Cambridge Assessment International Education

Cambridge International AS & A Level

THINKING SKILLS **9694/31**

Paper 3 Problem Analysis and Solution **October/November 2020**

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 October/November 2020 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 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.

Abbreviations

The following abbreviations may be used in a mark scheme:

AG answer given (on question paper)
awrt answer which rounds to
cao correct answer only
ft follow through (from earlier error)
oe or equivalent
SC special case
soi seen or implied
www without wrong working

Question	Answer	Marks
1(a)	Two hectares from each 20 hectare field, so least are 2 + 3 and 1 + 1 **[1]** = 7, Original was 155 so 15.5 expected 15.5 – 7 = 8.5. *1 mark for 7 or 15.5 seen* *SC: 1 mark for treating as one field: 1 + 1 + 1 + 2 = 5 hectares out of action. So, 10.5 more than expected.*	**2**
1(b)	Least four hectares of the combined area produce 1 + 1 + 1 + 2 = 5, so 7 – 5 = 2 OR 150 – 148 = 2 *FT their 7 OR their 148 from (a)*	**1**
1(c)	\$900 × 15% × 155 = \$20925 *1 mark for 15% correctly combined with one of other numbers.*	**2**
1(d)	\$1999 ignore cents. Accept ⩽ \$2000 FT (b) × \$1000 *1 mark for \$2001 or > \$2000*	**2**
1(e)	The largest percentage loss is 10% **[1]** from a field of uniform production. The threshold is when 10% of the new price is 15% of the old, or \$1350.	**2**
1(f)	100m of 4 × 8 (down) + 7 × 5 (across) = 6700 m	**1**

Question	Answer	Marks
2(a)		**2**

Couple	A	B	C	D	E	F	G	H	I	J
Total score for Waltz	23	20	16	**24**	17	24	25	**19**	22	24
Points for Waltz	6	**4**	**1**	**10**	**2**	**10**	**12**	**3**	**5**	**10**

1 mark for top row,
*1 mark for entire bottom row **ft** from top row*

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)</td><td>
<table>
<tr><td>Couple</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td></tr>
<tr><td>Points for Waltz</td><td>6</td><td>4</td><td>1</td><td>10</td><td>2</td><td>10</td><td>12</td><td>3</td><td>5</td><td>10</td></tr>
<tr><td>Points for Jive</td><td>6</td><td>3</td><td>2</td><td>10</td><td>4</td><td>7</td><td>6</td><td>12</td><td>1</td><td>8</td></tr>
<tr><td>Total</td><td>12</td><td>7</td><td>3</td><td>20</td><td>6</td><td>17</td><td>18</td><td>15</td><td>6</td><td>18</td></tr>
</table>
<u>D with 20 points</u>
ft from (a)
</td><td>**1**</td></tr>
<tr><td>2(c)</td><td>
<table>
<tr><td>Couple</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td></tr>
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<tr><td>Points for Audience</td><td>3</td><td>1</td><td>2</td><td>5</td><td>4</td><td>7</td><td>12</td><td>8</td><td>6</td><td>10</td></tr>
<tr><td>Grand Total</td><td>15</td><td>8</td><td>5</td><td>25</td><td>10</td><td>24</td><td>30</td><td>23</td><td>12</td><td>28</td></tr>
</table>
<u>G with 30 points</u>
1 mark for audience points correctly assigned
SC: 1 mark for G with 39 points (using percentage not points)
</td><td>**2**</td></tr>
<tr><td>2(d)</td><td>Couple B now have 4 + 3 + 8 = 15 points **[1]**
Couple H have 16 points and are still in 5th place
/ D, F, G, H and J all have at least 16 points **[1]**</td><td>**2**</td></tr>
<tr><td>2(e)</td><td>Only possibility is that the points for the Jive were:
2, 3, 12, 4, 6, 10, 8, 7, 1, 5 giving totals 4, 8, 16, 16, 16, 16, 16, 8, 8, 8
So <u>A</u> with <u>4</u> points

1 mark for indication that the couples with 16 points must be C, D, E, F, and G
1 mark for deducing that the four tied (in 6th place) each have 8 points</td><td>**3**</td></tr>
<tr><td>2(f)</td><td>One of couples with 16 will have at least 5 points, a total of 21. **[1]**
The couples on 8 points can get a maximum of 12 points, a total of 20. **[1]**</td><td></td></tr>
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Question	Answer	Marks
2(g)	Greatest is 55 **[1]** Least is 15 **[2]** *1 mark for attempt to find a set of scores that add to 100 with at least 4 adjacent pairs.*	**3**

