CAMBRIDGE
International Education

Cambridge International AS & A Level

THINKING SKILLS **9694/33**

Paper 3 Problem Analysis and Solution **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

 [Turn over

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
	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
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)	1, 3, 4, 5, 6	1
1(b)	6 cars **[1]** at any time between 12:38 and 12:41 inclusive **[1 dep]** *SC: 1 mark for a correct time, but no number of cars indicated*	2
1(c)	9 and 11	1
1(d)	2, 3, 7	1
1(e)	10, 11, 12	1
1(f)	Car 1 was in the car park for 7 hours 29 minutes The first 38 minutes were free, so had to pay for 6 hours 51 minutes **[1]** This would have cost 411 × \$0.20 = \$82.20 *SC: 1 mark for \$89.80 (includes first 38 minutes)*	2
1(g)	Car 3 Time goes from 83 min to 91 min, so slips out of the special parking rate Cost goes from 83 × \$0.10 = \$8.30 to 91 × \$0.20 = \$18.20, (which is a difference of \$9.90) *2 marks for Car 3 AND \$8.30 AND \$18.20 seen* *1 mark for just Car 3 OR \$8.30 AND \$18.20* *SC: 1 mark for Car 2 AND \$8.70 AND \$18:60 seen*	2

Question	Answer	Marks
2(a)	Five trips take (5 × 60 + 4 × 20 =) 380 minutes **[1]** In the worst case he might start up to 9 minutes after the first available time, increasing the total to 389 minutes **[1]** (which is still less than 400)	2
2(b)(i)	6 minutes	1
2(b)(ii)	21:11 *1 mark for sight of 17:51 OR 21:20 OR 21:10*	2

Question	Answer	Marks
2(c)	A search will reveal that the only combination of multiples of \$16 and \$10 adding up to \$1618 that gives a total number of passengers $\leqslant$ 120 which is a multiple of 4 is 83 $\times$ \$16 + 29 $\times$ \$10, so the number aboard each trip was 112 ÷ 4 = <u>28</u> *1 mark for sight of any combination of multiples of \$16 and \$10 adding up to \$1618* *OR* *2 marks for sight of any combination of multiples of \$16 and \$10 adding up to \$1618 that give a total number of passengers $\leqslant$ 120* *OR* *2 marks for algebraic formulation, e.g. 8(4n + x) + 5(4n – x) = 809 with 2n passengers per day.*	**3**
2(d)(i)	<u>13:40, 15:00, 16:20, 17:40</u> *1 mark for any one of the following:* • two or three correct times with no more than four times given • 13:30, 14:50, 16:10, 17:30 (identifies 13:36, but goes to 13:30 rather than 13:40) • 13:36, 14:56, 16:16, 17:36 (does not start on multiple of 10) • all four correct times, plus 19:00 (which would arrive back less than 200 minutes after high tide, but after sunset) • 12:40, 14:00, 15:20, 16:40, 18:00 (departure times for September 2nd) • 13:00, 14:20, 15:40, 17:00, 18:20 (departure times for September 16th)	**2**
2(d)(ii)	September <u>6, 7, 8, 9, 10</u> 1 mark for one of the following: • the above dates plus September 5 (which could depart but would need to return by 10:23 • 07:10 or 12:50 seen	**2**
2(e)	He must return by 18:55 at the latest **[1]** If he departs at 12:55 and (every 75 minutes) at 14:10, 15:25, 16:40 and 17:55 **[1]** he will return at 18:55 (which is an acceptable time), so Ashley can schedule a fifth trip **[1]**	**3**

Question	Answer	Marks
3(a)	Filing documents would be allocated to Casey Entering data would be allocated to Jamie There is no-one left who could be allocated to typing letters	**1**

Question	Answer	Marks
3(b)	Filing documents – Casey – 8 × $47 = $376 Typing letters – Jamie – 7 × $44 = $308 Entering data – Gene – 6 × $45 = $270 Total = $376 + $308 + $270 = $954 *1 mark for any valid allocation of workers to the three tasks, with at least one worker's pay calculated correctly* *2 marks for a valid, but not optimal allocation with the correct total pay* *SC: 1 mark for the correct allocation of tasks to workers* *SC: 2 marks for $954 with an incorrect lower value subsequently found* *SC: 2 marks for $951 (ignoring 1 task per worker rule)*	**3**
3(c)	Any other task would not have been allocated as given: Answering the phone would have gone to Gene; Entering data would have gone to Jamie	**1**
3(d)	Answering the phone (Jamie would been allocated typing Letters first) (Casey or) Gene would have been allocated answering the phone before William if it had not been the last on the list	**1**
3(e)(i)	Answering the phone – $3 Typing letters – $2 Entering data – $4 Filing documents – $4 *1 mark for any one identified* *2 marks for any two identified*	**3**
3(e)(ii)	$40 and $51	**1**

Question	Answer	Marks
4(a)(i)	52	**1**
4(a)(ii)	5	**1**
4(b)	If the other two contestants were eliminated on their first questions **[1]**, then the remaining contestant would be asked 28 questions in total and could score 1 + 3 + 26 × 6 = 160	**2**
4(c)	A score of 13 can be scored in various ways e.g. 1 × 1 + 2 × 3 + 1 × 6, 1 × 1 + 4 × 3 *1 mark for finding any combination of 1s, 3s and/or 6s that gives a total of 13* To achieve a total of 13 (and be eliminated) with 11 questions the sequence would have to be: 1 + 3 + 0 + 3 + 0 + 3 + 0 + 3 + 0 + 0 + 0	**2**
4(d)(i)	3	**1**

Question	Answer	Marks
4(d)(ii)	The minimum number of questions would be asked if Jan had as many of her correct answers scoring highly as possible. The best way to achieve 7 is therefore 3 + 3 + 1 **[1]** To fit the scoring system the scores for the questions would need to be 1 + 3 + 0 + 3 + 0 + 0 + 0 and so the number of questions asked is 7 **[1]**	**2**
4(d)(iii)	The number of questions asked to Alice is 30 – 5 – 11 = 14 **[1]** The maximum score possible from 14 questions is 1 + 3 + 12 × 6 = 76 **[1]** Scoring 11 points less than this can be achieved by replacing two of the potential 6s with a 1 and a 0 (which can be done by having the second question incorrect). The scores would be: 1 + 0 + 1 + 3 + (10 × 6) = 65 1 question incorrect **[1]**	**3**
4(e)	To overhaul the 35 point lead, Paul would need to answer six more questions correctly than Gareth at 6 points each **[1]** Gareth would need to be eliminated (which would involve three questions scoring 0 points). The end of the quiz would need a sequence of: Paul – 6 Gareth – 0 Paul – 6 Gareth – 0 Paul – 6 Gareth – 0 and eliminated Paul – 6, three more times. *1 mark for some attempt to work backwards from the end of the quiz* When Gareth scores 6 points for the 23rd question, Paul can be certain that he cannot win *Alternatively:* Assuming that they both answer questions correctly, Gareth will retain his 35 point lead over Paul. **[1]** If Gareth is eliminated then Paul would need 6 further questions to take the lead from him. Gareth can therefore be sure that he will win if, after his question, there are only 5 questions for Paul even if he gets the next 3 wrong and is eliminated. **[1]** After Gareth answers the 21st question of the round Paul would still have a chance to win, but after Gareth answers the 23rd question of the round (his 11th question), there will only be 7 questions left and Paul can be asked at most 4 of them, so cannot win. *SC: 2 marks for 21st (forgets that eliminating Gareth gives Paul more questions)*	**3**

