Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

THINKING SKILLS **9694/11**

Paper 1 Problem Solving **October/November 2020**

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. Blank pages are indicated.

DC (CJ/SG) 188503/1

[Turn over

1 Four friends who live in different parts of the country are planning to meet next week, but have not yet decided where. Each of their possible meeting places is shown in the table below with the distance that each of the friends would have to travel to get there and the activities that are available.

Location	*Distance* (km)				*Swimming*	*Climbing*	*Walking*
	Bob	*Roger*	*Tanya*	*Vijay*			
A	43	25	36	41	Yes	Yes	Yes
B	13	36	24	17	Yes	Yes	No
C	41	12	17	16	Yes	No	Yes
D	35	27	29	12	No	Yes	Yes

None of the friends is willing to travel more than 40km to reach the meeting.

(a) Which of the possible locations will **not** be chosen for the meeting? [1]

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The friends decide that they will each vote for one activity that they wish to be able to do and the option that would satisfy the most friends will be chosen. (If there is no such option, then the location will be chosen at random.) They will still not choose any location that would require any of them to travel more than 40km.

(b) Tanya wishes for the meeting to take place at location B.

Explain why she should vote for swimming. [1]

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2 Isaac makes china mugs with names painted on them. He charges a fixed fee for the mug, together with a fixed charge for each letter in the name. Penelope buys a mug for each of her children, Alexander and Lucia. She pays $12.60 for Alexander's mug and $9.40 for Lucia's mug.

How much would Penelope have to pay for a mug with her own name on it? [2]

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3 At a particular car park the price for parking is based on the amount of time that the car will be parked for. The charge is 1¢ for every 2 minutes for stays of 3 hours or less. The charge is then 1¢ for every 3 minutes for any amount of time after that. Customers pay money into a machine which then issues a ticket for the amount of time that has been paid for. No change is issued.

Alexander is parking his car and needs to park for 2 hours 30 minutes, but only has a $1 coin.

How many additional minutes will Alexander pay for? [2]

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4 The Kennedys are going to buy a house in the village of Treeton. There are five houses for sale. Information about these houses is given in the following table.

House	*Number of bedrooms*	*Garage*	*Garden area in square metres*	*Distance to nearest store*	*Year built*	*Cost*
Beeches	3	Yes	100	2.9 km	1980	$525 000
Evergreen	5	Yes	210	2.2 km	2010	$625 000
Oakwood	4	No	300	0.5 km	1992	$505 000
Pines	4	Yes	50	1.0 km	1964	$499 000
Sycamores	3	No	120	1.8 km	2018	$475 000

The Kennedys would like a house built before 2000, with no more than four bedrooms. They would also like the house to have a garage, be no more than 3km from the nearest store, and to have a garden at least 100 square metres in area. They are prepared to compromise and will consider all houses that satisfy at least four of their preferences. If more than one house satisfies at least four of their preferences, they will insist on a garden of at least 100 square metres area and then opt for the one that costs least.

Which houses will the Kennedys consider, and which one will they buy? [3]

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5 Blue Island is a tourist attraction that can only be reached by ferry. Tourists may visit the island on any day but they must return to the mainland on the same day.

Ferries leave the mainland every 40 minutes.
The first ferry leaves at 09:00 and the last ferry leaves at 15:00.
Ferries leave Blue Island to return to the mainland at 11:00, 12:00, 13:00 and then every 30 minutes until 17:00.
The ferry journey in either direction takes 25 minutes.

Kenny catches the first ferry from the mainland to Blue Island after 12:00 and wants to spend at least three hours on the island.

(a) What is the earliest time that he can expect to arrive back on the mainland? [2]

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Each ferry can carry at most 30 tourists.

(b) Explain why not every ferry on any given day can carry a full load of tourists. [1]

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Last Monday each ferry carried at least 5 tourists.

(c) **(i)** What was the greatest possible number of tourists on Blue Island at 11:30? [2]

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(ii) What was the least possible number of tourists on Blue Island at 11:30? [2]

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6 All 136 members of the Oblainda Club are obliged to buy a ticket for the Club's Annual Dinner, costing $40, whether or not they attend. In addition, each member has the option to buy **one** guest ticket for $50. No guest may attend without the member who has bought the ticket.

183 people attended this year's dinner, including all the guests who had tickets. The total paid for tickets was $9140.

How many members did **not** attend this year's dinner? [3]

7 George works in an office entering data into a computer system. He can enter the information for 25 records in 1 hour and works for 4 hours each day from Monday to Friday, starting at 09:00.

The company that George works for has the option of sending George on a training course on Monday. If he goes on the course then he will not be able to enter any data that day but will be able to enter the information for 35 records each hour once he has been trained.

