Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

THINKING SKILLS **9694/12**

Paper 1 Problem Solving **October/November 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 **20** pages. Any blank pages are indicated.

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[Turn over

1 Callum lives in Gallows End and often goes for a drive in the surrounding rural area. Each pair of local villages is connected by one road between them. The lengths of these roads, in kilometres, are shown in the table below.

	Blackstock	Effington Edge	Gallows End	High Ketteridge
Blackstock		4	3	2
Effington Edge	4		1	6
Gallows End	3	1		5
High Ketteridge	2	6	5	

(a) How many roads connect these 4 villages? [1]

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Callum starts at Gallows End and travels to each of the other villages once before returning home. He will drive only on the roads between the villages and wants to take the longest route.

(b) How far will he drive? [1]

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2 The local sports club has a squash court which members can hire. Each slot for which the court can be hired lasts for 15 minutes, but it is possible to hire the court for several slots in a row.

The price to hire the court is different for different periods of the day.

Between 08:00 and 14:00, the price is $5 per 15 minutes.
Between 14:00 and 18:00, the price is $7 per 15 minutes.
Between 18:00 and 22:00, the price is $6 per 15 minutes.

(a) What is the cost to hire the court from 13:30 until 14:15? [1]

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Tanya booked the squash court for 1 hour. The cost was $26.

(b) What are the two possible start times for the booking? [2]

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3 Jenny has a recipe for fruit salad which contains six ingredients. The ingredients, the quantities needed and the prices at which they can be bought are given in the table. They can only be bought in the amounts stated.

Ingredient	*Quantity required*	*Price*
Pineapple	2	$3 each
Orange	1	$2.50 for 4
Grapes	200 grams	$5 for 400 grams
Strawberries	300 grams	$2.25 for 200 grams
Blueberries	125 grams	$1.50 for 100 grams
Sugar	100 grams	$1.75 for 500 grams

This recipe makes one dish of fruit salad and serves 8 people.

Jenny is hosting a party and she will make fruit salad for 32 people. She needs to buy all the ingredients.

(a) How much will Jenny have to pay, in total, for these ingredients? [2]

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Two friends are each making one dish of fruit salad. They already have most of the ingredients, but still need to buy strawberries and blueberries. They realise that they can save money by buying them all together as one purchase.

(b) How much money can they save by doing this? [2]

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Karin is making one dish of fruit salad and she needs to buy all the ingredients. She decides to save on costs by adapting the recipe: she will use any combination of strawberries and blueberries, as long as their combined weight is the same as in the recipe.

(c) How much money can Karin save by doing this? [1]

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4 Carol checks data entry sheets on a computer and is paid for each item that she checks.

It takes Carol 40 seconds to complete each item and she is paid 25¢ per item.

Carol discovers that, by using a large monitor rather than her usual screen, she can reduce the time taken to check each item by a quarter.

The large screen would cost her $420, but she knows that, after a certain number of hours worked, the extra money that she has been able to earn will have offset the cost of the monitor.

What is this number of hours? [2]

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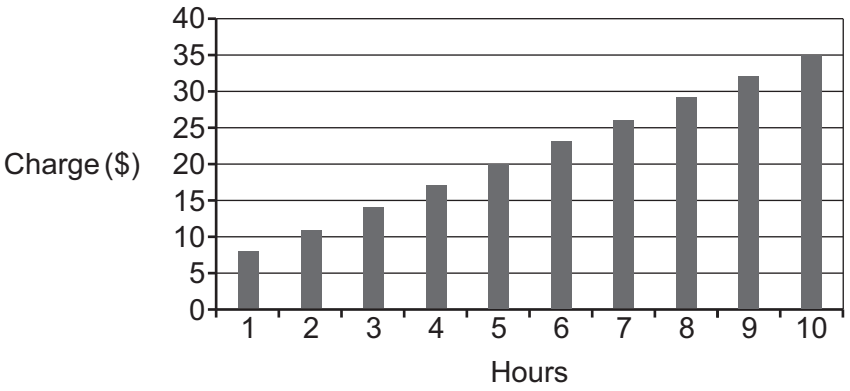
5 Josh owns a company which hires out boats on a lake near his home. Boats may be hired for any whole number of hours up to a maximum of 10 hours. The charge for hiring a boat is divided into a basic charge for hiring the boat, plus an amount for each hour that the boat is hired.

The bar chart shows the charges for hiring the boat.



(a) (i) What is the cost per hour to hire a boat? [1]

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(ii) What is the basic charge for hiring a boat? [1]

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In order to do the necessary safety checks, there must always be a gap of 20 minutes between the return of a boat from one hire and the next time it is taken out. Boats are always returned on time and are never returned earlier than has been paid for. Josh's company opens at 08:00 each day and closes at 18:00.

(b) What is the maximum that can be earned in a day from hiring out one boat? [2]

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6 Paul Starmer and Roy Clegg both made their first appearance for Kikett United football club in the same match, five years ago. Paul has scored exactly 40% of all the team's goals since then and Roy has scored exactly 40% of the rest of the goals.

Paul and Roy have scored a combined total of 208 goals for Kikett United.

