Cambridge Assessment International Education

Cambridge International AS & A Level

THINKING SKILLS **9694/01**

Paper 1 Problem Solving **For examination from 2020**

MARK SCHEME

Maximum Mark: 50

Specimen

This document has **8** pages. Blank pages are indicated.

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.

Mark Scheme Notes

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.

If the final answer is not correct, marks may be awarded for correct working as indicated in the mark scheme.

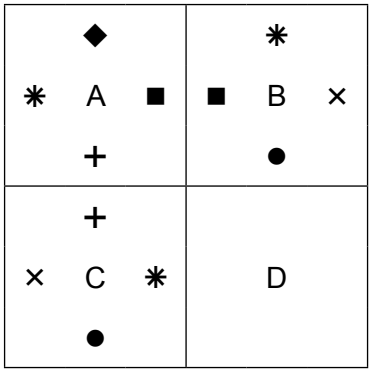
The following abbreviations may be used in a mark scheme:

AG answer given (on question paper)
awrt answer which rounds to
FT follow through (from earlier error)
oe or equivalent
SC special case
soi seen or implied

Question	Answer	Marks
1	Last week I paid 36 × 70 cents = \$25.20. This week I could have paid 24 × 90 cents = \$21.60. \$25.20 – \$21.60 = \$3.60 *1 mark for either \$25.20 or \$21.60 seen* *Alternative method:* Last week the cost was 36 × 20 cents = \$7.20 lower than usual. This week the cost would have been 12 × 90 cents = \$10.80 lower than usual. \$10.80 – \$7.20 = \$3.60 *1 mark for either \$7.20 or \$10.80 seen*	**2**

Question	Answer	Marks
2	As the third digit is 5, the sixth digit must be 0. As the first digit is 6 and the third digit is 5, the fourth digit must be 3. *1 mark for either of these* So the second digit must be 4, making Barry's passcode 645320.	**2**

Question	Answer	Marks
3(a)	9 The maximum number of times that any symbol can appear is 6, so there can be at most 36 symbols on edges of the tiles. Since the tiles are all square, there can be at most 9 tiles.	**1**

Question	Answer	Marks
3(b)	There are two symbols in common between tiles A and B: ✳ and ■. There are two symbols in common between tiles A and C: ✳ and +. The only way to have both sides with a symbol that could be matched is to rotate A 90 degrees anticlockwise from that displayed in the question. Filling in the remaining tiles gives:  Any tile with ✳ on the face anticlockwise from ● as long as the remaining two symbols are not (× and ■) or (× and +), as these would give the same set of symbols as on tile B or tile C. *3 marks for any correct tile D* *OR 2 marks for deducing that the ✳ on C and the ● on B are touching D* *OR 1 mark for having + between A and C and ■ between A and B*	**3**

Question	Answer	Marks
4(a)	$30 \times 4 + 20 \times 5 =$ <u>220</u> cents ($2.20)	**1**
4(b)	The weight of 5 kg contributes $1.50 to the price of the delivery **[1]**. To have a price less than $3, the longest length must be less than 7.5 cm/ must be 7 cm **[1]**. The largest parcel will be a cube, with <u>all sides 7 cm</u>.	**3**
4(c)(i)	*Any plausible reason, for example:* • The deliveries may have been over a large distance. • Traffic conditions may have made the deliveries take a long time. • The deliveries may have required the driver to work in unsociable hours.	**1**
4(c)(ii)	*1 mark for each piece of information relevant to their part **(c)(i)**, for example:* • The amount that it costs to travel a fixed distance; the distance involved with each delivery. • The pay structure received by the drivers; the expected length of time required to deliver each parcel. • The time of day that deliveries are required to arrive; how much extra drivers are paid during unsociable hours.	**2**

Question	Answer	Marks
5	For EARTH to score 3 points more than TRACE, H must score 3 points more than C. H therefore scores 4 points and C scores 1 point. A similar comparison between either EARTH and CHART or CHART and TRACE reveals that E scores 3 points (2 points more than C or 1 point less than H). The letters of TEACHER are those of EARTH plus C and E, or CHART plus two Es, or TRACE plus H and E. TEACHER scores 18. *1 mark for any of C = 1, E = 3 or H = 4 correct OR for H – E = 1 OR H – C = 3* *2 marks for all three correct (could be implied by A + R + T = 7)* *3 marks for 18*	**3**

Question	Answer	Marks
6	To buy a bottle for \$2 customers must buy two for \$7 each, so \$323 must be made up of multiples of \$16 and \$7. Searching for the highest possible multiple of \$16: \$323/16 = 20 r3 Next multiple below with remainder as a multiple of 7: 19 × \$16 = \$304, r19 18 × \$16 = \$288, r35 *1 mark for \$323/16* *1 mark for recognising remainder and attempt to improve* *SC: Award 1 mark for suboptimal answer of 11.*	**3**

