Cambridge International AS & A Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

THINKING SKILLS **9694/11**

Paper 1 Problem Solving **May/June 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 **16** pages. Any blank pages are indicated.

[Turn over

1 Luc is organising a meeting for the managers of the local branches of his four stores. He has identified three possible locations in which he could hold the meeting. The prices for hiring each of the rooms and the total distances that each manager would have to travel are shown in the table.

Location	Price per hour ($)	Travelling distance (km)			
Riverside Hotel	18	8	6	14	9
Grand Hotel	20	9	7	8	10
Central Hotel	19	4	12	5	11

The meeting will last for 2 hours. Luc will pay the managers travelling expenses of $0.50 per kilometre.

(a) What would be the total cost for the meeting if Luc chooses the venue so that the furthest distance that any manager travels is as small as possible? [2]

....

....

....

....

....

....

....

....

(b) What would be the total cost for the meeting if Luc chooses the venue so that the total cost for the meeting is as small as possible? [1]

....

....

....

....

....

....

....

2 During the last two weeks, Julian organised a campaign to get the workers in his office to reduce the amount of waste that they produce each day. Normally they produce a similar amount of waste each day. He recorded the amount of waste, in grams, produced on each day in the table below.

Day	Mon	Tue	Wed	Thu	Fri	Sat
Week 1	460	236	261	243	249	350
Week 2	410	402	312	301	385	389

In week 1, Julian had run his campaign from Monday to Thursday. While the campaign had no effect on the first day, there was a large reduction in waste produced for the rest of the campaign and the day after the campaign had ended. The amounts of waste then started to increase again.

Julian ran the campaign again during week 2 and observed that similar changes in the waste produced occurred.

(a) On which day in week 2 did Julian start the campaign? [1]

....

....

....

....

(b) For how many days in week 2 did Julian run the campaign? [1]

....

....

....

....

3 The Flamingo Club is a club that raises money for charity. It has 203 members, each paying a membership fee of $15 per year.

On the 15th day of every month there is a prize draw, with one lucky member winning $30 for 1st prize, one winning $20 for 2nd prize and one winning $10 for 3rd prize. At the end of the year, all the remaining money from membership fees is donated to a local charity.

(a) How much money is donated to the local charity each year? [2]

....

....

....

....

....

....

The club decides that, from next year, they will have an additional New Year's Day bonus draw, on the 1st of January, with a doubling of the usual prizes. Members have been asked to pay $2 more each year.

(b) How much money will be donated to the local charity next year? [2]

....

....

....

....

....

....

....

....

....

....

4 The standard cost of my gym membership is $50 per week, which I have to pay in advance. However, to encourage more use of the gym, I get a refund (which is a whole number of dollars) for each day that I attend the gym. The refund is the same amount for each day that I attend the gym, and is not so large as to make it possible for the gym to pay me money for my membership. The gym is open 5 days every week.

During the last 10 weeks, I attended the gym for the same number of days each week and the overall cost for my gym membership was $360.

How much is the refund for each day that I attend the gym?   [2]

....

....

....

....

....

....

....

....

....

....

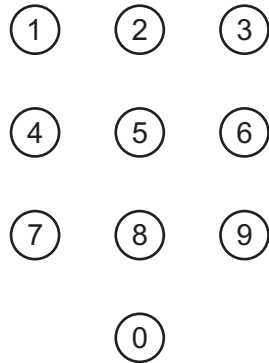...

5 Hackers can see mouse movements and clicks on Fred's computer, but not what is typed. He has been entering his PIN using the mouse as he thought it was more secure. To do this, he clicks the buttons on a PINpad displayed on the screen.

$$\textcircled{1} \quad \textcircled{2} \quad \textcircled{3}$$

$$\textcircled{4} \quad \textcircled{5} \quad \textcircled{6}$$

$$\textcircled{7} \quad \textcircled{8} \quad \textcircled{9}$$

$$\textcircled{0}$$

From the pattern of mouse activity the hackers can determine that his PIN might be 3296.

(a) What are all the other numbers that it might be? [2]

....

....

....

....

....

....

(b) Give one example of a PIN with 4 distinct digits whose pattern would give at least one more possible equivalent mouse pattern than 3296 has. [1]

....

....

....

....

....

....

6 The postage rate in Grendalia is 65¢ for letters up to 50 grams plus 4¢ for every extra 10 grams or part of 10 grams.

Pat wishes to send a letter weighing 117 grams. He has plenty of stamps, but their values are all 15¢, 12¢ and 2¢.

Assuming that Pat pays exactly the correct postage, what is the minimum number of his stamps that he will use? [3]

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

7 When customers arrive at a drop-in advice centre, they collect a ticket with a three-digit number: beginning each day with 001, 002, 003, etc.

Customers are seen in the order of their arrival. When an adviser is free, the next number is displayed and the customer with that number begins their appointment. That number remains on the display until the next adviser is free and the next number is displayed. An appointment lasts at least 5 minutes and no more than 10 minutes. No time is lost between customers and there are always enough customers to fill all the appointments.

