



## Cambridge International AS & A Level

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**THINKING SKILLS**

**9694/11**

Paper 1 Problem Solving

**May/June 2023**

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 May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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>dep</b>  | mark depends on earlier, asterisked (*), mark |
| <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 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   |
| <b>Highlight</b>  | Use anywhere it is helpful to clarify the marking        |

| Question | Answer | Marks |
|----------|--------|-------|
| 1(a)     | Petro  | 1     |
| 1(b)     | Hayley | 1     |

| Question | Answer  | Marks |
|----------|---|-------|
| 2        | <p>Hire of van for three days, <math>\\$90 \times 3 = \\$270</math> [1]</p> <p>Distances 153, 400, 413 [1] so total 966 km</p> <p>Cost of fuel = <math>966/6 \times \\$1.2</math><br/>= <math>\\$193.20</math> [1]</p> <p>Total cost, <math>\\$270 + \\$193.20 = \\$463.20</math><br/>Profit on job, <math>\\$600 - 463.20 = \underline{\\$136.80}</math></p> | 4     |

| Question | Answer   | Marks |
|----------|--|-------|
| 3(a)     | Diagram must show all 4 colours with Pink and White on different bars. | 1     |
| 3(b)     | <u>8</u>   | 1     |

| Question | Answer   | Marks |
|----------|--|-------|
| 4        | <p>The minimum would occur when 28 seats in each row (14 pairs on either side of the central aisle) are sold at a discount [1]</p> <p>Smallest total for front 10 rows is <math>10 \times (28 \times \\$50 + 2 \times \\$55) = \\$15\,100</math><br/>Smallest total for rows 11–40 is <math>30 \times (28 \times \\$30 + 2 \times \\$35) = \\$27\,300</math><br/>Total discount = <math>\\$5600</math><br/><i>1 mark for any one of these three</i></p> <p>Smallest total income is <u><math>\\$42\,400</math></u></p> <p>OR</p> <p>The minimum would occur when 2 seats in each row (1 on either side of the central aisle) are sold without a discount [1]</p> <p>If discount is applied to all seats, extra income from non-discounted 80 aisle seats = <math>40 \times \\$10 = \\$400</math> [1]</p> <p>Smallest total income = <math>(300 \times \\$50 + 900 \times \\$30) + \\$400 = \underline{\\$42\,400}</math></p> | 3     |

| Question | Answer   | Marks    |
|----------|--|----------|
| 5(a)     | 9 small, 2 large<br>8 small, 2 medium, 1 large<br>7 small, 4 medium<br><br><i>1 mark for each</i><br><br><i>Allow any clear notation, e.g. 3333333377</i>  | <b>3</b> |
| 5(b)     | At least two trials to find total cost using twice as many small cakes as large<br><i>OR</i><br>$3 \times 2L + 5M + 7L = 120$<br><i>OR</i><br>Search to find a multiple of 13 plus a multiple of 5 giving \$120<br><i>1 mark for any of these</i><br><br>Number of medium cakes = <u>11</u><br><br><i>SC: 1 mark for answer of 7</i> | <b>2</b> |

| Question | Answer  | Marks    |
|----------|---|----------|
| 6(a)     | <i>1 mark for</i><br>Number of matches to be played = 15<br><i>OR</i> time to first semi-final start = 420 minutes (7 hours)<br><i>OR</i> first semi-final starts at 16:00<br><br>Least total duration = $15 \times 20 + 14 \times 15 = 510$ minutes = 8 hours 30 minutes. Tournament ends at <u>17:30</u>  | <b>2</b> |
| 6(b)(i)  | Jimmy is at stadium for $15 \times 30 + 14 \times 15 =$ <u>660 minutes</u> or <u>11 hours</u>   | <b>1</b> |
| 6(b)(ii) | For latest start time, Jimmy must play in the 2nd match in the 4th group<br>Number of matches already played = 10<br><i>1 mark for either</i><br>Greatest duration 300 minutes + 10 breaks <b>[1]</b><br>= 450 minutes = 7 hours 30 minutes<br>Jimmy's first match could start as late as <u>16:30</u><br><br><i>SC: 1 mark for final answer of 16:15</i> | <b>3</b> |

| Question | Answer  | Marks |
|----------|---|-------|
| 7(a)     | $23 + 49 = 72$ [1]<br>$25 + 47 = 72$ [1]<br>$25 + 49 = 74$ [1]<br><br><i>If 4 answers are given, award 1 mark for 3 correct with 1 incorrect<br/>           No marks if more than 4 answers given</i> | 3     |
| 7(b)     | $56 \times 9 = 504$ [1]<br>$58 \times 9 = 522$ [1]<br><br><i>If 3 answers are given, award 1 mark for 2 correct with 1 incorrect<br/>           No marks if more than 3 answers given</i>             | 2     |

