Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3479259719

THINKING SKILLS **9694/13**

Paper 1 Problem Solving **May/June 2023**

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.

1 A narrow rectangular flower bed in my garden is 7.2 metres long and had nothing growing in it until I planted 9 sunflower seeds in it last week.

When planted, the distance between each seed and the next was the same, and at both ends the distance from the end of the bed to the nearest seed was exactly twice the distance between one seed and the next.

What was the distance between one seed and the next? [2]

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2 A shop sells large candles at $12 each and small candles at $7 each. On Mondays there is a special offer: buy 3 candles of the same size and get a fourth of that size free. On Tuesdays there is a different special offer: buy any 2 candles and get the cheaper one at half price. (If both candles are the same price, either one of them can be considered to be the cheaper one.)

Calinda wishes to buy 6 large candles and 9 small candles.

How much would she save by buying the candles on Tuesday instead of Monday? [2]

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3 The Community School canteen will be catering for all their students for their annual celebration meal. There are 1200 students in the school, so a survey of the choices of a small sample of 60 students was carried out to get a guide of how many of each meal would be prepared.

Each student was asked to choose one meal. The table shows information about the results.

Meal	*Number of students*
Hamburger and fries	21
Chicken wrap and wedges	18
Vegetarian chilli and rice	9
Prawn stir-fry	12

The canteen manager decides to make an excess of 10% of each meal. Based on past experience, he knows that this will ensure all students get their choice of meal.

(a) How many of each meal will the canteen make? [2]

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The day before the celebration meal, the manager realised that they would not be able to make the prawn stir-fry and will need to buy in the meals ready-made. The prices to buy from local restaurants are shown in the table below.

	Price of each prawn stir-fry meal			
	101–150 meals	*151–200 meals*	*201–250 meals*	*251–300 meals*
Mai Wah	$3.00	$2.75	$2.25	$2.00
Kam's Kitchen	$3.50	$3.00	$2.50	$1.50
Green River	$2.75	$2.25	$2.00	$1.75

Now that these meals need to be bought in, the manager decides that he will not necessarily buy the full 10% excess in meals that he had previously planned.

(b) What is the smallest total amount that the manager could pay for the prawn stir-fry meals that are needed? [2]

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4 The Bolandian Social Club is staging an activities day for the local community. There will be sessions of various activities, each with an instructor. At most 12 people can attend a session. The first session of each activity will start at 10:00. Subsequent sessions in each activity will start 10 minutes after the end of the previous session in that activity. The day ends at 16:30 and a session will not start if it cannot be completed by 16:30.

The activities that are available, the lengths of the sessions and the charge per session are shown in the following table.

Event	*Length of session*	*Charge per session*
Archery	40 minutes	$9
Bowling	30 minutes	$8
Darts	45 minutes	$10
Judo	60 minutes	$15
Yoga	50 minutes	$12

(a) How many sessions of Darts will there be? [1]

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(b) What is the greatest possible amount of money that can be taken from the Bowling sessions? [2]

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The instructors are free when they are not leading a session. The Bowling instructor and the Yoga instructor agree to meet for 10 minutes for a cup of tea, if they are both free at the same time.

(c) At what times could they meet? [2]

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Sam has $32 to spend. She is happy to attend more than one session of any of the activities, but will spend the whole $32.

(d) List all the combinations of activities that Sam could attend. (You do not need to give the order of the activities within each combination.) [2]

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5 Jack and Lara decide to have a driving adventure. After some research they plan to drive the longest continuous drivable distance between two points on Earth: Sagres in Portugal to Khasan in Russia. Their route is 14 224 kilometres long.

They plan to sleep 8 hours, drive 10 hours and have 6 hours for relaxation each day.
They will share the driving equally each day. Jack will drive for the first 5 hours and Lara for the second 5 hours.

(a) Assume that they leave on a Tuesday morning and drive at 70 km / h throughout.

On which day of the week will they arrive in Khasan, and who will be driving? Justify your answer. [3]

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Their vehicle travels 5 kilometres per litre of fuel used on average. The tank can hold 50 litres, and the tank is full when they start their journey.

