Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6716093707

THINKING SKILLS **9694/13**

Paper 1 Problem Solving **October/November 2021**

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 The table below shows the prices of insurance for a learner driver.

Calendar Months	*Price*
1	$90
2	$164
3	$240

This insurance only applies before the test is passed. At that stage it ends, with no refund given.

Alice has booked a test in four months' time. She thinks she is very likely to fail the test. If she does not pass, then she can take another test two months later.

(a) What are the four different total possible costs of insurance for all of the first four months? [2]

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Alice is considering two options for her insurance:

1) Pay for four months now, and pay for another two months later if she fails the test.
2) Pay for insurance for six months in advance.

(b) If she does fail the first test, which option is cheaper, and by how much? [2]

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2 A knitter needs two balls of yarn to knit a scarf 1.5 metres long, and three balls to knit a scarf 3 metres long.

How many balls of yarn will they need to be sure that they can knit a scarf 4.75 metres long? [1]

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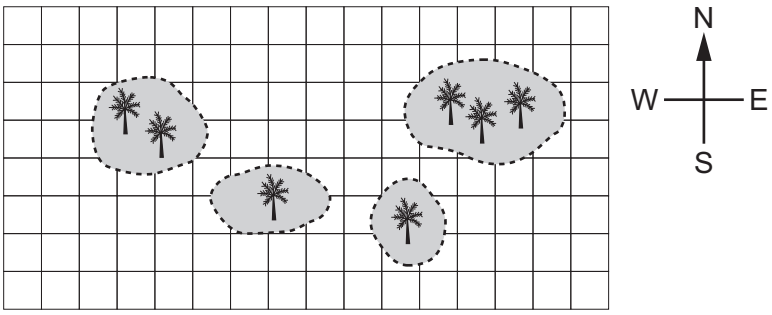
3 Blackbeard sailed due south across the ocean until he arrived at a beach on one of a small group of islands. Here he buried the treasure and then sailed off over the horizon due west into the sunset.

Show, by marking on the map below, all the parts of the coast or coasts where the treasure could be. [2]



4 The following table gives information about the classes held at Shane's gym.

Type of class	*Length (minutes)*	*Start times*	*Days available*	*Cost per session*
Spin	40	10:00, 11:00, 14:00, 15:00, 17:00	Monday, Wednesday, Friday	$9
Aerobics	45	12:00, 13:15, 14:30	Monday, Tuesday, Wednesday	$12
Pilates	60	10:00, 11:30, 13:00, 14:30	Every day	$15
Zumba	30	11:00, 13:00, 15:30	Tuesday, Friday	$8

All classes start on time. Anyone who wishes to do more than one class needs to allow 20 minutes between the end of one class and the beginning of the next class.

Annabel wants to do a Spin class and a Zumba class next Friday. She can start her first class any time after 10:30.

(a) (i) If Annabel does the Spin class first, what is the earliest time that she will be able to leave Shane's? [1]

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(ii) If Annabel does the Spin class first, what is the shortest possible time between her arriving at and leaving Shane's? [1]

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Annabel thinks that if she does the Zumba class first she will spend less time at Shane's.

(b) Show that Annabel is correct in her thinking. [2]

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Belinda intends to visit Shane's one day next week. She wants to do three different classes and she wants the total cost to be as small as possible.

(c) Which day should she choose, and how much will it cost her? [1]

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Charlie will visit Shane's next Friday. She will do three different classes but she cannot arrive before 10:30.

(d) (i) Explain why Charlie cannot do the classes in the order Zumba, Spin, Pilates. [2]

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(ii) Charlie wants the least possible time between the beginning of the first class and the end of the third class.

What is the least possible time that she can be at Shane's? State which classes she should choose. [2]

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5 A shop has three different offers on its video games. These offers are shown in the following table.

Offer	*Details of the offer*
X	Buy 3 games, get the cheapest one at half-price
Y	Buy 2 games, get the cheaper one at half-price
Z	Buy 1 game, get any second game for $11

Carrie wishes to buy four games which cost $12, $16, $20 and $26.

(a) What is the least amount that Carrie will need to pay? Show how this is achieved. [2]

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Bill wishes to buy three games. Using offer Z, the least that Bill could pay in total is $39.

(b) What is the combined cost of the two cheapest games that Bill wishes to buy? [1]

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Using offer X, Bill would pay $42 in total. Using offer Y, the least that he could pay in total is $40.

(c) What are the costs of each of the three games that Bill wishes to buy? [2]

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6 Clive has decided to paint three rooms in his house. He will need 10 litres of red paint for one of the rooms, 12 litres of pink paint for another room and 16 litres of orange paint for the final room.

