CAMBRIDGE
International Education

Cambridge International AS & A Level

THINKING SKILLS **9694/03**

Paper 3 Problem Analysis and Solution **For examination from 2028**

SPECIMEN PAPER **2 hours**

0123456789

You must answer on the enclosed answer booklet.

You will need: Answer booklet (enclosed)
Calculator

INSTRUCTIONS

- Answer **all** questions.
- Follow the instructions on the front cover of the answer booklet. If you need additional answer paper, ask the invigilator for a continuation booklet.
- You should use a calculator where appropriate.
- Show your working.
  You may be awarded marks for correct steps towards a solution.
  In some questions, you must show your working to be awarded full marks.

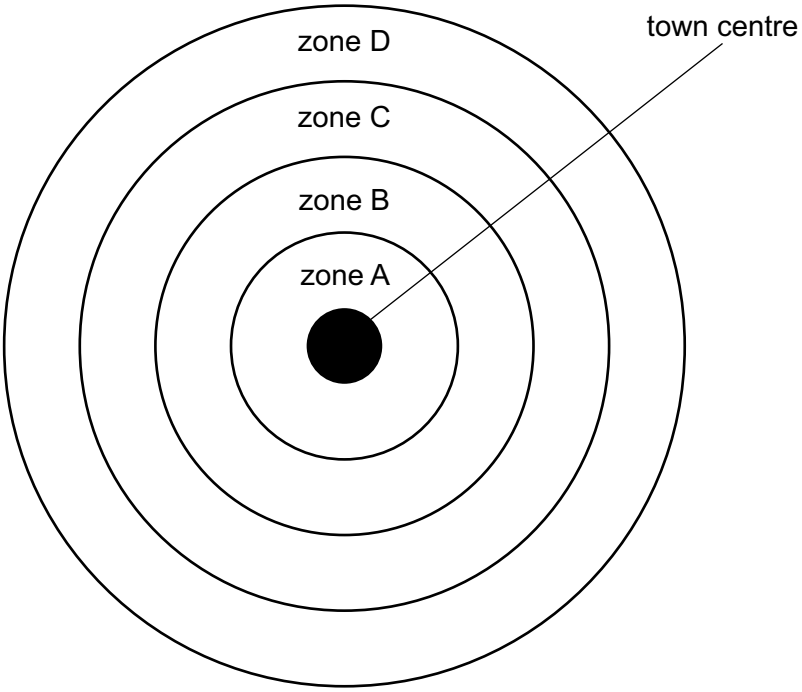
INFORMATION

- 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 **12** pages. Any blank pages are indicated.

BLANK PAGE

1 A bus company operates in 4 zones, A, B, C, and D, around a town centre.



The table shows the price of tickets from the town centre to each of the zones. It also shows the daily number of passengers travelling from the centre to each zone.

centre to zone	A	B	C	D
price	$1.10	$1.60	$2.20	$2.80
passengers	972	1017	975	1020

The council wanted to reduce the cost of tickets for people living further away from the town centre, by introducing a subsidy. The first suggestion was to put a limit of $1.50 on the price of the tickets.
For any ticket currently costing more than $1.50, the passenger would pay $1.50 and the council would pay the balance to the bus company.

(a) How much would the total daily subsidy be for tickets from the town centre, if the number of passengers travelling stayed the same? [2]

The council considered the subsidy to be too expensive, so the limit was set to $2. The new ticket prices did not change the number of passengers travelling to zone C, but the number of passengers travelling to zone D increased by 20%.

(b) How much did the council expect to pay for this new daily subsidy? [2]

In fact, the bus drivers found it easier to give a ticket to zone D to passengers who paid $2. Since a ticket to zone D is valid to zone C, tickets to zone C were no longer sold. The council had to pay more for the subsidy than they expected.

(c) How much did the council pay for the daily subsidy? [1]

2 ‘Orientate’ is a single-player game, played on a 10 × 10 grid displayed on the touch screen of an electronic device.
The game has five rounds. In each round, the grid contains eight T-shapes, each occupying four squares.

- In round one, four T-shapes are revealed at the start and the player has to find the other four.
- In round two, three are revealed at the start and the player has to find the other five.
- In round three, two are revealed at the start and the player has to find the other six.
- In round four, one is revealed at the start and the player has to find the other seven.
- In round five, none are revealed at the start and the player has to find all eight.

At no time do two T-shapes ever touch, either edge to edge or corner to corner.

In every round:

- When a square is touched, either a tick (✓) appears in the square, indicating that part of a T-shape occupies the square, or a cross (X) appears. Each tick scores 2 points, whereas each cross deducts 1 point from the player’s score.
- Immediately after a tick appears that completes a T-shape, all four squares turn black and a bonus of 2 points is added to the score.
- The round ends when all eight T-shapes have been revealed or when twelve crosses have appeared, whichever occurs first.

No points are scored for T-shapes already displayed at the start of any round.

Tom is playing a game of Orientate. This is the current situation part way through round three.

