Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

THINKING SKILLS **9694/11**

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.

[Turn over

1 In Mrs Wilson's geography class, the student who achieves the largest increase in their test score between any two consecutive weeks of term wins a prize.

	Week 1	Week 2	Week 3	Week 4	Week 5
Sandra	95	93	60	77	63
Alex	92	89	62	54	59
Petro	51	52	86	86	60
Dominic	45	48	59	49	80
Hayley	98	90	56	65	92

(a) Which student wins the prize? [1]

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The students suggest changing the system so that the prize winner is the student who achieves the largest increase in their test score across **three** consecutive weeks of term (for example, the difference between Week 2 and Week 4).

(b) Which student would win the prize using this system? [1]

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2   Donald hires a van for delivery jobs to various cities. The cost of hire is $90 per day plus the cost of the fuel he will use. The van can travel 6 km for each litre of fuel used and the fuel costs $1.20 per litre.

This week, Donald hires the van for three days for the following job:
- On Monday, Hondmarket to Targhill
- On Tuesday, Targhill to Kingburg
- On Wednesday, Kingburg to Hondmarket

The distances in km between cities are shown in the table.

Hondmarket			
153	Targhill		
212	245	Newton	
413	400	193	Kingburg

Donald picks up the van in Hondmarket on Monday and returns it on Wednesday (also in Hondmarket).

If he gets paid $600 for the whole job, how much profit will he make?   [4]

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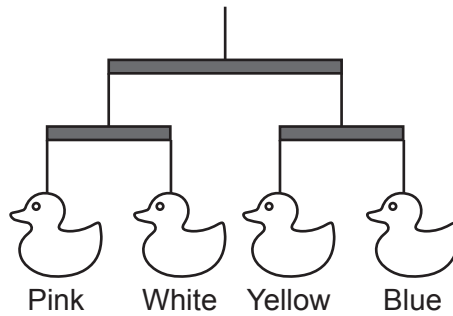...

3 Baby Lara has a mobile over her cot. It has four coloured ducks suspended by strings from wooden bars. The bars can rotate freely on the strings. The diagram shows a side view when all the ducks are in a line.

Pink   White   Yellow   Blue

Looking up when Lara woke up, she saw the mobile, from directly below.

(a) Give, on the diagram below, an example of an arrangement of the colours that she would **not** see. [1]

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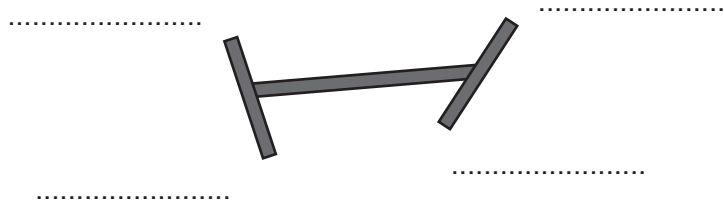
(b) How many arrangements of the four colours are possible with the bars as shown in **(a)**? [1]

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4 The Langtry Theatre has 40 rows of seats with 30 seats in each row, numbered consecutively. There is a central aisle between seats 15 and 16 of each row.

The ticket prices for the current production at the theatre are as follows:

front 10 rows $55 each

rows 11–40 $35 each

There is an overall discount of $10 when tickets for two seats next to each other in the same row and on the same side of the central aisle are purchased together.

All tickets for tonight's performance have been sold.

What is the smallest possible total income from ticket sales for tonight's performance? [3]

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5   Sylvie sells cakes. Small cakes cost $3 each, medium cakes cost $5 each and large cakes cost $7 each. Adam has $41 to buy 11 cakes for his work colleagues. He will buy the cakes from Sylvie and will spend all the money.

   (a) List all the possible combinations of cakes that Adam could buy.   [3]

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   Bernice intends to spend exactly $120 on cakes from Sylvie. She will buy twice as many small cakes as large cakes.

   (b) How many medium cakes will Bernice buy?   [2]

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6 Twelve teams are taking part in a football tournament at a stadium next Saturday. The twelve teams are arranged into four groups with three teams in each group. In each of the four groups, each team will play the other members of the group once. In the semi-finals, the winner of the first group will play the winner of the second group, and the winner of the third group will play the winner of the fourth group. The winners of these two matches will play in the final.

Each match will last for 20 minutes; but if the teams are level, they will continue to play for an extra 10 minutes. If they are then still level, the winner will be decided by the toss of a coin.

