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**THINKING SKILLS**

**9694/32**

Paper 3 Problem Analysis and Solution

**May/June 2019**

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.

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This document consists of **6** 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.

Question	Answer	Marks																								
1(a)	<u>8</u>	1																								
1(b)(i)	$28 - 6 = 22$ in the first 4 events; 2 events each, so $11 + 6 = 17$	1																								
1(b)(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Event</th> <th style="text-align: center;">Number of cyclists in each team</th> <th style="text-align: center;">Maximum number of teams allowed per squad</th> <th style="text-align: left;">Allocation</th> </tr> </thead> <tbody> <tr> <td>Individual trial</td> <td style="text-align: center;">1</td> <td style="text-align: center;">4</td> <td>I J K G</td> </tr> <tr> <td>Manhattan</td> <td style="text-align: center;">2</td> <td style="text-align: center;">4</td> <td>AB CD EF GH</td> </tr> <tr> <td>Chase</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td>AB CD EF</td> </tr> <tr> <td>Derby</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td>I J K H</td> </tr> <tr> <td>Road race</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1</td> <td>LMNOPQ</td> </tr> </tbody> </table> <p><i>1 mark for any solution with six different letters uniquely in the Road Race.</i></p>	Event	Number of cyclists in each team	Maximum number of teams allowed per squad	Allocation	Individual trial	1	4	I J K G	Manhattan	2	4	AB CD EF GH	Chase	2	3	AB CD EF	Derby	4	1	I J K H	Road race	6	1	LMNOPQ	2
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1(c)	$3 + 6 + 6 + 4 + 6 = 25$ medals	1																								
1(d)(i)	(7 golds can be awarded as:) (6 in the) Road Race and (1 in the) Individual trial or (4 in the) Derby, (2 in the) Manhattan and (1 in the) Individual trial or (4 in the) Derby, (2 in the) Chase and (1 in the) Individual trial	1																								
1(d)(ii)	(7 golds can be awarded as:) (6 in the) Road race + (1 in the) Individual trial: Possible silvers: 1, 2, 2, 4, 0 in the 5 events, a total of 9 or (4 in the) Derby, (2 in the) Manhattan/Chase and (1 in the) Individual trial: Possible silvers: 1, 2, 2, 0, 6 in the 5 events, a total of 11 Greatest number of silver = <u>11</u>  <i>1 mark for 9 seen</i>	2																								
1(e)	(7 golds can be awarded as:) (6 in the) Road race + (1 in the) Individual Trial: Other medals: 2, 4, 4, 4, 0 = 14 or (4 in the) Derby, (2 in the) Manhattan or Chase and (1 in the) Individual Trial: Other medals: 2, 4, 4, 0, 6 = 16  Smallest possible total is $14 + 7 = 21$ <b>www</b>  <i>Award 1 mark for 14, 16 or 23</i>	2																								

Question	Answer	Marks
2(a)	$26+10+17+20+33+15 = \$121$	1
2(b)	Sum of medians is $29 + 15 + 24 + 25 + 34 + 16 = \$143$	1
2(c)	Shampoo at HyperFood <b>[2]</b> .  The increases for the three supermarkets would be \$18, \$17 and \$1 (respectively). Cotes does not have any product priced at \$18, and Dasamart does not have any product priced at \$1 <b>[1]</b> .  <i>If 0 scored, award 1 mark for \$18, \$17 and \$1 OR for consideration of totals with a price doubled compared with \$152.</i>  <i>SC: Bromley Potatoes [1]</i>	3
2(d)(i)	In Cotes, replacing Macassar Oil with Brill-milk reduces the basket price by the same (\$3) in both countries, so the allowance will remain the same. (Identification of figures compared required.)	1
2(d)(ii)	The quotient will change from $134/130$ (1.0308) to $131/127$ (1.0315), so the allowance will go up.  <i>Sight of both correct 'ratios', with no or incorrect conclusion. [1]</i>  <i>SC: 1 mark for correct deduction from ratios involving another supermarket or average.</i>	2
2(e)	Yes. If the UK prices are lower, the allowance will be higher.	1
2(f)	Since their salaries in pounds remain the same but buy more dollars, their spending power in Bolandia will increase.	1