91	92	93	94	95	96	97	98	X	
81	82		84	85	86	X	X		
71				75	76	✓	78	79	
61	X	63	64	65	66	✓	68	69	70
X	52	53	54	55	56	57	58	59	60
41	42	43	44	45	X	47			
	32	33	34	35		37	38		40
		23	24				28	29	30
	12	13	14	15	X	17	18	19	20
1	2	3	4	5	6	7	8	9	10

The squares have been numbered to help identify positions on the grid. For instance, the T-shape in the top right corner can be described as 80-89-90-100.

Tom has completed the first two rounds without any crosses appearing. He knows that he can complete this round without any further crosses, and he hopes he can beat his previous best total score of 273.

(a) How many squares has Tom touched so far this round? [2]

(b) What is Tom's total score at present? [2]

(c) What evidence is there that 11-21-22-31 and 39-48-49-50 are the two T-shapes that were revealed at the start of round three? [1]

(d) Give the numbers of the ten squares that Tom will touch to complete the last three T-shapes in this round. [3]

(e) What is the maximum total number of crosses that Tom can reveal in the last two rounds and still beat his previous best score? [2]

3 A ‘three-legged race’ is a running event in which pairs of runners compete with the left leg of one runner strapped to the right leg of the other runner. Every year, there is a series of five three-legged races in which three teams of six compete for a trophy. The teams are Team Blue, Team Red and Team Yellow.

In each race, all 18 runners take part, paired with another member of their own team. Points are awarded to the first five pairs to cross the finishing line, as follows:

First 12 points
Second 8 points
Third 5 points
Fourth 3 points
Fifth 1 point

If two or more pairs cross the finishing line together, those pairs run again to decide the positions, but only if at least one of the teams involved will score any points.

No runner may be paired with the same person twice, so every runner competes once with every other member of their team.

The winning team is awarded the trophy. The runner with the greatest number of points wins a cash prize. The points awarded to a pair count only once towards the team trophy in each race, but both runners are awarded the points towards their individual totals.

This is today’s scoreboard, showing the points awarded to the runners in the first three races.

runner	team	race 1	race 2	race 3	race 4	race 5	total
Alex	Yellow	3		8			
Beth	Red		5	5			
Charlie	Red	5					
Dev	Blue		8				
Felix	Red	12		5			
Hiro	Yellow			12			
Li	Yellow	8					
Max	Red	12	1				
Mia	Yellow	3		12			
Orla	Blue	1	8	3			
Oscar	Yellow						
Pedro	Blue		12	3			
Rishi	Blue		3				
Ryan	Red		1	1			
Sam	Yellow	8		8			
Shanti	Red	5	5	1			
Sundip	Blue		12				
Taylor	Blue	1	3				

Team Blue is the only one of the three teams that has never won the overall trophy. They scored only 1 point in today's first race.

(a) (i) How many points did Team Red score and how many points did Team Yellow score in the first race? [2]

(ii) Who was Hiro's partner in the first race? [1]

The fourth race has just finished. The results of the fourth race are as follows:

First	Felix and Shanti
Second	Li and Mia
Third	Oscar and Sam
Fourth	Orla and Rishi
Fifth	Dev and Sundip
Sixth	Alex and Hiro
Seventh	Beth and Max
Eighth	Charlie and Ryan
Ninth	Pedro and Taylor

(b) Who has achieved the same top-five position in the third and fourth races? [1]

Last year Team Red and Team Yellow tied with a total of 52 points each and the trophy was shared.

(c) What was Team Blue's total last year? [1]

(d) Explain why the result of the competition can never be a three-way tie. [1]

With one race left, the team totals are now:

Yellow	44 points
Red	41 points
Blue	31 points

(e) Give the three possible final team totals for Team Red and Team Yellow that would result in them sharing the trophy again today, after the final race. [3]

In the final race:

- Team Blue's pairs are Dev and Taylor, Orla and Sundip, and Pedro and Rishi
- Team Yellow's pairs are Alex and Oscar, Hiro and Li, and Mia and Sam.

(f) Deduce Team Red's three pairs in the final race. [2]

There was also a tie in the individual competition last year, which resulted in two runners each receiving half of the cash prize.

The top five individuals after the fourth race today are:

Felix	29 points
Mia	23 points
Shanti	23 points
Sam	21 points
Li	16 points

(g) Explain why it is now certain that Felix or Mia or Shanti will win the whole of today's cash prize. [4]

4 The holiday resort at Costa Calma offers a 7-night package holiday.

Buffet meals are available for guests every day, but as part of the package guests may choose to book some evening meals in the three speciality restaurants: Albanian, Bosnian or Croatian.

Some guests are not pleased because there are restrictions on the choices.

- Only two restaurants are open each evening.
- Guests must make any restaurant booking, in person, on the morning of the day before they wish to eat at that restaurant.
- A guest can have only one booking 'open' at a time. This means that, once a booking has been made, the guest cannot make another booking until after they have had that meal.
- A guest may eat at each restaurant only once during their holiday.

