Cambridge Assessment International Education

Cambridge International AS & A Level

THINKING SKILLS **9694/33**

Paper 3 Problem Analysis and Solution **October/November 2021**

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 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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.

NOTES FOR MARKERS

Working

Supporting working is **not** needed to gain full marks, unless otherwise stated in the mark scheme.

If working clearly shows, beyond any doubt, that a correct answer derives purely from incorrect reasoning, that answer may be invalidated, unless otherwise stated 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'.

Incorrectly labelled work

If the candidate has labelled their work with the wrong Question/part number, highlight the label(s) and add a comment to flag it. This will help avoid confusion for anyone checking the script later on.

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:

AG answer given (on question paper)
awrt answer which rounds to
ft follow through (from earlier error)
isw ignore subsequent working
oe or equivalent
SC special case
soi 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
Highlight	Use anywhere it is helpful to clarify the marking

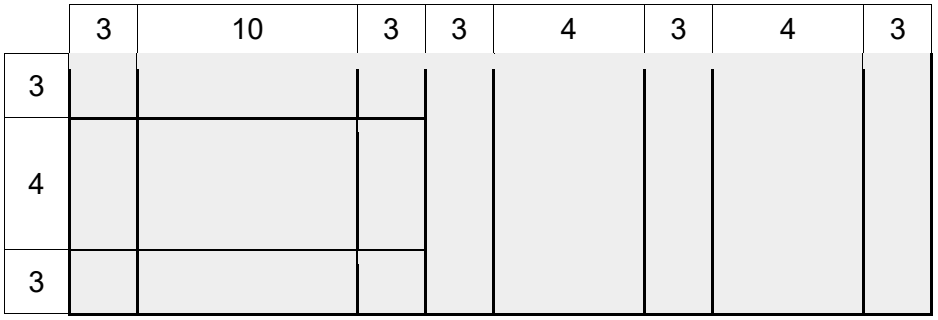
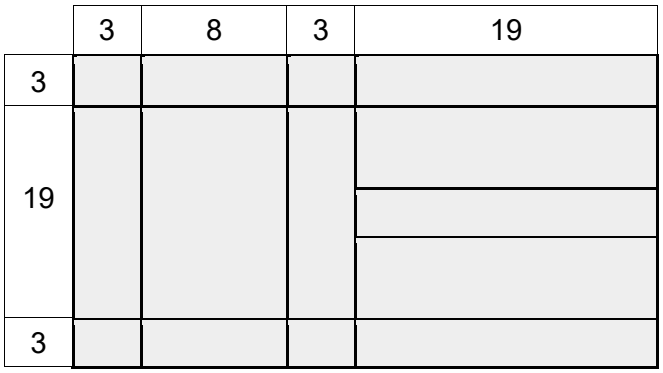
There must be at least one annotation on each page of the answer booklet.

Question	Answer	Marks
1(a)	$0.47 + $0.93 + $0.50 + $1.10 = $3 per km, so a total of 42 × $3 = $126 **[1]** Additional donations of $10 + $5 + $20 + $5 = $40, so total is $166 *1 mark for 6 of 8 components correct and no extras*	**2**
1(b)	Anh gives $5 for any distance unless Jennifer completes the marathon. Vijay's sponsorship will be $5 if Jennifer completes 10 km. 11 km	**1**
1(c)	If Cyril promises either $1 or $2 per complete kilometre then the amounts for completing the marathon would be $42 or $84 The amounts for completing the marathon must make this number up to $100 so the possible amounts are: $58 **[1]** and $16 **[1]** *SC: If neither scored, award 1 mark for 42 or 84 seen.*	**2**
1(d)	$370 from donations, so a further $630 needed. **[1]** 630 ÷ 24 = 26.25 27 km	**2**
1(e)	If there are no donations then the $1000 would be achieved by completing 15 km if the amount per km was at least $1000 ÷ 15 = $66.67 **[1]** To require a distance of 16 km to achieve the target, the maximum amount that could be promised per km is $66.66 In that case the amount raised for completing 42 km would be 42 × $66.66 = $2799.72 **[1]** The minimum amount that could have been promised for completing the marathon is therefore $200.28 *SC: (By using 16 $62.50 (1000/16): 1 mark for $2625 or 2 marks for $375.* *SC: (integer sponsorship values), giving $66 as the maximum to require 16 km, and 1 mark for $2772 donated if completed or 2 marks $228.* *SC: 2 marks for $3000 – (42 × 1000/15) = $200* *SC: 1 mark for using (999/16)*	**3**