Question	Answer	Marks
7	Each team plays two matches against each of the other 11 teams, a total of 22 matches. *[1 mark]* 12 × 22 = 264, but each match involves two teams, so the total number of matches in a season is 264 ÷ 2 = 132. *[1 mark]* 132 – 34 = 98 matches had a winner, of which (98 ÷ 2) + 9 = 58 were won by the home team (and 40 by the away team). *SC: Includes matches of each team against itself:* *Award 1 mark for 144 matches, and a second mark if they arrive at 64*	**3**

Question	Answer	Marks
8(a)	To minimise the cost of Friday's lunch, Wednesday's lunch cost $4.40. This makes Friday's lunch cost $6.60. To minimise the cost of Tuesday's lunch, Thursday's lunch cost $4.60. This makes Tuesday's lunch cost $5.80. The cheapest remaining amount is $4.80. $4.40 + $4.60 + $4.80 + $5.80 + $6.60 + $7.60 = $33.80 *1 mark for allocating the $4.40 to either Wednesday or Thursday and calculating the consequent cost* *OR* *2 marks for the correct costs for Tuesday, Wednesday, Thursday and Friday*	**3**
8(b)	The highest that Thursday could be is $6.40, with Tuesday being $7.60. Maximising Friday as $7.20 would make Wednesday $4.80, with $4.40 still needing to be the cost on another day. Taking Friday instead as $6.60, with Wednesday as $4.40, leaves the highest costs available for other days and gives a greater total (by $1.80). $7.60 + $7.40 + $7.20 + $6.60 + $6.40 + $4.40 = $39.60 *1 mark for $6.60 as Friday's lunch OR for a total of $37.80*	**2**

Question	Answer	Marks
9(a)	Since the sector representing Tuesday has got larger and the sector representing Wednesday has got smaller, it must have been at the start of the day on Wednesday that James changed the price.	**1**
9(b)	The sales on Monday and Tuesday were 2/3 of the total sales, but generated 3/4 of the income. *[1 mark soi]* Therefore, on Wednesday to Friday, half as many sales generated 1/3 of the income, *[1 mark soi]* which means that each bookmark must have been sold at 2/3 the price – which is $4.	**3**

Question	Answer	Marks
10(a)(i)	Last week's bill was a total of $20, so the reduction is $2. *[1 mark]* If it applied to orange juice it would be a half price carton of orange juice: Buy 1 carton of orange juice, get an extra one for half price. Buy 2 cartons of orange juice, get an extra one for half price. *[1 mark for both]*	**2**
10(a)(ii)	$2 cannot be achieved with half price packets, so it would have to be: 40% off all packets of snacks. *[1 mark]* $2 could also be achieved from 10% off the total price of the bill. *[1 mark]*	**2**

Question	Answer	Marks
10(b)	To distinguish between the two offers that could be on orange juice, there needs to be 2 cartons of orange juice in the purchase. *[1 mark]* There needs to be 1 packet of snacks in the order to distinguish between the offer being on snacks or the overall order. *[1 mark]* *No additional purchases allowed for 2 marks* *FT from **(a)**:* *If four offers were identified in part **(a)**, award 1 mark for a purchase that would allow three of the offers to be distinguished and 2 marks for the cheapest purchase that would allow all four offers to be distinguished*	**2**

Question	Answer	Marks
11(a)	The currently unknown corner squares are adjacent to either 2 or 4, so cannot contain the number 3.	**1**
11(b)	If Raj sees a 7 then he would know that the grid had been rotated 90 degrees clockwise *[1 mark]* 1 could only have been in the bottom left originally, so if he sees a 1 then Raj will know that the grid had returned to its original position. *[1 mark]* 5 could only have been in the top right originally, so if he sees a 5 then Raj will know that the grid was rotated by 180 degrees. *[1 mark]* *Explanation required for each mark* *SC: Award 1 mark for three correct numbers given with no explanations and no other numbers.*	**3**
11(c)	There is only one way in which the 2, 4 and 7 can be positioned if they are to have the correct positions relative to each other. *[1 mark]* 7 | | | 5 | | 4 9 | 2 | This leaves 1, 3, 6 and 8 to be placed. The middle box must be 8 as all of the others would result in two adjacent squares having consecutive numbers. *[1 mark]* Prize 6 must therefore be in the bottom right. *[1 mark]* 7 | 3 | 1 5 | 8 | 4 9 | 2 | 6	**3**

Question	Answer	Marks
12(a)	20 km at 30 km/h would take 40 minutes. 50 km at 100 km/h would take 30 minutes. 30 km at 40 km/h would take 45 minutes. The total amount of time would be 115 minutes.	**1**
12(b)	The extra 6 minutes must come from the reduced speed in the roadworks. Considering an arbitrary distance: a 60 km stretch of roadworks: This would previously have taken 36 minutes and now takes 60 minutes, so a 60 km stretch of roadworks would have extended the time by 24 minutes. Since the extra time is one quarter of this, the stretch of roadworks must have been 15 km. *1 mark for calculating how much the time would be extended by for any specific stretch of roadworks* *1 mark for the correct proportion of this time in relation to 6 minutes*	**3**