Paint is sold in 2 litre tins and normally costs the same for any colour. However, there is a special offer on red paint, reducing the price of each tin by $3. Clive is considering buying red, white and yellow paint and then mixing it to make the pink and orange paint that he needs.

He will make the pink paint by mixing red and white paint in the ratio 2 : 1.
He will make the orange paint by mixing equal quantities of red and yellow paint.

How much money will Clive save by doing this instead of buying red, pink and orange paint? [3]

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7 Every morning from Monday to Friday Chris buys a bottle of water, a packet of tuna sandwiches and a packet of plain crisps from the local shop. The amounts that he spent on each day in the last two weeks are shown in the table below.

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	$2.80	$2.80	$2.80	$2.60	$2.60
Week 2	$2.90	$2.90	$2.00	$2.20	$2.20

The individual full prices of the items have not changed, but there have been offers in place on some of the days:

In the first week bottles of water were half price.
From Wednesday to Friday of the second week packets of sandwiches were half price.
Packets of crisps were reduced in price by the same amount on five of the ten days.

(a) Which was the first day on which packets of crisps were reduced in price? [1]

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(b) If there were no offers in place on a particular day, what would be the full price for Chris's items? [2]

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8 In the game of *Snoobill*, points are scored by hitting coloured balls. A player continues making attempts until they either fail to hit a ball, hit a ball of a colour they have already hit, or have succeeded in hitting all of the different colours.

A red ball scores 1 point, orange 2, yellow 3, green 4, blue 5, violet 6 and black 7. A player's total score is obtained by adding the points for each colour of ball they have hit.

(a) What is the largest total score a player can achieve? [1]

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Suppose a player hits 3 colours and scores a total of 12 points.

(b) List all the different combinations of the colours of the three balls that would give this score of 12 points. [2]

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In one game Al and Bert each hit 3 colours, but Al's total score was 11 points greater than Bert's. One of the colours Bert hit was yellow (3 points).

(c) Which colours did Al hit? [2]

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9 A local shop sells spring water in bottles of three different sizes. The sizes and prices of the bottles are shown in the following table.

Bottle size	1 litre	2 litres	5 litres
Price	$8	$15	$35

There is a special offer: any 4 bottles of the same size for the price of 3.

(a) What is the least possible cost of buying 5 litres of this water? [1]

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(b) What is the least possible cost of buying exactly 15 litres of this water? [2]

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(c) How could 15 litres of this water be obtained more cheaply from this shop? [1]

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10 Buses run regularly between Garton and Hendy.
They leave Garton on the hour and at 30 minutes past the hour from 07:00 until 22:30.
They leave Hendy at 10 and 40 minutes past each hour from 07:10 until 22:10.

The journey in either direction takes 75 minutes. When a bus arrives at Garton or Hendy, it leaves again for the return journey after a break of at least 5 minutes and it becomes the next bus in the other direction. No other buses travel between Garton and Hendy.

(a) At what time will the 07:00 bus from Garton to Hendy leave Garton for the second time? [1]

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(b) How many times in a day will the bus that makes the 07:00 journey from Garton to Hendy leave Garton? [1]

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Bill is driving the 08:40 bus from Hendy to Garton.

(c) How many buses will he pass that are travelling from Garton to Hendy? State the times that these buses leave Garton. [2]

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(d) How many buses are required to provide the return bus service between Garton and Hendy? Explain your answer. [2]

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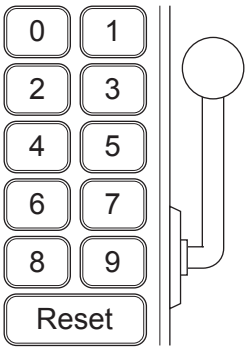
11 A box for the secure storage of keys has 11 buttons: digits 0–9 and Reset.



The box is opened by pressing Reset, entering a code and then pulling a lever. The code must have between one and five different digits (inclusive).

The physical mechanism used means that it is not possible to press both of a pair of digits on a row, and the order in which the digits are pressed does not make any difference.
This means that Reset 1 9 2 7 and Reset 1 2 7 9 are the same, but Reset 1 9 2 8 is not possible.

(a) How many 5-digit codes are there? [1]

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(b) How many different codes are possible? [3]

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(c) Give one reason why the makers recommend selecting 3- or 4-digit codes rather than 5-digit ones. [1]

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12 On a shopping trip, Mr Alexander took with him twice as much money as Mrs Alexander took with her. During the trip, Mrs Alexander spent twice as much money as Mr Alexander spent. When they returned home, Mr Alexander had three times as much money left as Mrs Alexander did.

(a) If Mr Alexander spent $7, how much money did Mrs Alexander return home with? [2]

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(b) If Mrs Alexander returned home with $33, how much money did Mr Alexander spend? [1]

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