

Cambridge International AS & A Level

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
NUMBER

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THINKING SKILLS

9694/12

Paper 1 Problem Solving

October/November 2020

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. Blank pages are indicated.



- 1 A cake decorator charges a fixed fee for icing a message onto a cake, together with a fixed charge per letter of the message. The message “Congratulations” costs a total of \$18.25, while “Happy Birthday” costs a total of \$16.95.

What is the fixed fee? [2]

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- 2 The admission price to a theme park is determined by the size of the group entering. The admission prices for all group sizes are given in the table below.

<i>Number in group</i>	1	2	3	4	5	6	7 to 9	10 to 15	16 to 20	21+
<i>Admission price</i>	\$10	\$19	\$28	\$36	\$43	\$49	\$60	\$80	\$100	\$164

27 students arrive together and decide to arrange themselves in groups so that in total they pay the least possible admission price.

What is the total admission price the students pay? [2]

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- 3 Daphne and Eric buy ice creams from the local stall. They both always choose one scoop of each of two different flavours. The flavours they choose from are chocolate, coffee, lemon, mango, pistachio, strawberry, and vanilla. Daphne does not eat pistachio and Eric does not eat chocolate or coffee ice cream.

How many more ice cream combinations can Daphne choose from compared to Eric? [3]

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4 Details of the films showing at the five studios of the Elsinore Cinema Complex this week are as follows:

Studio	Film	Running time	Screenings daily at:					
1	The Question	118 mins	11:30	13:50	16:10	18:30	20:50	–
2	Slings And Arrows	102 mins	11:15	13:15	15:15	17:15	19:15	21:15
3	Outrageous Fortune	131 mins	11:00	13:30	16:00	18:30	21:00	–
4	Take Arms	93 mins	11:40	13:30	15:20	17:10	19:00	20:50
5	Sea Of Trouble	124 mins	11:20	13:45	16:10	18:35	21:00	–

All the times of the screenings in the table are the times at which the films start. Adverts and trailers are shown between screenings.

All tickets are for one specific screening only, in a specified seat. They cost \$5 for all screenings that begin before 18:00 and \$8 for all screenings from 18:00 onwards.

Studios 1 and 2 both have 250 seats, Studios 3 and 4 both have 200 seats and Studio 5 has 150 seats.

(a) Horatio and Ophelia have arranged to meet today to see the 15:15 screening of *Slings And Arrows*. They also intend to see the next film that begins after *Slings And Arrows* has finished.

At what time will their second film finish? [2]

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Slings And Arrows has been very popular. Yesterday's ticket sales for Studio 2 totalled \$6760.

(b) (i) What is the total number of tickets available for Studio 2 each day this week? [1]

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(ii) What is the minimum number of tickets that could have been sold for Studio 2 yesterday? [3]

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- 5 Thursday is Quiz Night at Wenwatt Social Club. Contestants compete for a sum of money known as the 'Horde'. Each week there are 50 questions and the contestant with the most correct answers wins all or part of the Horde, depending upon the winning score, as follows:

<i>Winning Score</i>	<i>Prize money</i>
47–50	the whole Horde
43–46	\$90
39–42	\$75
35–38	\$60
less than 35	\$40

If two or more contestants have the same winning score, they share the prize money, but the prize money is reduced (if necessary) to the largest amount that will give each person a multiple of \$5. For instance, if three contestants have a winning score of 44 correct answers they win \$30 each, but if four contestants have a winning score of 44 the prize money is reduced to \$80 and the contestants win \$20 each.

On any particular Thursday the Horde consists of the amount left over from the previous week (if any) plus \$125.

Three weeks ago one contestant had a winning score of 48 and won a record \$765.
Two weeks ago there were three winners, with a score of 36.
Last week there were two winners, with a score of 41.

How much will the Horde be this week? [3]

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7 Between 01:00 and 02:00, Bill's clock works normally, with the minute hand moving forwards 1 minute every minute. Between 02:00 and 03:00 – in real time – the minute hand on Bill's clock moves at half of the correct speed, showing 1 minute's progress every 2 minutes. Between 03:00 and 04:00 (real time), the minute hand on Bill's clock moves even slower, showing 1 minute's progress every 3 minutes of real time. This pattern continues for subsequent hours.

(a) Bill sets his clock to 01:00 when the real time is also 01:00.

What time will Bill's clock show when the real time is 07:00? [2]

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(b) When the real time is 03:30, Bill decides to set his clock to 02:30.