All advisers start work at 09:00 and have a lunch break from 12:00 to 13:00.

Rachel visits the centre on Monday, when only one adviser is working, and she sees that the number 028 is displayed.

(a) What is the earliest time that Rachel could have arrived at the centre? [2]

....

....

....

....

On Tuesday, three advisers are working. When Sam arrives she takes her ticket.
It is number 052.

(b) What is the latest time that Sam's appointment could begin? [2]

....

....

....

....

On Wednesday, one adviser is working. When Tommy arrives he takes his ticket, which has the number 063. The number being displayed is 048.

(c) (i) What is the smallest number of minutes that Tommy could have to wait for his appointment to begin? [1]

....

....

(ii) What is the largest number of minutes that Tommy could have to wait for his appointment to begin? [1]

....

....

8 In the Pelfas Basketball League each player is given a 'recent performance rating' (RPR) once they have played three games during the current season.

The RPR is updated after each subsequent game and is the sum of the number of points scored by the player in the game just played and half the total number of points they scored in their previous two games.

Ged played his sixth game of this season today. He scored 18 points, which has increased his RPR from 34.5 to 37. He has now scored exactly 100 points so far this season, despite only scoring 8 points in his third game.

(a) How many points did Ged score in each of his previous two games? [3]

....

....

....

....

....

....

....

....

(b) What was Ged's first RPR this season? [2]

....

....

....

....

....

....

....

....

9 These are the daily timetables for the ferries that link the islands of Benbow, Livesey and Smollett.

Benbow ↔ Livesey journey time 53 mins each way	
Departures from Benbow	Departures from Livesey
07:45	08:05
10:15	10:35
12:25	12:45
14:40	15:00
17:10	17:30

Benbow ↔ Smollett journey time 44 mins each way	
Departures from Benbow	Departures from Smollett
08:10	08:30
10:25	10:45
12:40	13:00
14:55	15:15
17:20	17:40

Livesey ↔ Smollett journey time 72 mins each way	
Departures from Livesey	Departures from Smollett
09:10	09:30
11:25	11:45
13:55	14:15
16:15	16:35

(a) How many ferries are travelling between islands at 12:50 each day? [1]

....

....

....

....

....

(b) What is the shortest scheduled time interval between any two arrivals at Smollett during the day? [2]

....

....

....

....

....

....

....

....

....

....

I need to get from Smollett to Livesey as early as possible tomorrow, but I have just heard that the first ferry of the day tomorrow on this route has been cancelled.

The other routes will both be operating their full schedule.

(c) How much sooner can I get to Livesey tomorrow travelling via Benbow than if I wait for the 11:45 ferry from Smollett? [2]

....

....

....

....

....

....

....

....

(d) Assuming that they both travel at constant speed, at what time do the first two Benbow ↔ Smollett ferries of the day pass each other? [2]

....

....

....

....

....

....

....

....

10 The computer game *Gem Rush* involves collecting gemstones. A timer on the screen counts down from 120 seconds at the beginning of a game and the game ends when it reaches zero.

There are four types of gemstone to be collected:

- Diamonds, which score 10 points each
- Emeralds, which score 7 points each
- Sapphires, which score 3 points each
- Rubies, which do not score points, but each one adds 10 seconds to the timer

I played a game of *Gem Rush* yesterday and scored a total of 1490 points. At the end of the game the statistics displayed showed that the game had lasted for 1070 seconds and I had collected a total of 327 gemstones. I noticed that I had collected exactly the same number of emeralds as sapphires.

How many gemstones of each type did I collect in yesterday's game of *Gem Rush*? [4]

11 The first version of accountancy software provided figures with unwanted leading zeros. A correction was attempted, but unfortunately it removed all zeros. For example:

$000004708.08 was displayed as $478.8

The following table shows what was displayed for some items. All the items actually cost something between $999 and $9999.

Weland	$176.2
Xiland	$194.9
Yiland	$214.
Zeland	$4283.78

(a) What is the largest possible difference between the displayed amount for Yiland and the actual cost of that item? [1]

....

....

....

....

(b) What is the smallest possible difference (but greater than zero) between the displayed amount for one of these items and the actual cost of that item? [2]

....

....

....

....

....

(c) Vyland's actual cost is also between $999 and $9999. The difference between this and the amount displayed is the largest possible.

What is this difference? [1]

....

....

....

....

12 One length of the swimming pool at Uppetodray Leisure Centre is 30 metres.

Today Adam and Ben are swimming in neighbouring lanes in the pool. They are both swimming at constant speed, with Adam swimming each full length in 75 seconds and Ben swimming each full length in 50 seconds. They both started from the same end of the pool, but Adam had already swum 80 metres when Ben began.

(a) How long after Ben began did they first pass each other, swimming in opposite directions?

[3]

(b) What distance had they both swum when they had swum the same distance as each other?

[2]

13 A cable car has an average speed of 4.8 km/h on a trip up to the top of a hill and back down. The average speed for the section up the hill is 4 km/h.

What is the average speed for the section down the hill? [2]

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

BLANK PAGE