



## Cambridge International AS & A Level

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### THINKING SKILLS

9694/13

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.

**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        | <u>0.6 m or 60 cm</u><br><br><i>1 mark for 60 (without units)</i><br>OR<br><i>recognition that double ‘gaps’ at the edges means that there are effectively 12 ‘gaps’ (8 + 4) making up 720 cm / 7.2 m</i><br>OR<br><i>a correctly calculated trial, e.g. <math>140 + (8 \times 70) + 140 = 840</math></i> | 2     |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                              | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2        | On Monday, cost = $5 \times \$12 + 7 \times \$7 = \$109$<br>OR<br>On Tuesday, cost = $\$(12 + 6) \times 3 + \$(7 + 3.50) \times 4 + \$7 = \$103$ [1]<br>Saving is <u>\$6</u><br><br><i>Alternatively:</i><br>4 candles of the same size have the same price under both offers, so the saving is the same as would be achieved when buying 2 large and 1 small candle, [1]<br>which is half the price of a large candle – <u>\$6</u> | 2     |

| Question | Answer                                                                                                                                                                               | Marks |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 3(a)     | <u>462 hamburger and fries</u><br><u>396 chicken wraps and wedges</u><br><u>198 vegetarian chilli and rice</u><br><u>264 prawn stir-fry</u><br><br><i>1 mark for any one correct</i> | 2     |
| 3(b)     | The lowest total cost is obtained by buying 251 meals [1] at \$1.50 from Kam’s Kitchen<br>This would cost <u>\$376.50</u>                                                            | 2     |

| Question | Answer                                                                                                                                                                                      | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 4(a)     | <u>7</u>                                                                                                                                                                                    | 1     |
| 4(b)     | There will be 10 sessions of Bowling [1]<br>Total possible charges = $10 \times 12 \times \$8 = \$960$                                                                                      | 2     |
| 4(c)     | <u>11:50, 13:50, 15:50</u><br><br><i>1 mark for 2 correct and not more than 3 given</i><br><i>If 0 marks scored, award 1 mark for breaks coincide every 120 minutes (stated or implied)</i> | 2     |

| Question | Answer                                                                                                                                                                 | Marks    |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 4(d)     | Archery, Bowling, Judo<br>Darts, Darts, Yoga<br>Bowling, Yoga, Yoga<br>Bowling, Bowling, Bowling, Bowling<br><br><i>1 mark for 2 correct and not more than 4 given</i> | <b>2</b> |

| Question | Answer                                                                                                                                        | Marks    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 5(a)     | Time is $14224/70 = 203.2$ hours or 20.32 days or 20 complete days <b>[1*]</b><br>Arrive on a Monday <b>[1]</b><br>Jack driving <b>[1dep]</b> | <b>3</b> |
| 5(b)     | <u>56</u> fill ups required<br><br><i>1 mark for 2844.8 or 284.48 or 56.(896) or 57 seen</i>                                                  | <b>2</b> |
| 5(c)     | Amount of fuel required: $14224/8 = 1778$ litres<br>Cost of fuel: $1778 \times 1.1 = \underline{\$1955.8}$                                    | <b>1</b> |

| Question | Answer                   | Marks    |
|----------|--------------------------|----------|
| 6(a)     | <u>Queensland</u>        | <b>1</b> |
| 6(b)(i)  | <u>South Australia</u>   | <b>1</b> |
| 6(b)(ii) | <u>Western Australia</u> | <b>1</b> |

| Question | Answer                                                                                                                                                                                                                                                                                                          | Marks    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 7        | The Fairy zone must be between the Unicorn and Pirate zones and the Kitten zone must be between the Rainbow and Sparkle zones <b>[1]</b><br>There are four ways to arrange these two groups of zones. <b>[1]</b><br>There are two positions that the Pirate zone can be in so a total of <u>8</u> arrangements. | <b>3</b> |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Marks    |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 8(a)     | 5 days at 750 words = 3750 words.<br>In one week up to $3750 + 2 \times 1500$ [= 6750 words]. <b>[1]</b><br>To reach 9000 words requires $(9500 - 6750) / 750 = 4$ more days<br><u>[Thursday] 11th May</u>                                                                                                                                                                                                                                                                                                                                                         | <b>2</b> |
| 8(b)     | Since the targets for Saturdays and Sundays are double, there are the equivalent of $4 \times 2 + 7 = 15$ regular days. <b>[1]</b><br>To guarantee that she finishes, Joanne must complete another 8000 words.<br>$8000 / 15$ <b>[1]</b><br><u>534</u> words per day<br><br><i>OR</i><br>$7x + 4 \times 2x = 8000$ <b>[2]</b><br><u>534</u> words per day<br><br><i>OR</i><br><i>1 mark for a trial for the 11 days with double the number of words on the weekend days</i><br><i>1 mark for a second trial that is an improvement</i><br><u>534</u> words per day | <b>3</b> |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Marks    |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 9        | \$24.59 gained 3 points and \$55.41 gained 30 points so the smallest and largest bills collected 33 points <b>[1]</b><br><br>Combination of points for the other three bills is<br>$27 + 8 + 3$ or $15 + 15 + 8$ <b>[1]</b><br><br>$27, 8, 3$ is minimised by spending \$52.00, \$30.00 and \$24.60 = \$106.60<br>$15, 15, 8$ is minimised by spending \$40.00, \$40.01 and \$30.00 = \$110.01<br><i>1 mark for either evaluated correctly</i><br><br>So the minimum is $\$80 + 106.60 = \underline{\$186.60}$ | <b>4</b> |