Question	Answer	Marks
3(a)	The cheapest room that can accommodate 30 guests is the Conservatory The cost of the hall will be $\$250 \times 4 = \$1000$ The remaining costs are $\$24 \times 30 = \$720$ The total cost of the party is $\$1000 + \$720 = \$1720$  <i>1 mark for either \$1000 or \$720.</i>	2
3(b)	The Bijou room will need to be used. The total cost of the party will be $2 \times \$200 + 10 \times \$24 = \$640$ Alice will charge $2 \times \$150 + 10 \times \$40 = \$700$ Alice will make a <u>profit</u> of <u>\$60</u>  <i>1 mark for either \$640 or \$700 or \$160 seen.</i>	2

Question	Answer	Marks
3(c)	<p>Alice will lose money from her charge for the number of hours, but recovers \$16 for each guest that attends. <b>[1]</b></p> <p>If the Bijou room is used, then Alice needs to recover a total of \$150 from the guest charges. <b>[1]</b></p> <p>This would require <u>10</u> guests. (Since other rooms would leave more to be recovered from guest charges, this must be the smallest total number.)</p> <p><i>Inequality showing <math>16n &gt; 150</math> <del>oe</del> cores the first two marks.</i></p>	<b>3</b>
3(d)(i)	<p>Since the hourly charge for the party is less than Alice's fixed charge, Alice's profits for a given number of guests would be maximised by the shortest possible party.</p> <p>The party would last for <u>2</u> hours.</p>	<b>1</b>
3(d)(ii)	<p>If she wishes to achieve a 20% profit, Alice only recovers \$40 – \$24 – \$4.80 = \$11.20 from each guest. <b>[1]</b></p> <p>For a 20% profit on a party in the Bijou room, Alice needs to recover more than \$400 + \$80 – \$300 = \$180. <b>[1]</b></p> <p>The number of guests needs to be more than <math>\\$180 \div \\$11.20</math>, so <u>17</u> (which is within the capacity of the room).</p>	<b>3</b>
3(e)	<p>Alice will gain <math>3 \times \\$150 + 30 \times \\$35 = \\$1500</math> for the first 30 guests <b>[1]</b></p> <p>The cost of a party for 50 guests is <math>3 \times \\$275 + 50 \times \\$24 = \\$2025</math> To make a profit of at least 5%, Alice needs to gain \$2126.25 from the charge to guests <b>[1]</b></p> <p>The additional 20 guests must therefore contribute a total of \$626.25 <b>[1]</b></p> <p>The lowest rate that Alice could set is <u>\$31.32</u> (\$31.3125)</p>	<b>4</b>

Question	Answer	Marks
4(a)	$72(.0) ((8 + 8 + 8) \times 3.0)$	1
4(b)(i)	$18 \times 3 - 5$ [1] $49(.0)$	2
4(b)(ii)	$(4 + 4 + 4) \times 3.0$ $= 36(.0)$	1
4(c)(i)	Cuthbert $(22 \times 2.5 = 55.0)$ Amelia $(21 \times 2.5 = 52.5)$ Kingsley $(19 \times 2.5 = 47.5)$  <i>1 mark for Cuthbert without wrong extra name</i> <i>1 mark for Amelia AND Kingsley without wrong extra name</i>  <i>SC: 1 mark for Cuthbert, Amelia and Kinglsey with one extra name</i>	2
4(c)(ii)	Godric: [1]  52 does not divide by any of the higher difficulty ratings / $52.0 = 19 \times 3.0 - 5.0$ . [1]	2
4(d)	45 is a multiple of both 2.5 and 3.0 (oe)	1
4(e)	$243.5(0)$  <i>If 2 marks cannot be awarded, award 1 mark for sight of either of the following:</i>  <ul style="list-style-type: none"> <li>• a score of <math>114(.0)</math> for the third trick (<math>19 \times 2 \times 3.0</math>)</li> <li>• inclusion of <math>27(.0)</math> (from the qualifying performance)</li> </ul>	2
4(f)(i)	Cuthbert currently has 139, 105.5 behind Helga. In order to overtake her, he must be awarded $\geq 22$ marks. This is achieved with 8, 7, 7 but he must be awarded another 8 which will be discounted. So at least 2 judges must award him 8 marks. <b>AG</b>  <i>1 mark for 22 or 21.1 soi</i>	2
4(f)(ii)	Cuthbert's maximum possible grand total is 259. [1] OR Minerva has 118.5 so far. She could score a maximum of 144 with her final trick for a grand total of 262.5. [1]  So No. <i>Explicit judgment required for 2 marks</i>	2