Question	Answer	Marks
3(a)(i)	Least 2nd prize when others are greatest, so 1st prize is \$200 and 3rd/4th as large as possible while still less than 2nd prize. \$200 (\$68) \$67 \$65 OR \$199 (\$68) \$67 \$66 *1 mark for \$67 OR \$200 OR \$199*	**2**
3(a)(ii)	Greatest 2nd prize requires 3rd and 4th to be as small as possible, so \$21 and \$20, leaving \$180 and \$179	**1**
3(b)	2nd and 3rd as close as possible: \$88 and \$87 **[1]** Largest 4th prize is \$86, so Smallest 1st prize is \$400 – \$88 – \$87 – \$86 \$139	**2**
3(c)	\$140, \$110, \$80, \$50, \$20 *1 mark for equally spaced centred on 80. OR* *1 mark for any set of 5 equally spaced prizes AND a second, improved set.*	**2**
3(d)	4th and 5th prizes must be \$21 and \$20, leaving \$359 to be distributed with 1st twice 3rd and 2nd as high as possible. This is equivalent to dividing into 5 parts 2: 2: 1 \$144 \$143 \$72 *1 mark for 359 OR BOTH 20 and 21* *1 mark for three amounts with the 1st equal to twice 3rd and 2nd equal to one less than 1st.* *SC: 1 mark considering four prizes rather than five: which gives \$134, \$133, \$67, \$66. So highest second prize is \$133.*	**3**

Question	Answer	Marks
4(a)	(\$0), \$4, \$6, \$19 and \$21 *1 mark for 3 correct with at most one incorrect.*	**2**

Question	Answer	Marks
4(b)	walker paying with \$10 note : $6 \times$ \$1. walker paying with \$25 note: $2 \times$ \$10 + $1 \times$ \$1 cyclist paying with \$10 note: $4 \times$ \$1. cyclist paying with \$25 note: $1 \times$ \$10 + $9 \times$ \$1 $9 \times$ \$1 and $2 \times$ \$10 needed *1 mark for each OR all four combinations.*	**2**
4(c)	(for example) 4 pedestrians would require \$9 in change $9 \times$ \$1 notes are needed. **[1]** An amount between \$26 and \$30 would require $2 \times$ \$10 notes for example \$26 would be cost for 5 pedestrians and 1 cyclist **[1]** $2 \times$ \$10 notes (and $4 \times$ \$1) are needed \$29	**3**
4(d)(i)	$2 \times$ \$25 customers first: \$42 needed **[1]** Then $4 \times$ \$10 customers: \$24 needed so \$66 needed in total *1 mark for $2 \times$ \$25 then $4 \times$ \$10.*	**2**
4(d)(ii)	$6 \times$ \$1 note customers first: $6 \times$ \$4: $24 \times$ \$1 gained **[1]** $4 \times$ \$10 customers: require \$24 change: $4 \times$ \$10 gained, $24 \times$ \$1 paid out Overall: $4 \times$ \$10 gained **[1]** $2 \times$ \$25 customers: \$10 + \$10 + \$1 needed each ($4 \times$ \$10 notes received from previous customer) so \$2 needed in the float	**3**
4(e)	A variety of ways that he can cope with $4 \times$ \$10 notes: 4 pedestrians paying with \$1 bills = 4×4 = \$16 4 cyclists paying with \$10 bills = 4×4 =\$16 change needed 5 pedestrians pay with \$1 bills = 5×4 = \$20 1 pedestrian pays with \$10 bill = \$6 change needed 3 cyclists pay with \$10 bills = \$12 change needed $5 \times$ \$10 notes: minimum change required = \$20 if cyclists. Then only space for 2 pedestrians $5 \times$ \$10 notes: \$30 if pedestrians. 7 pedestrians could only raise \$28. Algebraically: if c=number of cyclists, $6c + 4(12 – 2c) > 50$ *1 mark for an example of how 3 or 4 is achieved.* *1 mark for concluding 4.* *1 mark for justifying that 5 is impossible.*	**3**