



## **Cambridge International AS & A Level**

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**THINKING SKILLS**

**9694/12**

Paper 1 Problem Solving

**October/November 2022**

**MARK SCHEME**

Maximum Mark: 50

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**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 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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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 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.

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’.

**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:

<b>AG</b>	answer given (on question paper)
<b>awrt</b>	answer which rounds to
<b>ft</b>	follow through (from earlier error)
<b>oe</b>	or equivalent
<b>SC</b>	special case
<b>soi</b>	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 that this helps to identify the precise piece of the working to which another stamp pertains (or an inexplicit correct answer).

	Correct item
	Incorrect item
	Individual mark of partial credit
	Double mark of partial credit
	Essential element of answer/working missing
	Correct follow through
	Transcription error
	Judged to be not good enough to earn the relevant credit
	Benefit of doubt
	Working seen but no credit awarded; blank page checked
<b>Highlight</b>	Identifies the part of the working to which another stamp pertains

Question	Answer	Marks
1	2 sections can be completed between 09:00 and 10:30 (but a third cannot be started). <b>[1]</b> Only 1 can be completed between 11:30 and 12:30, so there will be 2 more sections to complete once the second meeting is finished at 13:30. $2 \times 30$ minutes later than 13:30 is <u>14:30</u>	2

Question	Answer	Marks
2(a)(i)	<u>36 minutes</u>	1
2(a)(ii)	36 minutes on the bus, plus up to 20 minutes of waiting, So <u>56 minutes</u> ft	1
2(b)	Waiting time now $(20 + 5)$ minutes instead of $(10 + 10)$ minutes, so adds 5 minutes, So <u>61 minutes</u> ft	1

Question	Answer	Marks
3	Her father gave her $(\$420 \div 20) \times \$5 = \$105$ to bring her total to \$539. <b>[1]</b> If she had asked her father first he would have given her $(\$360 \div 20) \times \$5 = \$90$ so she would have told her mother she had raised \$452. <b>[1]</b> So her mother would have given her $(\$450 \div 10) \times \$2 = \$90$ to bring her total to \$542. By approaching her father first she could have raised a further <u>\$3</u> .	3

Question	Answer	Marks
4(a)	If the journey is directly away from the office then the taxi would have a journey of 15 km <b>[1]</b> Total charge will be $10 \times 10 + (5 + 15) \times 4 =$ <u>\$1.80</u>	2
4(b)	The new price structure means that the charge for Peter's journey will be \$1.60 <b>[1]</b> Under the old structure the charge for the taxi's return to the office must have been $\$1.60 - \$0.20 - \$1.00 = \$0.40$ This would mean that Peter finishes his journey <u>10</u> km from the office	2

Question	Answer	Marks
5(a)	<u>39</u> points	<b>1</b>
5(b)	The first member scored 40 points, so the other two scored a combined total of 32 points. If one finished 30th, 29th, 27th or 26th / scored 1, 2, 4 or 5 points the other would have had to have scored 31, 30, 28 or 27 points, which are scores that were not available. <b>[1]</b> One of the Red Team finished 28th (so 3 & 29 points were not possible). <b>[1]</b>	<b>2</b>
5(c)	<u>3rd, 7th and 11th</u>  <i>1 mark for considering a set of points for evenly spaced positions involving 35, 32, 29 or 26 points.</i> <i>1 mark for showing that one of 35 or 29 is not possible.</i>	<b>3</b>

Question	Answer	Marks
6(a)	The journey requires two moves to the right and six moves forward. Total moves <u>8</u> .	<b>1</b>
6(b)(i)	Total number of possible routes is <u>28</u> <i>Award 1 mark for evidence of any of the following:</i> <i>(If the first move is to the right, then the second could be on move 2 to 8 giving) 7 routes.</i> <i>In total there will be 7 + 6 + 5 + 4 + 3 + 2 + 1 possible routes.</i> <i>The number of ways of choosing 2 from 8.</i>	<b>2</b>
6(b)(ii)	<i>(Middle square will be on route if first move is to the right and second move to the right is on move 5,6,7 or 8.) 4 routes <b>[1]</b></i> <i>Similarly, if first move to the right is on move 2, 3 or 4 there are 4 possible routes going through middle square for each. Hence total number of routes going through middle square is <u>16</u></i>	<b>2</b>

Question	Answer	Marks
7(a)	<u>40 m</u>	<b>1</b>
7(b)	They will pass at [(Jm, Em)] (30, 90), (60, 180), (90, 270), (120, 360) and (150, 450). <i>1 mark for any of these pairs with no more than one incorrect pair.</i> <i>OR any two of E's distances</i> So Estefania will have swum <u>450 m</u> .	<b>2</b>

