Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6663882534

THINKING SKILLS **9694/11**

Paper 1 Problem Solving **May/June 2021**

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- Show your working.

  Where a final answer is incorrect or missing, you may still be awarded marks for correct steps towards a solution.

  In most questions, full marks will be awarded for a correct answer without any working. In some questions, however, you will not be awarded full marks if working needed to support an answer is not shown.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

[Turn over

1 In a school test consisting of 10 questions, 5 points are awarded for a correct answer but 3 points are deducted for an incorrect answer. A blank answer scores 0.

Mike scored a total of 0 and he did not leave all of the answers blank.

(a) How many questions did Mike answer correctly? [1]

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Sheila scored a total of 32.

(b) How many questions did Sheila answer correctly? [1]

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2 Jack and his sister Jill are in a bookshop.

Jack has a voucher for 20% off the cost of any two books bought together. He has chosen *Up The Hill*, priced at $25, and *Broken Crown*, priced at $15.

Jill has a voucher that allows her to pay only $2 for the cheaper of any two books bought together. She wants to buy *A Pail Of Water*, priced at $28, and *Tumbling After*, priced at $12.

Both vouchers can be used only once.

(a) If they each use their own voucher to pay for their own pair of books, what will be the total cost of the four books? [2]

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(b) Show how they can use the vouchers so that they pay the minimum possible for the four books, and calculate this total. [2]

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3 Rob must take each dose of his medicine at least 1 hour before food, but at least 2 hours after food.

Rob's daily meal schedule is shown below, and he eats only at meal times (and throughout the whole period of these times):

Breakfast: 07:00–07:30
Lunch: 13:00–13:30
Dinner: 19:00–20:00

He sleeps between 22:30 and 06:30.

(a) During how much total time in every 24-hour period could Rob take a dose of his medicine? [2]

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Rob needs to take three doses of medicine in each 24-hour period. The doses must be taken at least 6 hours apart from each other.

(b) State three times during the day when Rob could take his medicine. [1]

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Rob's doctor suggests taking a different medicine, but Rob does not want to change his daily meal schedule. The new medicine must also be taken at least 1 hour before food and at least 2 hours after food. The new medicine would need to be taken four times in each 24-hour period, and the doses would need to be taken at least 3 hours apart from each other.

(c) Would it be possible for Rob to change to this new medicine without altering his daily meal schedule or sleeping times? Explain your answer. [1]

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4 A choir called Melodia has hired a local theatre for 3 nights to present a programme of operatic arias.

The theatre has 400 seats and the hire cost is $700 per night plus 25% of the ticket sales. The theatre has provided the tickets. It will also print programmes, if required, at a cost of 40¢ each, provided at least 250 are ordered. Based on previous experience, it has been decided to ask for 900 programmes to be printed.

Tickets are on sale for $8 each and programmes will be sold for $1 each.

(a) What is the minimum number of tickets that need to be sold in order to cover the hiring and printing costs from ticket sales alone? [3]

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(b) What is the maximum profit that Melodia can make altogether from the sale of tickets and programmes? [3]

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5 I won $180 in a competition recently and I decided to share the whole of it between my three grandchildren in the ratio of their ages.

When I gave them their money today, 8-year-old James, 6-year-old Sarah and 4-year-old Lucy all thanked me. However, Sarah did point out that her birthday is only three weeks away and Lucy's birthday is next week.

How much more would Sarah have received if I had shared out the money immediately after her birthday instead of today? [2]

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6 After a school examination, six students make the following true statements:

1. Rachel obtained a higher mark than Marie.
2. Marie obtained a lower mark than Celia.
3. Heather obtained a higher mark than Jeremy.
4. Jeremy obtained a higher mark than Rachel.
5. Celia obtained a lower mark than Heather.
6. Kevin obtained a lower mark than Marie.

Each student's mark was a whole number.

Two students obtained the same marks as each other.

(a) Which two students could they have been? State **all** the possible pairs. [2]

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The student with the lowest mark obtained 63.

(b) What is the smallest possible total mark for all six students? [1]

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7 The TV drama 'Squaring the Circle' can be bought as a boxset consisting of three series: Series One, Series Two and Series Three. Each series consists of 6 episodes and each episode lasts 45 minutes.

Abigail plans to watch Series One next Saturday. She will start watching at 09:30. She will have a 10-minute break between episodes, except she will have a 1-hour break after the third episode.

(a) At what time will Abigail finish watching the final episode of Series One? [2]

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Brian plans to watch all three series of Squaring the Circle over five consecutive Sundays. He is free between 15:00 and 18:00. He will take one break each Sunday and wants to watch the same amount each Sunday. If Brian is part way through an episode at 18:00, he will resume from that point of the episode on the following Sunday.

