



Cambridge International AS & A Level

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THINKING SKILLS

9694/11

Paper 1 Problem Solving

May/June 2024

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 some questions, if you do not show your working, full marks will not be awarded.

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 A public library has 5 computers, each of which can be booked for 20-minute slots. The library is open from 09:15 to 12:30 and from 13:15 to 16:30 each day. The computers are checked in the final 25 minutes of the day and cannot be booked during that time.

What is the maximum number of 20-minute slots that could be booked in one day? [2]

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2 A car rental company offers luxury sports cars for hire. The customer is charged a standard \$700 per day, plus \$5 for every kilometre travelled during the hire period.

(a) A customer hired a sports car for 2 days, costing her \$1750.

How many kilometres did she drive over the 2 days? [2]

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The car rental company is changing its pricing system. The standard charge will be \$1000 per day, but there is no extra charge for the first 100km travelled.

There will also be a charge for every kilometre travelled beyond 100 km; this will be set such that the total price for a distance of 150km travelled during a one-day hire period will be the same under the new system as the old one.

(b) For what range of distances up to 100km, for a one-day hire, will the new pricing system make less profit than the old one? [1]

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(c) What charge per kilometre will be set? [1]

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- 3 An orchestra is putting on a concert. The concert will consist of two halves with an interval in between. The orchestra will play a total of eight pieces of music, four in each half. The pieces can be played in any order. The usual duration of each piece is shown in the table.

<i>Piece</i>	<i>Duration in minutes</i>
A	20
B	11
C	5
D	14
E	6
F	10
G	15
H	9

There will be a gap of 2 minutes between each piece in each half and the interval will last 25 minutes. The concert will start at 19:30.

- (a) At what time will the concert end? [2]

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- (b) Give an example of how the pieces can be split between the two halves so that each half has the same duration. [1]

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This week, the orchestra will be led by two guest conductors, Sam and Tom. Sam will conduct four pieces in the first half and Tom will conduct four pieces in the second half. It is known that when Sam conducts, the duration of a piece will be 5% less than its usual duration. When Tom conducts, the duration of a piece is 10% longer than its usual duration.

Suppose that the pieces are played in the order A, B, C, D, E, F, G, H.

(c) How much longer or shorter than usual will the concert last? [2]

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Suppose now that the pieces can be played in any order.

(d) What is the maximum possible duration of the concert, when Sam and Tom conduct? [2]

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- 4 The river Meshat is 376 km long. The river starts at Swanley and reaches the sea at Waverley. There is a footpath alongside the river, so people can walk from Swanley to Waverley. It is also possible to travel along the river in a rowing boat.

Andy plans to walk the whole length of the footpath, starting at Swanley on Monday 1 March. He will walk 16 km each day, except on Sundays, when he will rest.

- (a) On what date will Andy arrive in Waverley? [1]

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Andy's friend Matt plans to row his boat from Swanley to Waverley. He will row 24 km each day, including Sunday. He plans to arrive in Waverley on the same day as Andy.

- (b) On what date should Matt leave Swanley? [2]

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- 5 Mavis is forgetful, but the things that she does remember are correct. Last weekend, she took between 3 and 5 of her grandchildren shopping to between 2 and 4 shops. In each shop she bought between 1 and 3 items, each of which cost between \$12 and \$25. She bought each accompanying grandchild an ice cream that cost between \$1 and \$2. (All of the ranges of numbers she remembers are inclusive.)

What is the largest amount per grandchild that she could have spent? [2]

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- 6 In the TV quiz *Venture*, each contestant is asked a maximum of 50 questions. Every correct answer scores 5 points, but 2 points are deducted for every question ‘passed’ (not attempted). There is no penalty for an incorrect answer, except that if a contestant gives a fifth incorrect answer, their score is frozen and they receive no further questions.

The winner of yesterday’s quiz was Sally, despite having her score frozen at 157 when she gave an incorrect answer to question number 42.

- (a) How many questions did Sally answer correctly? [2]

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Runner-up Darius was the only contestant yesterday who survived all 50 questions without having his score frozen. Nevertheless, Sally beat him by one point.

- (b) How many of his 50 questions did Darius ‘pass’? [2]

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7 On a shopping trip, each of five friends bought something and spent a whole number of dollars. Angela spent \$5 more than Katie, Katie spent \$4 more than Harry, Harry spent \$2 more than David, and David spent \$1 more than Clive.

(a) What is the smallest **total** amount of money that could have been spent? [1]

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(b) If more than \$100 was spent in total, what is the smallest amount of money that Katie could have spent? [2]

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(c) If Katie spent twice as much as David, how much was spent in total? [2]

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- 8 In a diving event, competitors are given a mark out of 10 by each of two judges. The difficulty of a dive is rated on a scale from 1 to 5 in steps of 0.5 (so 1, 1.5, 2, ...). The score for a dive is the sum of the two judges' marks multiplied by the difficulty rating.