Question	Answer	Marks
2(a)	\$600 **[1]** One contestant answers correctly and is also given \$100 from each of the other three, who all answer incorrectly. **[1]**	**2**
2(b)	41 Each has 200 to be removed **[1]** \$2050 has been added to the totals during the show Each correct answer adds \$50 to the sum of the contestants' totals **[1]** *their \$2050 ÷ \$50*	**3**
2(c)	8 *(not from wrong working)* 19 correct answers added \$1900 to her total AND 3 incorrect answers removed \$300 from her total **[1]** \$200 (initial total) + *their (*\$1900 – \$300) + \$650 (given by computer) = \$2450 **[1]** *their* (\$2450 – \$2050) ÷ \$50 **[1]**	**3**
2(d)(i)	Kyle \$400 Rajiv \$1000 Anona \$1150 Nerys \$ 500 *1 mark for two correct totals*	**2**
2(d)(ii)	59: (Anona) incorrect/\$100 to Nerys **[1]** 60: (Nerys) correct/50 from Rajiv **[1]** SC1: responses switched questions	**2**
2(e)	\$425 (more) If she had retired after the first show she would have won \$3600 **[1]** The total she won altogether was \$900 + \$1025 + 2 × \$1050 **[1]**	**3**

Question	Answer	Marks
3(a)	1, 3 [1] 2 [1] (ignore 4, 6, 7). *Only award 2 marks if no incorrect lengths given.*	**2**
3(b)	Correct ropes: [1,2,5], [1,3,7], [1,4,6], [1,5,7], [2,4,7], [3,6,7], [2,3,7], [1,5,6] *1 mark for any correct rope.* *1 mark for clear identification of all lengths for that rope.*	**2**
3(c)	A 15 metre rope with ribbons at 7 m and 13 m (or 2 m and 8 m) will allow this. *1 mark for any rope length with 3 ribbons that achieves all the required lengths.*	**2**
3(d)	21	**1**
3(e)	An 11 m rope with ribbons at [2,7,8] (= [3,4,9]) OR [1,4,9] (= [2,7,10]) **[2]** can be used to measure 1, 2, 3, 4, 5, 6, 7, 8, 9 or 11 metres. **[1]** *1 mark for any rope and set of 3 ribbons that achieves 9 identified different lengths.* *OR* *2 marks for any rope and set of 3 ribbons that achieves10 identified different lengths.*	**3**

Question	Answer	Marks
4(a)	Tray = 35 cm^2 **[1]** Sleeve = 45 cm^2 **[1]**	**2**
4(b)	$4 \times H \times H = L \times H$ or $4H = L$ *Any answer for which the length = 4 × height*	**1**
4(c)	*3 marks for any answer where L = 2H* *OR* *1 mark for each of the following (max 2):* • *an algebraic representation of the area of painted tray* • *an algebraic representation of the area of painted sleeve*	**3**
4(d)	$\underline{8 \times 6 \times 3}$ *1 mark for each of the following (max 2):* • *a correct algebraic expression of the equation (that simplifies to $8W + 8H = 2HW + 4H^2$)* • *substitute a value for H or W and deduce matching other value* • *one pair of tray and sleeve correctly calculated* • *another pair of tray and sleeve correctly calculated*	**3**
4(e)	Tray net has dimensions 18×12 Sleeve net has dimensions 21×12 Can fit trays to cover 90×96 on one sheet, and sleeves to cover 84×96 *1 mark for either* So sleeves will generate more waste **[1]**.	**2**
4(f)(i)	*Any matchbox with dimensions* *$L = 2W + H$, where $2W + 3H \leqslant 100$* *OR* *$L = W + 2H$, where $L + 2W + 5H \leqslant 100$*	**1**

Question	Answer	Marks
4(f)(ii)	*1 mark for finding a dimension of the net pair that is a factor of 100.* *1 mark for finding the other dimension of the net pair that wastes no more than 400 cm^2.* $\underline{10 \times 4 \times 3}$ or $\underline{19 \times 8 \times 3}$ L = W + 2H layout  *OR* L = 2W + H layout  	**3**