| Question | Answer  | Marks |
|----------|---|-------|
| 8(a)     | <u>12</u>   | 1     |
| 8(b)     | In week 5 I am limited to returning 25 bags (not 27) [1]<br>So I still have 12 bags at the end of week 5<br><br>After week 7 delivery I have $43 - 25 + 16 = \underline{34}$ bags | 2     |
| 8(c)     | I have returned 109 bags [1]<br><u>\$5.45</u><br><br>SC: 1 mark for \$5.55 (from returning 12 in week 6)  | 2     |

| Question | Answer  | Marks |
|----------|---|-------|
| 9(a)(i)  | Difference between E and B is 6, so $E = 7$ (and $B = 1$ ) [1*]<br>F scores $19 - 2 \times 7 = 5$ [1dep] AG<br>OR<br>Max value of F is 7, so E must be 6 or 7. If $E = 6$ , $A + C = 10$ and $B = 0$<br>which is not possible, so $E = 7$ [1*]<br>F scores $19 - 2 \times 7 = 5$ [1dep] AG<br>OR<br>FEE = 19 means either $E = 6$ or $7$ . If $E = 6$ , $A + C + E = 16$ implies $A + C = 10$ ,<br>but 6 and 7 are taken, (so $A + C < 10$ ), so $E = 7$ [1*]<br>F scores $19 - 2 \times 7 = 5$ [1dep] AG | 2     |
| 9(a)(ii) | 11 [1]<br>13 [1]<br><br><i>If 3 answers are given, award 1 mark for 2 correct with 1 incorrect<br/>           No marks if more than 3 answers given</i><br><br><i>If 0 scored, award 1 mark for A and C are 3 and 6 (or 6 and 3)</i>  | 2     |
| 9(b)     | ACE scores 16. Least scores for U, T, L, Y are 21, 14, 8, 22, total <u>81</u>   | 1     |

| Question | Answer  | Marks |
|----------|---|-------|
| 9(c)     | <p>2 O's and 1 T score (<math>56 - 5 =</math>) 51<br/>           1 O and 1 T score (<math>57 - (2 \times 5 + 2 \times 7) =</math>) 33<br/> <i>1 mark for either</i><br/> <math>O = 51 - 33 = 18</math> and <math>T = \underline{15}</math></p> <p>OR</p> <p>TOFFEE (57) – FOOT (56) = FEE – O = 1.[1]<br/>           FEE is 19 so O is 18.<br/>           From FOOT, <math>T = 56 - 5 - 18 - 18 = \underline{15}</math></p> | 2     |

| Question | Answer   | Marks |
|----------|--|-------|
| 10(a)    | <p>6 basketballs; 14 volleyballs [1]<br/>           9 basketballs; 10 volleyballs [1]<br/>           10 basketballs; 9 volleyballs [1]</p> <p><i>If 4 answers are given, award 1 mark for 3 correct with 1 incorrect<br/>           No marks if more than 4 answers given</i></p>  | 3     |
| 10(b)    | <p><i>2 marks for any correct final answer or a set of final answers ALL of which are correct</i></p> <p>8 basketballs; 5 volleyballs; 6 footballs<br/>           8 basketballs; 6 volleyballs; 5 footballs<br/>           6 basketballs; 5 volleyballs; 8 footballs<br/>           5 basketballs; 8 volleyballs; 7 footballs<br/>           5 basketballs; 9 volleyballs; 6 footballs</p> <p><i>If 2 marks for correct final answer (or a set of final answers ALL of which are correct) not awarded, award max of 1 mark for any response in a list of no more than 3 that is worth 1 mark or 2 marks, but not given as a final answer.</i></p> <p><i>1 mark for an answer with a total of 19 or 20 but with (limited) violation of one other condition:<br/>           Weight no more than 2g outside the required range<br/>           Only 4 of one type of Sportie<br/>           More than one Sportie of the same quantity</i></p> <p><i>No marks if more than 3 answers are given</i></p> | 2     |



| Question | Answer   | Marks    |
|----------|--|----------|
| 11(a)    | <u>18</u>  | <b>1</b> |
| 11(b)    | <u>35</u><br><i>1 mark for final answer 36</i><br><i>OR</i><br><i>1 mark for a correct set with a total in the range 90 to 108 with <math>K = P + 7</math>, <math>L = P + 8</math> or equivalent</i><br><i>OR</i><br><i>1 mark for a correct algebraic equality/inequality, e.g. <math>P + P + 7 + P + 8 &lt; 101</math></i> | <b>2</b> |

| Question | Answer  | Marks    |
|----------|---|----------|
| 12       | (Halfway is $126 + 88 - 41 =$ ) 173 (km) <b>[1]</b><br>(Distance travelled during the first two hours is $173 - 41 =$ ) 132 (km) <b>[1]</b><br>Distance travelled during the second hour is <u>49</u> km<br><br><i>OR</i><br>$x + x + 34 + 41 = \frac{1}{2} (2x + 34 + 88 + 126)$ <b>oe [2]</b><br>$x = 49$ , Distance travelled during the second hour is <u>49</u> km | <b>3</b> |