The schedule for which restaurants are open each evening is:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
A and **B**	**A** and **C**	**A** and **C**	**A** and **C**	**B** and **C**	**B** and **C**	**A** and **B**

Guests arrive at the resort in the afternoon of their first day, have 7 nights at the resort and leave in the morning to get their flight home.

Sam arrives on a Thursday and wants to eat at all three speciality restaurants during her stay.

(a) **(i)** On which three days would she have to eat at a speciality restaurant? [1]

(ii) On which day would she have no choice about which restaurant to eat at? State which restaurant she would have to eat at on this day. [2]

(b) For which other day of arrival would Sam have had no choice about which restaurant to eat at on one of the days? [1]

The manager suggests changing the schedule to:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
A and **B**	**A** and **C**	**B** and **C**	**A** and **C**	**B** and **C**	**A** and **C**	**A** and **B**

(c) Which guests would have reason to complain about this change, and what would be the grounds for complaint? [2]

(d) If exactly two restaurants are open on each evening, why is it impossible for all three restaurants to open for the same number of evenings a week? [1]

The manager's suggested schedule would not be as good for the staff in restaurants A and B as the original one, because they prefer to work all their days in a week consecutively.

The manager suggests using the original schedule, but opening all three restaurants on one evening of the week.

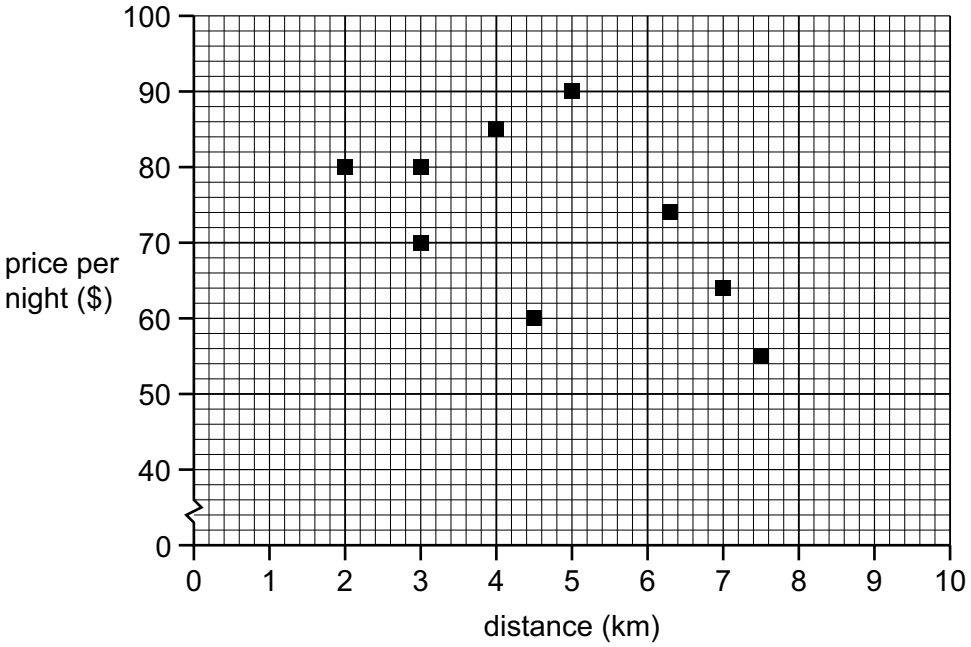
There are two days when it would be better to do this than any of the other days.

(e) Which are these two days, and why are they better for staff and for guests? [3]

5 John is looking for a hotel near a conference hall.

The table shows the hotels available online, and the graph shows the price per night in dollars against distance from the conference hall in kilometres.

hotel	distance (km)	price per night
A	6.3	$74
B	4.5	$60
C	3.0	$80
D	4.0	$85
E	7.0	$64
F	3.0	$70
G	5.0	$90
H	2.0	$80
I	7.3	$55



John is making a shortlist of hotels he will consider. John will not consider any hotel if there is some other hotel both at least as cheap and at least as close. If two hotels are the same distance and price, both will be considered unless they are both excluded by another hotel.

(a) (i) Which four hotels will he consider? [2]

(ii) Give **two** examples of a price and distance for a new hotel that would remove **just one** of these four from consideration. Each example must remove a different hotel and identify it. [3]

(b) Hotel J does not have its details available online. It is 2.7 km away and costs $57 per night.

Which hotels would John remove from his shortlist if hotel J had its details online? [1]

(c) Unfortunately, hotel J does not have any rooms available.

John will need a taxi from the conference hall to the hotel in the evening and back again in the morning. This will increase the cost of his stay at any hotel. The price of a taxi journey consists of a fixed charge and a rate per kilometre travelled.

(i) What is the lowest taxi rate per kilometre that would result in just one of the hotels online being considered by John? [3]

(ii) Two of the hotels online would have the same total cost for accommodation and taxis at this rate.

Which of these two hotels would John **not** choose because it is further away? [1]

BLANK PAGE

BLANK PAGE