How many goals have Paul and Roy scored individually? [3]

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Paul .....

Roy .....

7 Adele lives in Ocken. Her friend Ed lives in Tupa. The journey between their two homes comprises:

- A 10-minute walk between Adele's home and Ocken bus station
- A number 6 bus between Ocken station and Roville station
- A number 8 bus between Roville station and Tupa station
- A 15-minute walk between Tupa station and Ed's home

Number 6 buses between Ocken and Roville, in both directions, leave at 20 and 50 minutes past each hour. The journey takes 35 minutes.
Number 8 buses between Roville and Tupa, in both directions, leave at 15 and 45 minutes past each hour. The journey takes 40 minutes.

(a) What is the shortest time that it can take Adele to travel from her home to Ed's home? [2]

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Adele wants to arrive at Ed's home by 15:20 at the latest.

(b) What is the latest time that Adele can leave home? [2]

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Adele and Ed agree to meet at Roville station. They both leave home at 10:10.

(c) Who will arrive first and by how many minutes? [1]

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8 The University bookshop sells the three Economics books that are needed by first year students. The individual prices of the three books are $35, $25 and $15.

In the first week, students spent a total of $1785 on buying 81 of these books.

(a) (i) The amount spent on one of the books was $560.

How many copies of this book were sold? [1]

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(ii) How many copies of each of the other two books were sold? [3]

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In the second week, the bookshop introduced a special offer: all three books could be bought together at a discount of 20% on the cost of buying them all separately.

Overall, twice as many copies of the three books were bought using the special offer than were bought individually in the first week.

(b) How much money in total was spent on buying all three books using the special offer? [2]

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9 Alan wants to take a 12-day holiday some time during June, July, August or September next year. He has the following days booked in his diary for business meetings, and none of these can be changed.

Meeting	*Date*
1	6 June
2	7 June
3	13 June
4	21 June
5	28 June
6	2 July
7	4 July
8	14 July
9	24 July
10	31 July
11	14 August
12	16 August
13	21 August
14	25 August
15	30 August
16	10 September
17	20 September
18	22 September

He does not want any meeting days to fall within his holiday.
(There are 30 days in June and September, and 31 days in July and August.)

(a) State the **two** possible start dates for his holiday. [2]

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Alan decides that he wants a longer holiday. He is willing to have **one** meeting day fall within his holiday, but no more than that.

(b) What is the longest holiday that he can take, and on what days could it begin? [3]

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10 In a college of 100 students, only three games are available: chess, basketball and football.

65 students play more than one game, and 5 play none.
No one plays chess as their only game, but 12 students play basketball as their only game.

(a) Based on this information, what is the **largest** possible number of students who might play football? [1]

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(b) Based on the given information, what is the **smallest** possible number of students who might play football? [1]

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11 Laid Fresh Farms use Swiftpost to deliver their eggs to retailers. Swiftpost is paid 3 cents for every egg delivered intact and fined 6 cents for every broken egg.

Last week, Swiftpost were given 300 eggs to deliver to Parkside convenience store. The payment for this delivery, after fines had been deducted, was $7.65.

How many eggs were delivered intact? [3]

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12 How fast you can go on a bicycle depends on several things. Two of the most important things are the bicycle gear you are using (which affects how many times the wheels turn compared with the pedals) and your cadence (how many times you rotate the pedals through a full turn each minute).

A bicycle gear is made up of two cogs, one at the front and one at the back. An example of a 'gear ratio' is 36 by 20, which means the front cog has 36 teeth and the back cog has 20 teeth.

A bicycle will have several choices of front and back cogs to change between as you ride.

The change of cogs and cadence affects the speed proportionally, for example:

- Doubling the front cog size doubles the speed
- Doubling the back cog size halves the speed
- Doubling your cadence doubles the speed

Craig's bicycle has front cogs sized 24, 36 and 48, and back cogs of every size from 8 to 24 (8, 9, 10…24).

Craig is currently using the gear ratio 36 by 12.

(a) Without changing his cadence, which other gear ratios could Craig use to cycle at the same speed? [2]

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(b) If instead he doubles his cadence, which gear ratios could he use to cycle at the same speed? [2]

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Craig's friend Aston's bicycle has different front cogs. He has a choice of 30, 42 and 54, but has the same choice of back cogs as Craig.

(c) If Aston cycles at double the cadence of Craig, which gear ratio could he select to ride at the same speed as Craig? [2]

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[Turn over for Question 13]

13 In the inclusive 100 m race at a school sports day, everyone is given a fair chance to win regardless of their ability to run. Participants are given a head start based on their previously set times in the event. The fastest runner is placed at the start line and slower runners placed further up the track to give them enough track to complete the race in the same time as the fastest runner.

Previous set times for the event were 16 seconds for the fastest runner and 20 seconds for the slowest.

(a) What is the distance between the fastest and slowest runners at the start of the race? [2]

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The race was run and won in 15 seconds by the runner who started on the start line. The second-placed runner started with a 10 m head start and completed the race in 18 seconds. Each participant ran at a constant speed.

(b) How far behind was the second-placed runner when the winner crossed the finish line? [2]

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