All of the matches will be played consecutively in the order: first group, second group, third group, fourth group, semi-finals, final. There will be a 15-minute break between each match. The tournament will start at 09:00.

(a) What is the earliest time that the tournament could end? [2]

Jimmy is a member of one of the teams in the tournament and he will play in all their matches.

(b) (i) What is the greatest length of time that Jimmy could need to be at the stadium? [1]

(ii) What is the latest time that Jimmy's first match could start? [3]

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7 Alex's computer has a strange fault. It performs calculations correctly, but, when it displays the calculation, every digit displayed is either one higher or one lower than the correct digit.

On Monday, the computer display showed a complete calculation as:

$$34 + 58 = 63$$

Alex realised that this could result from three possible correct calculations.

(a) What are the three possible correct complete calculations? [3]

23 + 49 = 72

25 + 47 = 72

25 + 49 = 74

On Tuesday, the computer display showed a complete calculation as:

$$67 \times 8 = 413$$

Alex realised that this could result from two possible correct calculations.

(b) What are the two possible correct complete calculations? [2]

56 × 9 = 504

58 × 9 = 522

8 Shopping is delivered to my house every week in plastic carrier bags. During each delivery, the person delivering my shopping will receive any bags that I return to them from past deliveries, up to a maximum number equal to the number of bags used for last week's delivery, or 25 bags, whichever is smaller. I receive 5 cents for every bag I return, and each week I return the maximum number of bags permitted.

The number of bags used to deliver my shopping, since I began having my shopping delivered, are shown in the table below. I could not return any bags in Week 1, as I did not have any.

Week	Number of bags
1	17
2	20
3	12
4	27
5	10
6	41
7	16

(a) How many bags do I have at home after Week 3's delivery? [1]

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(b) How many bags do I have at home after Week 7's delivery? [2]

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(c) How much money have I received in total so far for all of the returned bags? [2]

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9   In a game, each of the first seven letters of the alphabet (A, B, C, D, E, F, G) is paired with a number from 1 to 7, in some order. Each letter is paired with a different number.

Words are formed from these letters. The score for each word is the sum of the numbers that are paired with the letters in the word.

In one game, FEE scores 19, ACE scores 16 and CAB scores 10.

(a) (i)   Explain why F must be paired with 5.   [2]

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    (ii) What are the possible scores for the word CAD?   [2]

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The remaining letters of the alphabet are also paired with numbers as follows:

    H I J K L M are paired with the numbers 8 to 13, in some order

    N O P Q R S T are paired with the numbers 14 to 20 in some order

    U V W X Y Z are paired with the numbers 21 to 26 in some order

(b) What is the least possible score for the word ACUTELY?   [1]

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The word FOOT scores 56 and the word TOFFEE scores 57.

(c) Which number is T paired with? [2]

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10 A 180 g bag of *Sporties* contains a combination of chocolate basketballs and chocolate volleyballs. The total weight of chocolate in a bag is always at least 178 g and never more than 182 g. Each basketball is 11 g and each volleyball is 8 g. The total number of balls in a bag is always 19 or 20.

The bag of *Sporties* I bought last week contained 7 basketballs and 13 volleyballs.

(a) What are the other three combinations of basketballs and volleyballs that a bag of *Sporties* may contain? [3]

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The makers of *Sporties* intend to add footballs, weighing 9 g each, to the combination of balls in the near future. The weight of a basketball and a volleyball will not change and the total weight of chocolate in a bag will still be between 178 g and 182 g. The total number of balls in a bag will still be 19 or 20. There will be at least 5 of each type of ball in every bag.

(b) Find a combination of basketballs, volleyballs and footballs that will result in a different number of each type in a bag. [2]

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11 Peter, Kirsty and Laura all have some books.
Peter gives 2 of his books to Kirsty, and Kirsty gives 3 of her books to Laura.
Laura now has 8 more books than Peter and 1 more book than Kirsty.
Everyone has at least 1 book.

(a) What is the smallest total number of books there could be? [1]

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There are at most 100 books in total.

(b) What is the largest number of books that Kirsty could have now? [2]

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12 Wayne is driving from Burada to Orada. He still has 126 km to go, but he has stopped for a rest after driving for three hours.

He travelled 34 fewer kilometres during the second hour than during the first hour because of heavy traffic. As a result, he was 41 km short of halfway through his journey at the end of the second hour.

During the third hour he travelled 88 km.

How far did Wayne travel during the second hour of his journey? [3]

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