(a) If George goes on the training course, at what time and on which day will he have entered the same number of records as he would have done had he not gone on the course? [2]

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The company currently pays George $10.00 per hour but will increase his pay to $10.50 per hour if he attends the course. It costs $50 to send George on the course and the company will also pay George at his current rate of $10.00 per hour for the 4 hours that he spends on the course.

(b) How many records does George need to enter when he returns from the course for the company to have saved money by sending him on the course? [3]

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8 For security purposes I regularly change my six-digit passcode for internet banking. I always choose a code that is made up of three different two-digit square numbers (i.e. square numbers between 10 and 99), with the sixth digit the same as the first digit.

(a) Which **two** digits never appear in any of my passcodes? [1]

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(b) How many different passcodes can I use? [2]

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The sum of the six digits of my current passcode is also a square number.

(c) What is my current passcode? [2]

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9 Each week Carol, a candlemaker, has to send 216 candles to a candle seller. The candles are cubes with sides of length just less than 10 cm. She can pack them tightly into boxes that are 30 cm × 30 cm × 30 cm, or boxes that are 20 cm × 30 cm × 40 cm, or a combination of the two types of box. Carol can buy both types of box for $0.40 each.

Delivery charges are $5.00 for each 30 × 30 × 30 box and $4.60 for each 20 × 30 × 40 box. These delivery charges are fixed, regardless of how many candles are in the box.

(a) What is the least amount Carol must pay each week for boxes and delivery? [2]

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Carol's weekly order goes down to 200 candles.

(b) What is the least amount Carol must now pay each week for boxes and delivery? [3]

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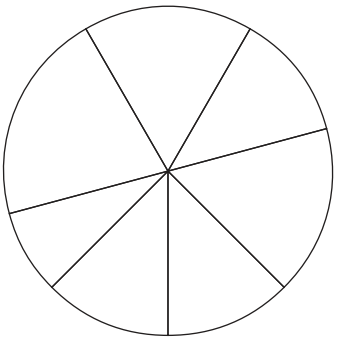
10 The number of cars sold at Bill's garage each day last week are represented in the pie chart below.



Bill has lost the labels to the pie chart, so he does not know which sector represents which day. However, he does remember that the days go in order around the pie chart, either clockwise or anticlockwise. He also remembers that he sold exactly 3 cars on each of Monday, Friday and Sunday.

(a) How many cars were sold on Wednesday? [2]

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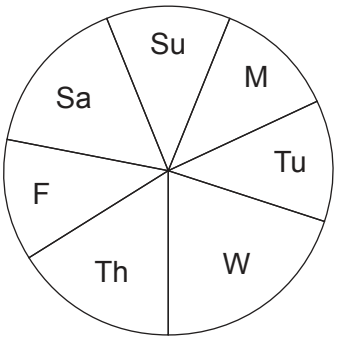
When Bill sells a car, he must pay to have it washed. The washing fee per car can vary from day to day, but is the same for all cars washed on any particular day. He makes another pie chart, this time with labels, to show the total fee he paid each day for car washing.



(b) On which day was the fee charged per car the greatest? [1]

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11 In a football league teams receive points according to the following system:

Win	6 points
Draw (with at least one goal)	3 points
Draw (with no goals scored)	2 points
Loss	0 points

The final matches of the season are to be played today. Every team in the league will be playing in a match today.

The points totals for the top four teams in the league are 98, 97, 96 and 96. All of the other teams have lower totals. Today's matches include a match between the teams that are currently first and second and a match between the teams that are currently tied in third place.

(a) It has been claimed that one team will definitely have more points than all of the others, once today's matches have been played, and so there will be a clear winner of the league.

Explain why this claim would not be true if any team in the league currently had a points total of 94. [2]

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(b) Explain why there cannot be a tie for first place involving two of the teams currently in the top four once today's matches are completed. [3]

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12 A display of lights contains three different colours of bulbs: red, blue and white. There are equal numbers of each colour of bulb. The amount of time that the bulbs stay on can be varied. However, the bulbs always come on according to the following pattern:

red bulbs come on every 2 seconds;
blue bulbs come on every 3 seconds;
white bulbs come on every 5 seconds.

Initially, the display is set so that all the bulbs flash momentarily when they come on.

All the bulbs flash at the same time at 12:00.

(a) How many **more** times will all the bulbs flash at the same time **before** 12:05? [2]

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The display is changed so that now the white bulbs stay on for 4 seconds when they come on (and therefore are off for 1 second before coming on again). The red and blue bulbs continue to flash as before.

All the bulbs come on at 13:00.

(b) What proportion of the bulbs are on exactly 8 seconds after 13:00? [1]

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The display is changed again. Now all the bulbs stay on for 1 second when they come on.

All the bulbs come on at 14:00.

(c) **(i)** For how many seconds during the first 30 seconds are no bulbs on? [3]

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(ii) For how many seconds during the first 30 seconds are exactly two bulbs on? [2]

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