



Cambridge International AS & A Level

CANDIDATE
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THINKING SKILLS

9694/12

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.

- 1 The direct distances in kilometres between six different towns are given in the table below. A dash indicates that there is no direct route available and the journey must be made via other towns.

	Anglemouth	Bournemouth	Covenham	Doncatry	Eppington
Bournemouth	4				
Covenham	10	7			
Doncatry	–	9	5		
Eppington	8	10	11	14	
Farmley	16	–	7	8	10

- (a) What is the total distance for the shortest possible route from Anglemouth to Doncatry? [1]

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- (b) What is the total distance for the shortest possible route from Bournemouth to Farmley? [1]

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2 In the TV Game Show *Guesswork* the aim is to score as few points as possible.

In one round of yesterday's show, the seven contestants had to guess the number of pebbles in a box. Each contestant scored the difference between their guess and the correct number.

The guesses, in the order they were given, were: 272, 236, 352, 298, 247, 283 and 334.

The two closest guesses both scored 18 points.

How many pebbles were there in the box? [2]

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3 Information about the courses offered by a language college is given in the following table.

<i>Course</i>	<i>Days available</i>	<i>Duration (minutes)</i>	<i>Number of sessions in course</i>	<i>Cost per session</i>
French	Monday, Tuesday, Wednesday	60	12	\$40
German	Every day except Wednesday	90	10	\$60
Mandarin	Tuesday, Friday, Saturday	45	18	\$45
Russian	Every day	75	15	\$50
Spanish	Monday, Wednesday, Friday	40	20	\$25

The college is open from Monday to Saturday each week. All sessions begin at 10:00. Students attend one session each week for the duration of their course.

Freddie wants to do a course in each of two different languages. He has \$1200 to spend.

(a) List all the pairs of courses that he can afford to attend. [2]

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George and Hetty want to attend the same course.

George cannot attend courses on Tuesdays or Thursdays. He does not want to spend more than \$750 and he wants the course to be no more than 15 hours total duration.

Hetty does not want to study Spanish. She cannot attend courses on Wednesdays or Saturdays and she wants each session to be less than 75 minutes in duration.

(b) Which course(s) can George and Hetty take, and on what day(s)? [2]

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The college is offering a reduction of 25% for two people booking for the same course on the same day.

(c) Would this offer change your answer to part (b)? Justify your answer. [1]

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4 A company packs 1000 kg of sardines per day into tins. Each tin contains between 125 g and 160 g of sardines, depending on the size of the fish. The tin is then topped up with vegetable oil to make the total weight, including the tin, to be 180 g.

(a) What is the maximum number of tins that can be packed in a day? [2]

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(b) The weight of one tin is 15 g.
What is the minimum weight of vegetable oil that could be used in a day? [2]

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- 5 Gregory is looking at an old calendar of a year that is not a leap year. In particular he is examining what day of the week each month begins on.

He remembers the following rhyme:

‘Thirty days have September,
April, June and November.
All the rest have thirty-one,
Except February, it’s a different one,
it has 28 days clear,
and 29 each leap year.’

- (a) He notices that there is one other month that starts on the same day of the week as April. Which month is that? [1]

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- (b) Three months all begin on the same day of the week. Which are they? [2]

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6 At a small medical centre, with only one doctor, each appointment lasts at least 5 minutes and at most 10 minutes. Each day the doctor works from 09:00 to 18:00 with a one-hour lunch break from 13:00 to 14:00. He also takes two 15-minute tea breaks, one at any time between 09:00 and 13:00 and one at any time between 14:00 and 18:00.

(a) What is the greatest number of appointments that the doctor could have in one day? [1]

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New regulations are introduced and the doctor is now allowed to have no more than 60 appointments in a day.

(b) Assuming that all appointments are taken, what is the earliest time that the doctor could finish his final appointment of the day? [2]

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Yesterday, the doctor's final appointment (his 60th) ended at exactly 16:30. All his appointments lasted either exactly 5 minutes or exactly 10 minutes.

(c) What are the two possible combinations of 5- and 10-minute appointments that the doctor could have had? [3]

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- 7 In my wallet I have some \$5 notes, along with 6 times as many \$1 notes, as well as some \$10 notes. Altogether, I have \$200.

How many \$10 notes do I have?

