Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

4622705611

THINKING SKILLS **9694/13**

Paper 1 Problem Solving **October/November 2022**

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 **20** pages. Any blank pages are indicated.

1 Driving to work takes me 15 minutes, whereas walking the same route takes me 30 minutes.

If my average driving speed is 5 km / h greater than my average walking speed, how far away must my workplace be? [2]

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2 Sarah's dog Goldy eats the recommended 2.5% of his weight in food per day. However, he is overweight and so needs to reduce the amount of food he eats until he reaches a more healthy weight.

His new diet will be to eat 800 g of food each day, which is 2% of his current weight, until he has reached his target weight.

(a) What is Goldy's current weight? [1]

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After 3 months, Goldy has reached a healthy weight of 35 kg. Sarah increases Goldy's activity to make sure he does not become overweight again. She will now need to feed Goldy 3% of his weight each day to take into account the more active lifestyle.

(b) How much more dog food will Sarah need to buy each **week**, compared with when Goldy was on his 2% diet, to maintain this healthy weight? [2]

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3 When Nat visits his friend he travels by bus.

His nearest bus stop is at Delta Street, from where he can take a number 5 or a number 11 bus. These are the only two bus routes that serve Delta Street. Depending upon which bus he takes, he has to change to a number 7 at either India Road or Bravo Lane.

The relevant bus timetables are as follows:

5 Oscar Station → Kilo Market			
Oscar Station	07:00		22:45
Lima Gardens	07:08	and	22:53
Delta Street	07:12	every	22:57
Sierra Crescent	07:19	15	23:04
India Road	07:24	minutes	23:09
Charlie Avenue	07:29	until	23:14
Uniform Rise	07:35		23:20
Kilo Market	07:42		23:27

11 Foxtrot Precinct → November Place			
Foxtrot Precinct	07:30		22:30
Mike Grove	07:36	and	22:36
Delta Street	07:44	every	22:44
Romeo Drive	07:51	20	22:51
Echo Hill	07:59	minutes	22:59
Victor Close	08:06	until	23:06
Bravo Lane	08:15		23:15
November Place	08:21		23:21

7 Quebec Yard → Hotel Row			
Quebec Yard	07:00		22:30
Alfa Corner	07:04		22:34
India Road	07:11	and	22:41
Golf Course	07:18	every	22:48
Bravo Lane	07:23	10	22:53
Papa Bridge	07:30	minutes	23:00
Tango Park	07:36	until	23:06
Juliett Way	07:43		23:13
Hotel Row	07:48		23:18

His friend meets him at the Tango Park bus stop.

(a) What is the shortest time period between the scheduled arrival times of any two buses at Delta Street bus stop? [2]

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It is 14:17 and Nat is at Delta Street bus stop. He intends to board the first bus that arrives.

(b) Show that, by taking the second bus instead, he could arrive at Tango Park 10 minutes earlier. [2]

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4 Since just the date of birth is generally used for age it is possible for a person to be legally older than someone born over 24 hours earlier in another part of the world. The local time at a particular point in the year can vary from 14 hours ahead of GMT (e.g. in Samoa) to 11 hours behind GMT (e.g. in American Samoa).

What is the greatest difference between the actual times of birth for two people with the same date of birth? [1]

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5 A tribe has a tradition that the favourite child of a father is the youngest daughter, or, if there is no daughter, the eldest son. Mothers favour the eldest daughter, otherwise the youngest son. (Assume that there are no twins or deaths.)

(a) Give an example where the second child is the favourite of both parents at the same time. [1]

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(b) How many children does a family need to have before there might be a child who is never either parent's favourite? Give the simplest example. [1]

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Bonnie is the middle of three sisters, and they have three brothers. All six are or have been the favourite.

(c) How many of the children are younger than Bonnie? Explain your answer. [2]

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6 Six teams are taking part in a hockey tournament. Each team will play each of the other teams once.

(a) How many matches will there be? [1]

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In each match the teams play for 20 minutes. If the scores are equal after 20 minutes, they continue to play for a further 10 minutes. There is a 5-minute interval between each match.

Last Saturday the tournament started at 09:00 and ended at 17:10.