| Question | Answer                                                                                                                                                                                                                                                                                      | Marks    |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 10(a)    | Profit from 6 cups without loyalty card scheme is $6 \times \$0.90 = \$5.40$ . <b>[1]</b><br>A completely filled loyalty card will require Amy to make 15 cups of coffee, but she will only be paid for 11, so the profit is<br>$11 \times \$2.10 - 15 \times \$1.20 = \$5.10$ . <b>[1]</b> | <b>2</b> |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Marks |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 10(b)    | <p>Jack pays for 9 @ \$2.10 = \$18.90 [1]<br/>           It will cost Amy \$14.40, so Jack needs to pay \$19.80<br/>           so Jack pays \$0.90 for 3 starred cups<br/>           so <u>\$0.30</u> each</p> <p>OR</p> <p><math>92.10 + 3x - 121.20 = 5.40</math> OR <math>90.9 + 3(x - 1.2) = 5.4</math> [1]<br/> <u>\$0.30</u> each</p> <p>OR</p> <p>The 12 cups of coffee will be 9 at full price and 3 at reduced price. [1]<br/> <u>\$0.30</u></p> | 2     |
| 10(c)    | <u>\$0.90</u>                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1     |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Marks |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 11(a)    | <p><math>26 + 6 + 8 + 4 + 12 = 56</math> [1]<br/>           20 minutes needs to be allowed for the 4 deliveries.<br/> <u>09:16</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2     |
| 11(b)    | <p>To calculate 09:56 as the expected arrival time:<br/>           09:44 would be the departure time from delivery 4<br/>           09:39 would be the arrival time at delivery 4<br/>           09:35 would be the departure time from delivery 3<br/>           09:30 would be the arrival time at delivery 3<br/>           09:22 would be the departure time from delivery 2<br/>           Delivery 3 is still to be completed, but delivery 2 must be completed.</p> <p><i>2 marks for delivery 2 with identification of 09:22 or 09:35 (departs 2 or 3) or 09:30 (arrives 3)</i><br/> <i>1 mark for any of the above times clearly associated with the correct event</i></p> <p>OR</p> <p>Delivery at 5 will be 31 minutes after 09:25<br/>           From leaving 2 to arrive at 5 takes <math>8 + 4 + 12 + 2 \times 5 = 34</math> mins<br/>           From leaving 3 to arrive at 5 takes <math>4 + 12 + 5 = 21</math> mins<br/>           Delivery 3 is still to be completed, but delivery 2 must be completed.</p> <p><i>2 marks for complete solution, 1 mark for identification of 31 mins and either 34 mins or 21 mins</i></p> | 2     |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Marks |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 12(a)    | $h = 2j - 4$ oe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1     |
| 12(b)    | <p><u><math>h = 32, j = 18, m = 11</math></u></p> <p><i>Search method:</i><br/> Criteria are <math>h = 2j - 4</math> or in words or equivalent<br/> <math>5h + 3j + 4m = 258</math> or in words or equivalent<br/> and total number of jars sold = 61<br/> 1 mark for an initial search that meets any one of these criteria<br/> <b>or</b><br/> 2 marks for an initial search meeting two of the criteria<br/> <b>and</b><br/> 1 mark for an adjustment that gets closer to the solution</p> <p><b>OR</b></p> <p><i>Algebraic solution, using the numbers of jars sold:</i><br/> Honey and jam sold: <math>h = 2j - 4</math> or <math>h + 18 = 2(j + 7)</math> oe [1]<br/> Total jars sold: <math>h + j + m = 100 - 39</math> [1]<br/> Money taken: <math>5h + 3j + 4m = 258</math> [1]<br/> <u><math>h = 32, j = 18, m = 11</math></u></p> <p><i>Alternative algebraic solution, using the original numbers of jars taken:</i><br/> <math>H = 2J</math> and <math>H + J + M = 100</math> [1]<br/> <math>5H + 3J + 4M = 425</math> [1]<br/> Leading to (50, 25, 25) [1]<br/> <u><math>h = 32, j = 18, m = 11</math></u></p> | 4     |