Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8817795931

THINKING SKILLS **9694/11**

Paper 1 Problem Solving **October/November 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 A gardener works in my garden 7 days each week. She charges me $6 if the weather is completely dry, but if it rains during any part of the day she instead charges me $8.

(a) The gardener charged me $54 for one week's work. How many days that week were completely dry? [2]

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The gardener changes her pricing structure so that on the first day of the week that it rains she charges me $8, and on any subsequent days that it rains she charges me $7. She continues to charge $6 when the weather is completely dry.

(b) Following this change, she charged me $47 for one week's work. How many days that week were completely dry? [1]

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2 Mark has been asked to write 2 short, 2 medium, and 1 long question for an exam paper according to the following specification.

Question type	*Parts*	*Total marks for question*
Short	1	1–4
Medium	2 or 3	3–6
Long	3 or 4	7–9

(a) What is the maximum total number of marks that the five questions could have? [1]

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(b) What is the maximum number of marks that a single part of a question could have? [1]

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(c) This is one of Mark's questions. Why has he included this part? [1]

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3 The Star Centre is open from Monday to Friday inclusive each week. It offers sessions in various activities. Information about these activities is given in the following table.

Activity	*Days available*	*Start times*	*Duration (in minutes)*
Baking	Monday, Tuesday	10:00, 12:15, 14:30, 16:45	120
Computers	Monday, Wednesday, Friday	10:30, 12:30, 15:30, 18:00	90
Pottery	Every day except Monday	11:00, 14:15, 17:30	150
Art	Tuesday, Thursday	09:00, 12:00, 14:30, 17:00	100
Singing	Tuesday, Wednesday, Thursday	10:30, 12:30, 14:30, 16:30, 18:30	75

Anyone who does two or more activities in a day must allow at least 30 minutes between sessions.

Robbie has retired and he does a different activity on each of Monday, Tuesday, Wednesday and Friday. His activities are Computers, Pottery, Art and Singing.

(a) On which day does Robbie do each of his activities? [1]

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Annabel does Art and then Baking on the same day. She has chosen the start times of her sessions so that the amount of time from the beginning of the Art session to the end of the Baking session is as small as possible.

(b) What is this amount of time? [2]

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Annabel realises that if she had done the Baking session before the Art session then she could have reduced the total time.

(c) Show that Annabel's realisation is correct. [1]

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4 A cake shop will write messages on top of the cakes that it produces.

The cost depends on the difficulty of writing the letter and whether the letter occurs more than once in the message.

Letters	*Cost for first or only occurrence of the letter*	*Cost for any repeats of the letter*
Easy letters: IJLOTUVX	\$0.20	\$0.15
Moderately-difficult letters: CEFHKNPSWZ	\$0.30	\$0.20
Difficult letters: ABDGMQRY	\$0.40	\$0.35

What is the cost of the message WELL DONE? [2]

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5 Mr and Mrs Jones have four children. The names and dates of birth of the children are as follows.

Name	*Date of birth*
Lottie	30 June 2001
Max	2 October 2002
Nia	21 August 2005
Ollie	5 August 2011

The Jones family visited a theme park on Nia's birthday in 2016.
The entry charges were as follows.

	Entry charge per person
Adult (16 years and over)	$40
Child 12 years old – 15 years old	$36
Child 5 years old – 11 years old	$25
Child under 5 years old	$21

(a) How much did the Jones family pay for their entry to the theme park? [2]

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The entry charges were unchanged in 2017.

(b) How much more would the total cost of the entry charges be on Nia's birthday in 2017? [1]

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In 2018, all single-person entry charges were increased by 10% on the 2016 charges. The theme park also introduced a Family Ticket costing $150. This allowed entry to the park for two adults and two children of any age on any day in July or August.

The Jones family visited the theme park in 2018 on Lottie's birthday.

(c) How much could they have saved by going on Ollie's birthday instead of Lottie's birthday? [3]

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6 At a soccer match between the Reds and the Blues, half of the crowd support the Reds, one quarter of the crowd support the Blues and the rest support neither the Reds nor the Blues. One third of the Reds-supporters are wearing red hats and one quarter of the Blues-supporters are wearing blue hats. Half of the people who support neither the Reds nor the Blues are wearing black hats. All of the remaining members of the crowd are not wearing a hat.