(b) In how many matches were the scores equal after the first 20 minutes of play? [3]

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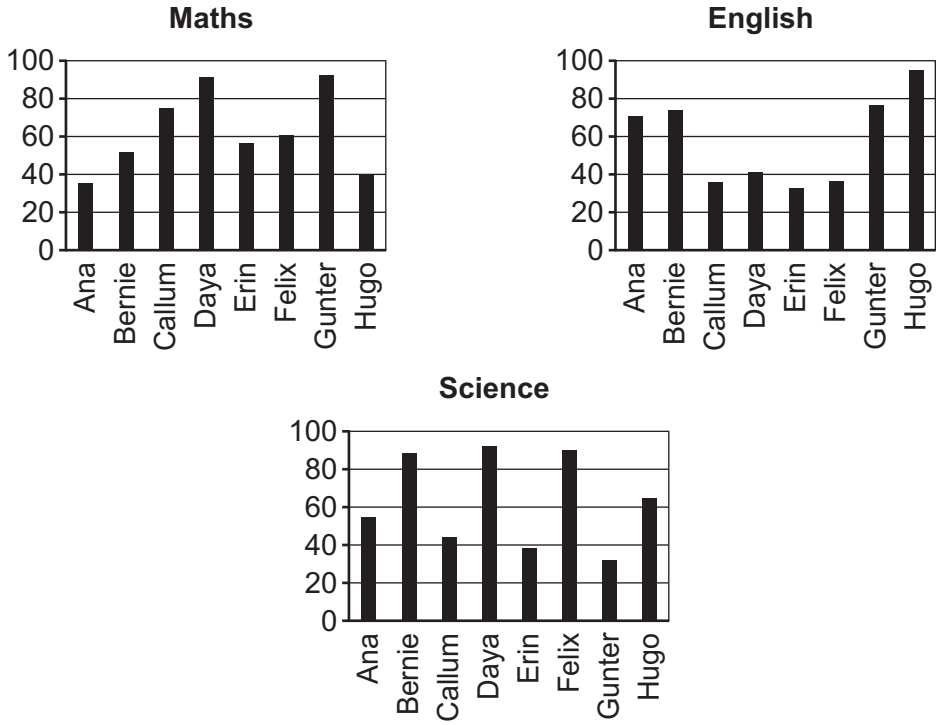
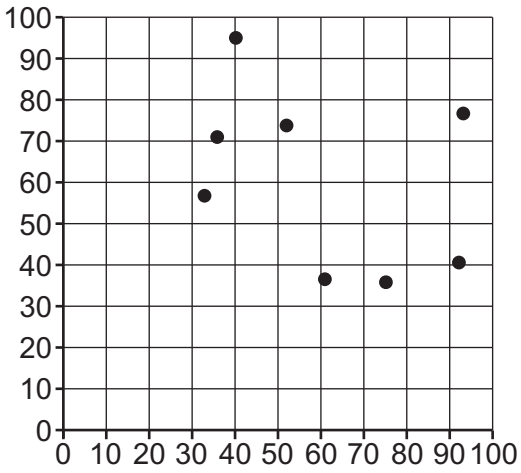
7 The graphs below show the examination scores for 8 students in 3 school subjects.



The head teacher tries to make a scatter plot for Maths and English, but neglects to label the axes.



He also accidentally interchanges one student's Maths and English marks.

(a) Which student's Maths and English marks have been interchanged on the scatterplot? [1]

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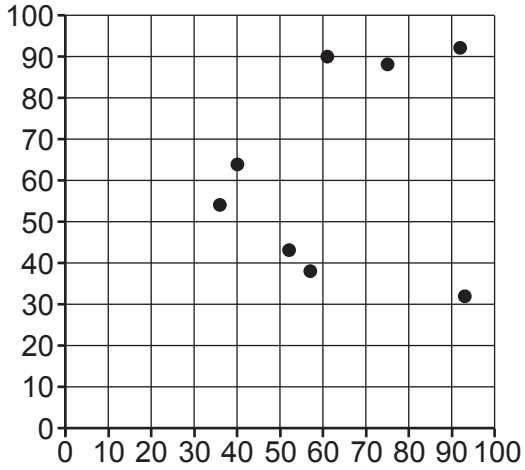
Next, the head teacher tries to make a scatter plot for Maths and Science, again neglecting to label the axes.



This time he accidentally interchanges two students' Science marks.

(b) Which two students' Science marks have been interchanged on this scatter plot? [2]

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8 Every sunny day, a plant increases in weight by 5 grams.
On days which are not sunny the plant decreases in weight by 3 grams.

Over a total of 16 days, overall the plant increased in weight by 8 grams.