(b) What is the greatest possible break that Brian can take each Sunday? [2]

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Caroline plans to watch all three series of Squaring the Circle in the evenings after work. She will watch from 19:00 every evening and will finish no later than 23:00. She will take a 10-minute break between episodes. She will only start watching an episode if she can finish it the same evening. She will start watching at 19:00 on Monday.

(c) At what time and on which day will she finish watching all three series? [2]

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Caroline decides instead that she will start watching an episode as long as she is able to watch at least 20 minutes before 23:00. On the following evening, she will continue from where she left off.

(d) At what time and on which day will she now finish watching all three series? [3]

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8 A transport truck collects barley from a number of locations during harvest time. Because each load of barley must be tested, the truck must return to the depot after each collection.

The driver must not drive more than 20 km or work for more than 8 hours in a day, but he must maximise the amount of barley collected on the first day.

The table shows the available locations for the driver to visit on the first day. The total journey times include travel to the location and back to the depot, and time for loading and dispensing.

Location	*Load (tonnes)*	*Distance from depot (km)*	*Total journey time (hrs)*
Albertong	6	2	2
Hackeridge	10	4	5
Mellbridge	2	1.5	2
Tomston	5	3	3
Yonderford	3	1	1
Zenderbrow	4	1.5	2

(a) Which locations should the driver visit on the first day? [2]

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The time that the driver is permitted to work per day is increased by 2 hours.

(b) What is the maximum amount of barley that could be collected and delivered to the depot on the first day? [2]

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9 The Skaters ice rink is open from 09:00 to 18:00 each day. Visitors to the rink must buy their entry tickets in advance and no later than the day before their visit. An entry ticket is valid for a 3-hour time slot, beginning on a specified hour, but can be used for any period of time within that 3-hour slot. The latest possible time slot is 15:00 to 18:00.

The number of tickets sold for each time slot last Monday are given in the following table.

Start of time slot	09:00	10:00	11:00	12:00	13:00	14:00	15:00
Number of tickets sold	20	33	44	40	54	48	35

Everyone who bought a ticket used it and stayed for at least one hour.

(a) What is the greatest possible number of visitors in the rink at 12:30? [1]

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(b) What is the greatest possible number of visitors in the rink at any time during the day? [1]

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(c) What is the greatest total number of hours for which the rink could have had no visitors during its open hours last Monday? [2]

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10 In a cycling time trial, cyclists cycle 60 km along the straight road between Linfield and Morton. The first cyclist leaves the starting point at 12:00, the second at 12:04, the third at 12:08, and so on at 4-minute intervals. The cyclist with the quickest overall time is the winner.

Each cyclist cycles at his constant speed throughout the trial.

The 1st cyclist cycles at 15 km/h. The 2nd cyclist gains 100 metres on the 1st cyclist during every two minutes.

(a) (i) At what time is the 2nd cyclist level with the 1st cyclist? [2]

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(ii) How far from the starting point are the first two cyclists when they are level? [1]

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The 16th cyclist finishes the course at exactly the same time as the 2nd cyclist.

(b) What was the constant speed of the 16th cyclist? [3]

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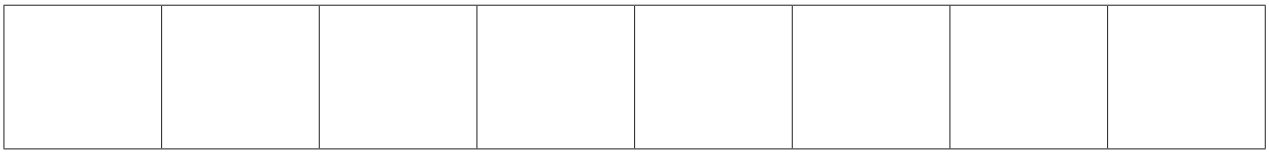
11 In a two-player game, players take it in turns, moving left to right, to write either a tick or a cross in each of the 8 boxes below. Players are not allowed to miss a go.



The rules are:

- two ticks in consecutive boxes must be followed by a cross
- two crosses in consecutive boxes must be followed by a tick

Player 1 begins, and wins the game if they succeed in forcing Player 2 to place a cross in the 8th box. If Player 2 can place a tick in the 8th box, then Player 2 wins.

Player 1 begins with a cross.

(a) State a valid sequence of ticks and crosses that leads to Player 2 winning. [1]

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(b) If Player 2's first move is a tick, explain how Player 1 can be certain to win. [2]

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12 Fay and Rose compared how much money they had saved in the bank.

They noticed that if Fay gave Rose $8 then they would have exactly the same amount of money as each other. They also noticed that if Rose gave Fay $8 then Fay would have exactly twice as much money as Rose had.

How much money did Rose have in the bank? [3]

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