Last Saturday, eight divers took part in an event. Some of the information about the scores is given in the following table.

<i>Competitor</i>	<i>Judge 1</i>	<i>Judge 2</i>	<i>Difficulty rating</i>	<i>Score</i>
Ari	6	5	4	
Beryl	8	6	3.5	49
Chris	8	8	4.5	
Dodi	6	6	4	
Ellen	9	9	3.5	
Frank	10	9	3	
Gio			4	60
Hassam	7	7	5	70

- (a) What are the possible marks that Gio was awarded by the judges? [1]

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- (b) Which competitors came 1st, 2nd and 3rd? [1]

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1st

2nd

3rd

This Saturday, seven divers took part in the event. Each diver had two dives. The scoring system was unchanged and each diver's final score was the sum of the scores for each of their two dives. Most of the information about the scores is given in the following table.

<i>Diver</i>	<i>Score for first dive</i>	<i>Second dive</i>				<i>Final score</i>
		<i>Judge 1</i>	<i>Judge 2</i>	<i>Difficulty rating</i>	<i>Score</i>	
Iona	48	6	5	4	44	92
Jake	55	10	7	4	68	123
Kiran	51	6				
Lee	56	8	6	4.5	63	119
Meg	72	7	7	3.5	49	121
Nora	44	5	8	4	52	96
Olly	54	4	10	5	70	124

Kiran came 6th in the event. The difficulty rating of his second dive was a whole number and no divers had the same final score.

(c) What are the possible marks that Judge 2 might have awarded Kiran? [3]

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- 9 In a game, the two players start with 5 marbles each. They take turns to be the 'hider' and the 'guesser'.

The hider conceals any number of marbles from 0 to 5 in their hand, and the guesser guesses how many there are. If the guesser guesses correctly, the hider must give all the marbles in their hand to the guesser. If the guesser guesses wrongly, they must give the hider the difference between their guess and the correct number of marbles.

A player wins the game once they have all 10 marbles. If the guesser does not have enough marbles to give to the hider, the hider wins the game.

- (a) Describe all the ways in which a player could win the game in the first turn. [2]

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Joe and Sara played the game and the first three turns went as follows:

- In the first turn, Joe hid 2 marbles and Sara guessed 3.
- In the second turn, Sara hid 1 marble and Joe guessed 4.
- In the third turn, Joe hid 1 marble and Sara guessed 1.

- (b) How many possible combinations of hiding and guessing numbers would lead to Sara winning the game in the fourth turn? [3]

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- 10** Ben is planning to buy a magazine that will be published every Monday for the next 27 weeks. The first issue will cost \$3 and then the remaining issues will cost \$10 each.

Ben currently has \$65 saved and only adds money to his savings every 4 weeks, just after he has been paid. The next time that he will be able to add to his savings is on the Friday before the fourth issue is published. He will then add the same amount to his savings every 4 weeks after that.

What is the smallest amount that Ben could add to his savings every 4 weeks so that he can buy every issue on the day that it is published? [3]

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11 Twins Pru and Simon both put 50¢ coins and 20¢ coins into jars on each of the thirty days of April.

Each day Pru put at least three 50¢ coins into her jar and at least two 20¢ coins more than the number of 50¢ coins. Simon added a total of at least \$2.70 to his jar each day.

(a) (i) What is the smallest possible total number of coins that Pru could have put into her jar during April? [1]

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(ii) What is the smallest possible total number of coins that Simon could have put into his jar during April? [1]

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At the beginning of May they combined the contents of their jars and weighed them. They found the total weight of the coins to be exactly 6000 g.

50¢ coins weigh 12 g and 20¢ coins weigh 8 g.

When they counted the coins they discovered that they had exactly 100 more 20¢ coins than 50¢ coins.

(b) What was the total amount the twins saved during April? [3]

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12 My bank records a reference for each transaction, but the online statement and the printed statement are displayed differently. The printed statement forces the first letter into upper case and the rest to lower, for example turning a4tuNE into A4tune. Even more annoyingly, it uses a font for the printed statement in which the digit one, lower case L and upper case i are indistinguishable.

How many different references could result in the printed version being shown as 'III'? [2]

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[Turn over for Question 13]

13 In a college of 100 students, three different cards are used: a sports card, a dinner card and a library card. Each card gives access to a different building.

Exactly five students have none of the cards.

Exactly five students have all three cards.

Every student who has a sports card also has a dinner card.

Every student who has a library card also has at least one other card.

A teacher claims: 'There are more sports cards than any other kind of card.'

(a) Explain how you can be sure that the teacher is incorrect. [1]

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Another teacher claims: 'There are more dinner cards than any other kind of card.'

(b) Explain why you cannot be sure whether the teacher's claim is true or false without further information. [2]

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