How many sunny days were there? [2]

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9 The Swirler is a ride at the Bolandian Theme Park. The Swirler car starts from The Point, travels round a track and finishes back at The Point. The car can carry up to 12 people at the same time.

The car leaves The Point on the hour and every 6 minutes thereafter. The ride lasts for 5 minutes. Boarding and disembarking takes 1 minute.

Each day, the first ride on the Swirler begins at 10:00 and the final ride ends at 18:00.

(a) What is the greatest number of people who can ride on the Swirler each day? [1]

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The Swirler is very popular and at The Point there is always a queue of people waiting to ride.

When Jacob joined the queue at 10:20, there were already 53 people ahead of him in the queue.

(b) At what time did Jacob begin his ride on the Swirler? [2]

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Last Thursday, there were never more than 60 people in the queue when the Swirler left The Point.

(c) What is the latest time that a person could have joined the existing queue and been certain to ride on the Swirler that day? [1]

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On Saturdays, visitors can pay more and obtain a Priority Pass. This pass allows the visitor to jump to the front of the queue for the Swirler. At most two visitors with these passes are allowed on any one ride.

Last Saturday, Lee joined the queue for the Swirler at 11:27. He did not have a Priority Pass. There were already 72 people in the queue.

(d) What is the earliest time that Lee could be certain to begin his ride? [2]

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10 Every month the glass in a very large greenhouse must be cleaned. When the cleaning is undertaken by more than one person, each person works at the same rate as if they were working by themselves.

If Hans does it by himself it takes him 4 hours; Iago takes 5 hours, Nelson 6 hours and Zinedine 20 hours.

(a) How long will it take to clean the glass if Hans, Iago, Nelson and Zinedine all work together? [2]

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(b) Sheena joins the cleaning team and when she works with the other four it takes exactly 1 hour to clean the glass.

How long would it take Sheena to clean the glass by herself? [1]

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11 Gino is taking part in a 775 km walk challenge to raise money for charity. He will start his walk on Tuesday 1 August and he wants to finish on 31 August. He will walk 20 km on Wednesdays and 30 km on all other days except Saturdays, when he will have a day off. He will walk whatever distance is left on 31 August.

(a) How far will Gino need to walk on 31 August? [2]

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Kim is also taking part in the challenge. She will walk for 5 consecutive days, have a day off, walk for another 5 consecutive days, have a day off, and will continue with this pattern until she completes the distance. She will alternate between walking 25 km and 15 km on the days that she walks.

Kim starts her walk on Tuesday 1 August and walks 25 km.

(b) On what day and date will she complete the walk, and how far will she walk on the final day? [3]

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12 An office worker must post 30 letters. 10 letters will be sent 1st class, which costs 40¢ per letter. 10 letters will be sent 2nd class, which costs 25¢ per letter. The other 10 letters can be sent either 1st class or 2nd class.

The cost of the postage can be made up using any number of stamps. The office worker has the following numbers of stamps in stock to choose from.

Stamp value	*Stamps in stock*
40 cent	5
30 cent	4
25 cent	10
10 cent	10
5 cent	16

(a) The manager tells the office worker that he must use stamps to the exact value required for each letter.

What is the highest number of letters that could be posted? [3]

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(b) The office worker realises that he could send more letters if he ignores the manager's instruction and chooses to use stamps to a higher value than is necessary for some letters.

What is now the highest number of letters that could be posted? [2]

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13 Every week Li collects an entry fee of $3 from each of the attendees at his local games club.

Usually, most people pay using three $1 coins, but some pay with either a $5 or $10 note and require change. Since Li collects the money when everyone has arrived, he can usually give everyone the change that is needed from the money that is paid to him.

Two weeks ago 34 people attended the club and many of them paid with notes. This meant that Li did not collect enough coins to give everyone the correct change.

(a) What is the smallest number of people who might have paid with notes two weeks ago? [3]

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Li collected money from as many people as possible as long as he could give change. There were three people who did not pay, but who agreed to pay $6 the next time they attended. All three of these attended last week and each paid with a $10 note. There were again 34 attendees at the club.

Last week Li was able to give everyone the correct change from the coins that he collected last week.

(b) What is the largest number of people who might have paid with notes last week? [3]

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Today, when one person paying with a $5 note apologised for not having the correct change, Li claimed that it was useful as he would be able to use the $5 note when giving change to someone else paying with a $10 note and so would not run out of $1 coins as quickly.

(c) Explain why Li is wrong, using calculations to support your reasoning. [2]

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