(b) What is the minimum number of times they will need to fill up the fuel tank? [2]

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The optimum fuel efficiency for their vehicle is 8 kilometres per litre of fuel, which is achieved if the car is driven at a speed of 88 km / h.
The average cost of a litre of fuel is $1.10.

(c) What would the total cost of fuel be, if the car were driven at this optimum speed throughout the journey? [1]

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6 In the 1950s the standard car 'number plate' in many countries was not just a number, but three letters (not I or O) followed by from one to three digits.

In Australia the first letter was originally allocated to different areas as follows

State/Territory	*First letter*	*Number of letters*	*Population (million)*
New South Wales	A–F	6	7.8
Victoria	G, H, J–M	6	6.2
Queensland	N, P, Q	3	4.9
South Australia	R–T	3	1.7
Western Australia	U–V	2	2.7
Tasmania	W	1	0.5
Northern Territory	X	1	0.2
Capital Territory	Y	1	0.4
Commonwealth	Z	1	–

The number of cars per person increased, and it was seen that there would not be enough standard 'numbers'.

(a) Which area would have expected to be the first to use up its allocation? [1]

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(b) **(i)** Which area could have donated one of its letters to another to extend the overall system for as long as possible? [1]

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(ii) Which area would then have been first to use up its allocation? [1]

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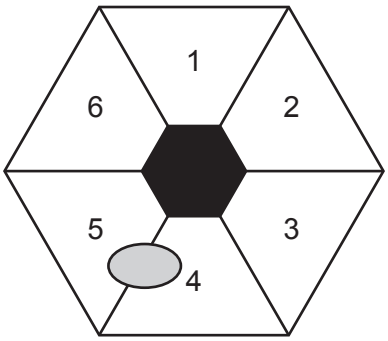
7 A new theme park is divided into six numbered zones, laid out as shown in the diagram. There is a lake on the border of zones 4 and 5.



Each zone will have a distinct theme and background music. The park designer is considering which zone to allocate to each of the themes. The Pirate Zone must be in either zone 4 or zone 5, in order to use the lake.

The zones must be arranged so that there is no disharmony in the music when moving from one zone to an adjacent one. The table shows which zones can be adjacent to each other.

	Fairy zone	Rainbow zone	Unicorn zone	Sparkle zone	Pirate zone	Kitten zone
Fairy zone		No	Yes	No	Yes	No
Rainbow zone	No		Yes	No	Yes	Yes
Unicorn zone	Yes	Yes		Yes	No	No
Sparkle zone	No	No	Yes		Yes	Yes
Pirate zone	Yes	Yes	No	Yes		No
Kitten zone	No	Yes	No	Yes	No	

In how many different ways can the themes be allocated to the zones? [3]

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8 Joanne is planning to write a short story. The publisher requires the story to be between 9500 and 10 500 words long. She plans to write between 500 and 750 words each day from Monday to Friday and between 1000 and 1500 words each day on Saturdays and Sundays.

Joanne will start writing on Monday 1st May.

(a) What is the earliest date on which Joanne might finish the short story? [2]

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By the end of the first 5 days, Joanne is disappointed to find that she has only written 1500 words. She wants to have the short story completed by the end of Tuesday 16th May. She sets herself a minimum number of words per day, so that she is sure that it will be finished on time. The amount for Saturdays and Sundays will be twice the amount for other days of the week.

(b) What is the minimum number of words she must plan to write every day on Mondays to Fridays? [3]

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9 Everlo supermarket has a loyalty scheme which awards participating customers loyalty points each time they spend at least $10.00, as follows:

$10.00 to $19.99	1 point
$20.00 to $29.99	3 points
$30.00 to $39.99	8 points
$40.00 to $49.99	15 points

For higher amounts, 25 points are awarded for $50.00 and 1 point for every further complete $1.00.

Shirley has shopped at Everlo five times since she joined the loyalty scheme and she now has a total of 71 points. Her smallest bill has been $24.59 and her largest bill has been $55.41. She has spent a different amount each time.