Question	Answer	Marks																																																	
8(a)	Vacant, Occupied, Vacant is same as Vacant, Vacant, Vacant (are both all green)	1																																																	
8(b)	<p>Correct answers:            Green, <i>Either</i>, Red, <i>Either</i>  <i>Either</i>, Red, <i>Either</i>, Green            Red, Red, Green, Red            Red, Green, Red, Red</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2"></th> <th colspan="5"><i>Number correct</i></th> </tr> <tr> <th colspan="2"></th> <th><b>1</b></th> <th><b>2</b></th> <th><b>3</b></th> <th><b>4</b></th> <th><b>5</b></th> </tr> </thead> <tbody> <tr> <td><i>Number given</i></td> <td><b>1</b></td> <td>1</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td></td> <td><b>2</b></td> <td>0</td> <td>1</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td></td> <td><b>3</b></td> <td>0</td> <td>1</td> <td>2</td> <td>-</td> <td>-</td> </tr> <tr> <td></td> <td><b>4</b></td> <td>0</td> <td>1</td> <td>1</td> <td>2</td> <td>-</td> </tr> <tr> <td></td> <td><b>5</b></td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>2</td> </tr> </tbody> </table> <p><i>If more than 5 are given and all are correct, award 2 marks.</i></p>			<i>Number correct</i>							<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<i>Number given</i>	<b>1</b>	1	-	-	-	-		<b>2</b>	0	1	-	-	-		<b>3</b>	0	1	2	-	-		<b>4</b>	0	1	1	2	-		<b>5</b>	0	0	1	1	2	2
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Question	Answer	Marks
9(a)	The total for each group must be 60 [1] Only <u>Beth</u> and <u>Gwen</u> fit with Alex's score of 20.	2
9(b)	The absent student must have a maximum score of less than 20 and their score must be even. <i>1 mark for either</i> The only two such are <u>Camilla</u> and <u>Fred</u>	2

Question	Answer	Marks
10(a)	<u>8</u>	1
10(b)	<p>Given the constraint that there must be a total of 30 marks, there are only 3 possibilities for (medium, long): (5, 0), (4, 1) and (3, 2). OR The constraint that there must be a total of 20 parts rules out (5, 0). [1]</p> <p>The constraint that the number of medium questions must be different from the number of short questions rules out (4, 1). [1]</p> <p>For example, 2 long questions with 10 parts worth 17 marks and 3 medium with 6 parts worth 9 marks satisfies the rules. [1]</p> <p>So there must be 2 long questions.</p>	3

Question	Answer	Marks
11(a)	<p>15 batches will be needed 1 batch made after 1 hour 30 minutes (while training the friend) [1] 14 batches at 2 per hour thereafter would take another 7 hours [1]</p>	2
11(b)	<p>If Jason spends the first 3 hours showing friends how to make the biscuits: (After 1.5 hours: 1 batch After 2.5 hours: 2 batches) After 3 hours: 3 batches. [1] (There will then be a repeating pattern of 1 extra batch after 30 minutes, then 2 extra batches after another 30 minutes.) So 3 batches will be made in each hour after this point. [1]</p> <p>4 hours after the original 3 is <u>7</u> hours.</p>	3
11(c)	<p>Assuming that Jason continually shows a new friend how to make batches he will make a batch every 1.5 hours. So batches completed at 30 minute intervals are: Jason 0 0 1 0 0 1 0 0 1 0 0 1 0 (4) Friends 0 0 0 0 1 0 1 1 1 1 2 1 2 (10) After 4.5 hours: 7 batches [1]</p> <p>If Jason trains just 3 friends then he will be able to make 5 batches in the time without changing the numbers made by friends, so minimum time is <u>6.5</u> hours</p>	2

Question	Answer	Marks
12(a)	<p>10 tickets with numbers of the form 55*</p> <p>10 tickets with numbers of the form 5*5</p> <p>6 tickets with numbers of the form *55 [1]</p> <p>555 is included in all three of the above sets, so there are <math>10 + 10 + 6 - 3</math>  <math>= 23</math> tickets which would win \$5 prizes</p> <p><i>OR</i></p> <p>9 tickets of the form 55* with * not equal to 5</p> <p>9 tickets of the form 5*5 with * not equal to 5</p> <p>5 tickets of the form *55 with * not equal to 5</p> <p><i>1 mark for identifying the number of any two types.</i></p> <p><u>23</u></p>	2
12(b)	<p>100 tickets with numbers 5**, 19 of which have another digit 5 (81)</p> <p>60 tickets with numbers *5*, 15 of which have another digit 5 (45)</p> <p>60 tickets with numbers **5, 15 of which have another digit 5 (45)</p> <p><i>1 mark for any one of 81, 45, 45</i></p> <p><math>81 + 45 + 45 = 171</math> tickets for \$2 prizes. [1]</p> <p>Total values of prizes is <math>171 \times 2 + '23' \times 5 + 50</math>  <math>= \\$507</math> [1] ft</p> <p>There are 601 tickets in total, so the amount donated to charity will be  <u>\$94</u></p> <p><i>Alternatively</i></p> <p><math>1 + 5 \times 9 \times 9</math> tickets with no 5s [1]</p> <p><math>601 - 406 - '23' - 1 = 171</math> tickets for \$2 prizes [1] ft</p> <p>Total values of prizes is <math>171 \times 2 + '23' \times 5 + 50</math>  <math>= \\$507</math> [1] ft</p> <p>There are 601 tickets in total, so the amount donated to charity will be  <u>\$94</u></p>	4