What proportion of the people wearing hats are Reds-supporters? [3]

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7 An old calendar used years of 365 days, but inserted an extra day into every year that was divisible by four to keep the calendar synchronised to the observed seasons, calling a year with 366 days a leap year.

(a) If leap years were abolished, how long would it take for the calendar to return to agreement with the old calendar? [1]

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A modern calendar also uses this system of leap years, except that if a year is divisible by one hundred it will not be a leap year, unless it is also divisible by four hundred, in which case it is.

(b) If leap years had been abolished in 2000 (which was a leap year), how long would it have taken for the calendar to return to agreement with the modern calendar? [3]

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8 Gilmesh and Hercules plan to run along a long road for 20 minutes. They will start together. Gilmesh will run 300 metres in the first minute, but in every successive minute he will run 10 metres less than in the previous minute.
Hercules will run 200 metres in the first minute, but in every successive minute he will run 5 metres more than in the previous minute.

At the end of each minute, a record will be taken of which runner is ahead and by how far.

(a) (i) At the end of which minute will the record show Gilmesh to be ahead by the greatest distance? [2]

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(ii) What is this greatest distance? [1]

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(b) At the end of which minute will the record first show Hercules to be ahead? [1]

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9 I have two cousins and the three of us share the same birthday. I am 8 years younger than my older cousin and 11 years older than my younger cousin.

At present the sum of our ages is 120.

(a) How old am I? [2]

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(b) What will my age be when our three ages and their sum comprise all the digits from 1 to 9? [2]

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10 In the vast outer reaches of the universe, there are three kinds of particles: red, green and blue.

- When two particles of the **same** colour collide they produce 1 unit of energy.
- When two particles of **different** colours collide they produce 2 units of energy **and** a particle of the third colour.

For example:

blue + blue → 1 unit of energy
red + green → blue + 2 units of energy

(a) What is the final result, after all possible collisions have happened, when starting with 6 blue particles? [1]

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(b) What is the maximum number of units of energy that can be produced when starting with 3 blue particles and 3 red particles? Give an example showing all the collisions and what is produced by them. [2]

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(c) What is the maximum number of units of energy that can be produced when starting with 2 blue particles, 2 red particles and 2 green particles? [1]

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(d) What is the maximum number of units of energy that can be produced when starting with 8 particles? [1]

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11 The company that manufactures the chocolate bar Quasar is currently running a promotion with prizes of $10, $100 and $1000.

While stocks last, each Quasar bar has a letter of the alphabet printed on the inside surface of the wrapper. Cash prizes of the relevant number of dollars can be claimed by sending in collections of wrappers that spell one of the following: TEN; HUNDRED; THOUSAND.

Every wrapper issued in connection with this promotion has one of the ten letters that make up the prize-winning words printed inside. Exactly 80% of these wrappers have the letter N. The numbers of wrappers with each of the other letters are as follows.

A	200
D	1250
E	18000
H	7500
O	500
R	1000
S	50
T	12000
U	7500

(a) What was the total number of wrappers issued with a letter printed inside? [1]

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(b) What is the largest total amount that the company could have to pay out in prize money? [3]

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12 Hobart bus tickets have numbers from 000000 to 999999. The number on the first ticket for each bus is random, with subsequent ticket numbers going up by one each time. In the rare event of going past 999999, the next number is 000000. A lucky ticket is one where the sum of the digits is 21.

(a) What is the average sum of the digits on a ticket? [1]

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(b) List all the possible differences between the sums of the digits on consecutive tickets. [3]

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Jim is the first person in the queue and is delighted to find that he has a lucky ticket. There are 23 people in the queue for the same bus.

(c) Give an example of a possible number for Jim where there is another lucky ticket, and the ticket of another person in the queue ends 00. [1]

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[Turn over for Question 13]

13 At the car park in the city centre, tickets must be bought when entering the car park, which takes a negligible amount of time. The prices are shown in the table below.

Maximum allowed length of stay	*Price ($)*
30 minutes	1.00
1 hour	1.50
2 hours	2.00
3 hours	2.50
5 hours	3.00
8 hours	3.50

There is a total of 50 spaces in the car park and the car park opens at 08:00.

If all cars are parked for the maximum amount of time paid for, what is the earliest time in the day that a total of at least $250 could have been paid for parking? Justify your answer. [3]

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