3
2(b)	<u>Ca</u> <i>1 mark for Ae (which would have collected 8 coins from the first three squares)</i> <i>OR</i> <i>De OR Ab (which are the other possible destinations from four moves, but collect 9 coins)</i>	2
2(c)(i)	There are 19 coins still to be collected [1] (so $48 - 19 =$) <u>29</u> have been collected Alternative solution: There are still 4 squares containing 1 coin, 3 containing 2 and 3 containing 3 [1] (so $(4 \times 1) + (5 \times 2) + (5 \times 3) =$) <u>29</u> have been collected	2
2(c)(ii)	177	1
2(c)(iii)	The only available moves from Ba are one square (up or down) / There are no available moves of two or three squares from Ba oe	1
2(c)(iv)	Ce can only be moved to from De (cannot be from Ca Cb Ae) There is no square other than De that can be moved to from Ce	1
2(c)(v)	<u>DRDURLRRDU</u> <i>1 mark for sight of an attempt that begins with (or consists of) 5 commands that would collect coins, i.e. DRDUR, DRDRU, UDRDU, UDRDR, URRLR or URRDU</i> <i>OR</i> <i>1 mark for one missing command from the otherwise correct sequence</i>	2
2(d)	$293 - 75 = 218$ seconds to be accounted for 23 intervals of 4 seconds between correct commands accounts for 92 seconds Each incorrect command accounts for 14 seconds <i>1 mark each for any of these three (max 2)</i> $126/14 =$ <u>9</u> incorrect commands	3

Question	Answer	Marks
3(a)	12:50	1
3(b)	There will be one break of 30 minutes, so Zoe will be writing invitations for 150 minutes [1] $75 \times \$4 + 125 \times \$3 = \$675$ <i>SC: 1 mark for answer of \$690 (deriving from Zoe taking no break)</i>	2
3(c)	2 with two attending and one attending alone is a total of 5 guests from 3 replies $195 / 5 = 39$ [1] The number unable to attend is therefore $144 - 3 \times 39 = 27$	2
3(d)	307	1
3(e)	45 meals will have cost \$10 more than if they had been ordered initially so $45 \times \$10 = \450 AG	1
3(f)	An additional meal that is not booked adds \$10 to the overspend, while a meal that is booked, but not used adds \$40 to the overspend [1] The range of 45 meals must be split in the ratio 1:4 [1] <u>214</u> Alternative solution: If $205 + x$ meals are booked: Overspend with 205 guests is $40x$ Overspend with 250 guests is $10(45 - x)$ [1] $40x = 450 - 10x$ [1] $x = 9$ and so <u>214</u> meals need to be booked Alternative solution: 1 mark for any correct pair of maximum overspends for any number of pre-ordered meals 1 mark for a second pair with a lower highest value	3

Question	Answer	Marks
4(a)	4 appears on both cards, so 1 point Both cards contain a pair that adds up to 10, so 2 points The totals of the two cards are both 14, so 4 points (So the total is 7 points) <i>2 marks for all three scoring cases shown 1 mark for any two of the scoring cases shown</i>	2
4(b)	2 points from numbers that appear on both cards (4, 9) 2 points for the same total from 1 pair of numbers ($4 + 9 = 4 + 9$) <u>4</u> points in total <i>1 mark if only one of the two cases identified.</i>	2
4(c)	Fiona's second card scored 1 point so her other card would have scored 0 So her remaining card cannot contain any of the numbers 2, 5 or 7 There cannot have been scores for matching pairs, so $1-6-x$, $1-x-8$, $3-4-x$ and $x-4-8$ are not possible, leaving: $1-4-9$, $3-6-8$ and $3-6-9$ $1-4-9$ has already been played / has the same total as $2-5-7$ so is also not possible The only possibilities are <u>$3-6-8$ and $3-6-9$</u> <i>2 marks for a correct answer and no other (except $1-4-9$) 1 mark for a correct answer or $1-4-9$ and an incorrect answer or just $1-4-9$</i>	3
4(d)(i)	There must be one number the same on the two cards, so either $1-x-x$, $x-5-x$ or $x-x-7$ In each case there are 2 possibilities for each of the other two positions, so a total of $3 \times 2 \times 2 = 12$ cases In two of those cases the total of all three cards will remain the same (when the 5 is replaced by 4, one of the other pair is unchanged and the final number is increased by 1) Total number of cases is <u>10</u> <i>1 mark for 3 correct or (at least 6 correct and one incorrect) 2 marks for 6 correct or 10 correct and up to two incorrect)</i> $1\ 4\ 9$, $1\ 6\ 8$, $1\ 6\ 9$, $2\ 5\ 8$, $2\ 5\ 9$, $3\ 5\ 8$, $3\ 5\ 9$, $2\ 6\ 7$, $3\ 4\ 7$, $3\ 6\ 7$	3

Question	Answer	Marks
4(d)(ii)	4 points could be scored as two matching numbers and one different number (1 + 1 + 2) There are $3 \times 2 = 6$ ways for this to happen 4 points could also be scored as two matching totals of pairs The only way for this to happen is with the 2–4–8 card <i>1 mark for either of the above</i> (The case with the same total, but no matching numbers, is not possible, as a total of 13 must involve two of 1, 4 and 7) <u>7</u> <i>SC: 1 mark for answer 6</i>	2
4(e)(i)	The numbers of cards with particular totals are: 1 card with a total of 12 and 1 with 18 3 cards with a total of 13 and 3 with 17 6 cards with a total of 14 and 6 with 16 7 cards with total of <u>15</u> <i>1 mark for correct number of cards with total in range 13–17</i>	2
4(e)(ii)	Each card must match one number from the previous card and one of the other two numbers increases by 1 or 2 while the other decreases by the same amount For example: 2–5–8 1–6–8 1–5–9 2–4–9 3–4–8 3–5–7 2–6–7 ft from 4(e)(i) for correct chain of 6 cards with total 14 or 16	1