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 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 A local government allocated budgets to sectors of education as shown in the table.

Sector of Education	*Budget for year 2000*	*Budget for year 2010*
Primary	$9 000 000	$12 000 000
Secondary	$12 000 000	$15 000 000
Higher	$6 000 000	$9 000 000

(a) Which sector of education received the greatest percentage increase in its budget from 2000 to 2010? [1]

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In 2020, the local government returned the budgets back to the proportions the sectors had in 2000. The Primary sector received a $3 000 000 increase in 2020 compared with 2010.

(b) How much money did Secondary and Higher each receive in the 2020 budget? [2]

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2 I have three different shirts (blue, black and brown) and four different hats (brown, white, red and yellow). I will wear my blue shirt with any hat except the white one and my brown shirt with any hat except the yellow one. I will not wear my white hat with my black shirt, but any other combination is possible.

(a) How many combinations of shirt and hat can I wear? [1]

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I am going to give away one of my hats.

(b) Giving away which hat would make the smallest reduction to the number of combinations of shirt and hat that I can wear? [1]

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3 George starts making breakfast at 07:00 every morning. His toaster makes 2 slices of toast at a time. It takes the toaster 4 minutes to make 2 slices of brown toast or 3 minutes to make 2 slices of white toast. After the toaster has been used once, it is warm, and, from then on, takes 1 minute less than these times to make subsequent pairs of slices of toast.

(a) George has only this one toaster.

(i) If George makes only white toast, how many **more** slices can he make by 07:13 than if he makes only brown toast? [2]

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(ii) What is the earliest time by which George can make 6 slices of white toast and 6 slices of brown toast? [1]

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(b) George buys a second identical toaster.

What is now the earliest time by which he can make 6 slices of white toast and 6 slices of brown toast? [1]

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4 Amandeep has a number of tasks that he needs to complete at home this weekend. The tasks and the amount of time that he needs to complete each task are shown in the table below.

Task	*Time required*	*Other information*
Clean kitchen	2 hours	Must be done on Saturday
Wash car	1 hour 30 minutes	
Write report	1 hour	
Assemble wardrobe	2 hours 15 minutes	Must be done on Sunday
Practise on drums	1 hour 45 minutes	

Amandeep also plays for his local cricket team and must attend a practice session on Saturday. He will need to leave home at 11:15 and will arrive back home at 15:15.

On each day Amandeep will not start any tasks until 10:00 and he will take a 15-minute break after he completes any task before starting the next. Once he has started any task he will work on the task until it is completed.

(a) If Amandeep leaves as many of the tasks as possible until Sunday, what is the earliest time that he could complete the final task on Sunday? [2]

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(b) Amandeep decides that he will not work on any tasks after 19:00 on Saturday and wants to make sure that the tasks that remain for Sunday will take the smallest total time possible.

Which tasks will Amandeep complete on Sunday? [3]

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5 Cups are sold in 3 different sizes: small, medium and large. Small cups cost $3, medium cups cost $5 and large cups cost $7.

I bought some cups and spent a total of $69.

(a) If I bought 6 small cups, how many medium and large cups must I have bought? [2]

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(b) If I bought 5 small cups, how many medium and large cups **could** I have bought? State all the possibilities. [2]

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6 Suppose the date today is 1 June 2020.
In Illyria this is written as a six-digit string: 010620 (day-month-year).
In Lilliput this is written as a six-digit string: 060120 (month-day-year).

(a) In Illyria, what will be the next date that reads the same from left to right as right to left? [1]

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(b) In Lilliput, what will be the next date that reads the same from left to right as right to left? [1]

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(c) A six-digit string is 'ambiguous' if it represents a valid but different date in each country.

What is the next date that is represented by an ambiguous six-digit string in which all six digits are different? [2]

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7 In Richard's cake shop, there are two sizes of cake but only one size of box.

The box can contain exactly:

- 4 large cakes, OR
- 3 large cakes and 2 small cakes, OR
- 2 large cakes and 3 small cakes, OR
- 5 small cakes.

All boxes must be filled in one of these ways; for example, it is not possible to put just 3 small cakes in a box, as they could slide around and get damaged.

(a) What is the smallest possible number of boxes that are needed for 10 large cakes and 13 small cakes? State the way in which the boxes should be filled. [2]

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Richard says, "Yesterday, I packed 17 cakes into 4 boxes."
Judy says, "There are 3 different ways in which you could have done that."

(b) State the three different ways. [2]

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8 In Bolandia 50¢ coins weigh 7 grams and 20¢ coins weigh 4 grams.

Marc lives in Bolandia. Each day he puts 50¢ coins and 20¢ coins into a jar. At the end of every month he empties the jar and pays the money he has saved into his savings account.

On each of the 30 days of last month Marc put at least two 50¢ coins **and** two 20¢ coins into the jar. When he emptied the jar he discovered that the total weight of the coins was exactly 900 grams.

(a) What is the minimum amount that Marc could have saved last month? [2]

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(b) What is the maximum amount that Marc could have saved last month? [3]

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9 Amir sells stationery supplies to businesses. He has set his price for paper at $8 per box, but, for 'large' orders, he offers a discounted rate of $6 per box. The discounted rate applies to all boxes in the order.

As a result of this offer it is possible to reduce the total cost of an order by $72, by adding one extra box of paper to the order.

What is the smallest number of boxes there can be in a 'large' order? [3]

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10 A single-track tramline runs for 9.0 kilometres between Beelo and Hiyar. There are no stations in between. It is uphill all the way from Beelo to Hiyar and downhill in the opposite direction. There is a passing place halfway between the two stations.

The downhill tram stops at the passing place for 2.5 minutes. It travels at the same constant speed during both halves of its journey, arriving at Beelo 20.5 minutes after departing from Hiyar.

The uphill tram travels at a constant speed that is 20% slower than that of the downhill tram and does not stop at all during its journey.

How many minutes after departing from Beelo does the uphill tram arrive at Hiyar? [3]

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11 The World Cup for teams playing *Flogit* is conducted as follows. In the first stage of the tournament, the 24 teams are divided into 4 leagues of 6. In each league each team plays every other team once. The teams coming first and second in each league proceed to the next stage of the tournament, which is a knockout stage. There are four quarter-final matches; the winners of these progress to the semi-finals, followed by the final.

(a) How many matches does the winning team play? [1]

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(b) How many matches in total are there in the tournament? [2]

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There are 9 players in each team in any match. No player is allowed to play more than 5 matches in succession.

(c) What is the fewest number of players that could have played for the winning team? [2]

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12 Assetguarder is a Financial Services Company with nine offices around the world. All nine offices are open for business from 09:00 to 17:00 local time from Monday to Friday each week.

The company has an IT Support department, run from the London office. This department must have someone on duty whenever at least one of the offices is open for business. Richard joined the IT Support department at the beginning of February. The local times at the locations of the other offices, compared to London, were as follows during the whole of February:

Auckland	+13 hours
Melbourne	+11 hours
Singapore	+8 hours
Cape Town	+2 hours
Frankfurt	+1 hour
London	–
Buenos Aires	–3 hours
New York	–5 hours
Vancouver	–8 hours

Consequently there had to be someone on duty at all times from the first opening time at the beginning of each week to the last closing time at the end of the week.

(a) On weekdays during Richard's first month:

(i) which office opened at the same time as the New York office closed? [1]

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(ii) for which one-hour period, in London time, was only one of the offices open for business? [3]

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(iii) for which one-hour period, in London time, were five of the offices open for business simultaneously? [2]

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(b) For what length of time was the IT Support department able to close down each weekend during Richard's first month? [2]

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