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- 8 A spelling test has been taken by all children in the English counties, and the published average scores rounded down. Some of the differences between the scores of counties are not considered to be significant.

Agatha has worked out that the method used to decide if a difference was significant or not was to allow a range either side of the published figures: ± 2 for large counties, ± 3 for medium, and ± 4 for small. If the two ranges overlap then the difference was deemed not significant.

For example, 503 ± 4 and 509 ± 2 could both be samples with average score of 507, and so not significantly different, but 504 ± 2 and 509 ± 2 are significantly different as there is no overlap.

- (a) (i) What is the smallest difference between two scores that could be considered significant? [1]

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- (ii) What is the largest that might not be? [1]

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Policy makers were surprised to be informed that there was no significant difference between D and A, nor between D and B, nor between D and C; yet C was significantly better than B and B was significantly better than A.

B is a medium-sized county.

- (b) What is the smallest possible difference between the published figures for A and C if they are not counties of the same size? [1]

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9 The charges per night at the Windmill Hotel are shown in the following table.

<i>Night of the week</i>	<i>Charge per night</i>
Monday, Tuesday, Wednesday, Thursday or Friday	\$100
Saturday or Sunday	\$120
<i>Discounts</i>	
10% per night for any block of 3 consecutive nights*	
15% per night for any block of 5 consecutive nights*	
*Each night can be discounted only once	

Pedro stays at the Windmill Hotel for 4 nights from Tuesday to Friday inclusive.

(a) What is the total charge for Pedro's stay? [1]

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Juan stays at the Windmill Hotel for 7 nights from Saturday to Friday inclusive.

(b) What is the least possible total charge for Juan's stay? [2]

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The hotel manager now decides that he will not allow any discount on the charges for a Saturday night stay. The discounts for 3 and 5 consecutive nights still apply, so long as the consecutive nights do not include a Saturday night.

Sasha arrives at the Windmill Hotel on a Tuesday and stays for 15 consecutive nights.

(c) What is the least possible total charge for Sasha's stay? [3]

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11 A shop sells envelopes for \$1 each. By mistake, the shop makes two different offers available on this product:

Offer 1: Six envelopes for the price of 5

Offer 2: Ten envelopes for the price of 8

The manager decides that a customer may use either offer, but not both.

(a) Show that, if 15 envelopes are purchased, the cheapest price is the same using either offer. [2]

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Colin buys a number of envelopes, choosing to use Offer 1 as it gives him the cheapest price.

(b) State all the possible numbers of envelopes that Colin might have bought. [2]

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- 12 A bus driver switches off the engine and reads her book whenever her bus arrives at a bus stop before the time when it is timetabled to leave that stop. At the timetabled leaving times, she puts away her book and drives on. If she arrives at a bus stop after the timetabled time, she omits the stop (does not stop there).

Here is part of the bus timetable:

<i>Bus stop</i>	<i>Leave</i>
Bus station	10:35
Wallaby Road	10:42
Kangaroo Street	10:51
Wombat Avenue	11:03
Camel Lane	11:09
Railway station	11:20

On Monday, the bus left the bus station on time and took exactly 7 minutes to get from each stop to the next one.

- (a) How many minutes did the driver spend reading between leaving the bus station and leaving the railway station, and which bus stop did the bus omit? [2]

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On Tuesday, the bus took exactly 6 minutes to get from each stop to the next one, but left the bus station 5 minutes late.

- (b) How many minutes did the driver spend reading between leaving the bus station and leaving the railway station, and which bus stops did the bus omit? [3]

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On Wednesday, the bus took exactly 5 minutes to get from each stop to the next one, and the driver spent a total of 13 minutes reading between leaving the bus station and leaving the railway station.

- (c) At what time between 10:35 and 11:00 did the bus leave the bus station? [2]

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[Turn over for Question 13]

13 The path around the lake in West Park is popular with joggers, including Ali, Kim and Viv. A complete circuit is 600 metres.

Ali is running at a constant speed of 4 metres per second.

Kim is running at a constant speed of 2.5 metres per second in the same direction as Ali.

Viv is running at a constant speed of 3.5 metres per second in the opposite direction to Ali.

Momentarily they are side by side, passing each other.

How long will it be before all three of them are next side by side? [3]

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