What is the lowest total amount that Shirley could have spent in her five visits to Everlo since she joined the loyalty scheme? [4]

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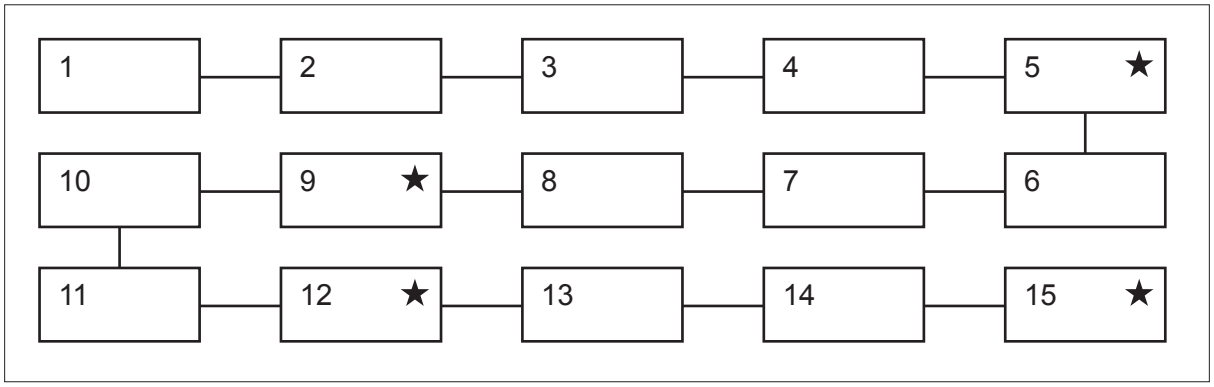
[Turn over for Question 10]

10 Amy has introduced a loyalty card scheme at her coffee shop. Customers are given a card with 15 boxes printed on it. Every time they buy a cup of coffee the next empty box on the card is stamped. When a box containing a star (★) is stamped the customer gets their drink for free. The layout of the card is shown below.



It costs Amy $1.20 to make a cup of coffee and she sells each cup of coffee for $2.10.

Each card is valid for 2 weeks, starting on the day that the first cup of coffee is bought.

Jack usually buys 6 cups of coffee during a 2-week period. Amy is hoping that the loyalty card will encourage customers like Jack to buy more coffee.

(a) Show that Amy will make less profit from sales to Jack if he completely fills his loyalty card. [2]

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Amy decides instead that the customer will get a cup of coffee for a reduced price whenever they reach a box containing a star on their card. She decides to set the reduced price so that her profit from Jack will be exactly the same as usual if he now buys exactly 12 cups of coffee using the card.

(b) What price does Amy set for this offer? [2]

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(c) How much more profit than usual would Amy receive from Jack if he buys 15 cups of coffee using the card? [1]

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11 A delivery service sends text messages to all of the customers that are receiving deliveries that day so that they know what time to expect the delivery.

The expected delivery time is calculated by taking the total amount of time that will be required for all of the journeys between customers and adding 5 minutes for each of the previous deliveries.

The details of the deliveries that were made today are shown in the table below.

Delivery number	*Travel time from previous location (minutes)*
1	26
2	6
3	8
4	4
5	12
6	16

The delivery van left the depot at 08:00, so the customer for delivery 1 was sent a text message saying that the delivery was expected to arrive at 08:26.

Delivery number 5 was for Li.

(a) What was the expected arrival time for Li's delivery? [2]

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Sometimes deliveries are delayed. The company allows customers to log in to a website to get updated information about the delivery time. The company is able to track the position of the delivery van and uses this information to update the time.

Li logged in to the website at 09:25 to check the expected arrival time of his delivery and was given a time of 09:56.

(b) Which was the last delivery that the driver had completed? Justify your answer. [2]

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[Turn over for Question 12]

12 Sarah produces preserves to sell on a market stall.

Unfortunately, Sarah lost all the sales details for the day and needs to work out what she sold in order to complete her accounts.

Sarah does know the following:

- She took twice as many jars of honey as raspberry jam.
- She brought back 18 jars of honey, 7 jars of raspberry jam and 14 jars of marmalade.

(a) What can she deduce about the relationship between number of jars of honey and raspberry jam sold? [1]

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She also knows the following:

- She took 100 jars of preserves in total.
- Honey is sold for $5, raspberry jam is sold for $3 and marmalade is sold for $4.
- She had made $258 from sales.

(b) How many jars of each preserve did Sarah sell? [4]

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