What time will Bill's clock show when the real time is 06:30? [2]

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8 The normal cost of entry to Phelthorpe Swimming Pool is \$4 per session.

A year ago a Splash! card was introduced, aimed at regular swimmers. Valid for twelve months, and costing \$25, it entitles the holder to use the pool for \$2 per session for the first 6 sessions, then unlimited use for \$1 per session.

Rebecca decided not to buy a Splash! card, but now she wishes she had bought one, having used the pool 23 times during the last twelve months.

(a) How much would Rebecca have saved over the last twelve months if she had bought a Splash! card? [2]

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It has been proposed to change the Splash! card so that customers pay a fixed amount monthly for the card and then only pay \$1 for each visit to the pool. The monthly price will be a whole number of dollars, and set so that swimmers must use the pool at least 5 times in the month in order to save money by owning the card.

(b) What is the cheapest monthly price that could be set for the new Splash! card? [2]

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9 A referendum has been held in the district of Mirth, to determine whether it should declare independence from Bolandia. All adult members of the district could vote; all of them either voted in favour of independence or voted against it, or did not vote at all.

According to the local newspapers:

'80% of those who voted voted in favour of independence'

and

'80% of the adult members of the district did not vote for independence'

(a) What percentage of the adult members of the district voted against independence? [2]

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(b) What percentage of the adult members of the district did not vote? [1]

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(c) What percentage of those who did **not** vote would have had to have voted against independence, in order to ensure that as many voted in favour as voted against? [1]

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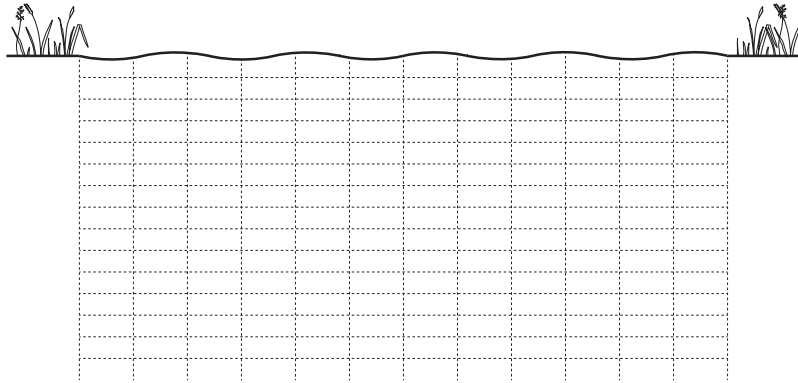
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- 10 The clear waters between Scylla and Charybdis have not been charted, but the depth has been measured 10 m from each bank. In both cases it was 6 m. The river is 60 m across.



Little sea monsters live in the river. Penelope knows that any two sea monsters could see each other, wherever they are in the water.

- (a) (i) What is the maximum possible depth 5 m from one of the banks? [1]
 [1]
- (ii) What is the maximum possible depth 20 m from the same bank? [1]
 [1]
- (iii) Why can it not be both of these at the same time? [1]
 [1]

The depth 20 m from the Charybdis bank is measured as 8 m.

Diomedes has to identify a channel for boats which is at least 7 m deep.

- (b) (i) What is the minimum width that he can be sure is available, and where is it? [2]

- (ii) What is the maximum possible depth? [1]

- 11 In a quiz show, four contestants are asked 24 questions each. Every correct answer scores 5 points but 1 point is deducted for every wrong answer. There is no penalty for choosing not to answer a question by passing.

The contestant with the highest score is the winner of the show, and gets an opportunity to win the money in the prize pot. At the beginning of each show, the prize pot contains any money left in it after the previous show. Once the contestants have answered all their questions, their scores are added up and \$10 is added to the prize pot for each point in the total.

- (a) What is the maximum amount that the prize pot can increase by in one show? [1]

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Today's contestants and their scores were:

Clare	81
Simon	77
Angela	65
Paul	63

In today's show, there were a total of 16 passes.

- (b) How many of today's questions were answered correctly? [4]

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The winner of the show is given four puzzles to solve within a time limit. The amount they win depends on how many they solve correctly:

- 4 correct – the whole prize pot
- 3 correct – 50% of the prize pot
- 2 correct – 25% of the prize pot
- 1 correct – 10% of the prize pot
- 0 correct – nothing

Clare solved three of the four puzzles correctly. She won \$2050.

(c) What was the value of the prize pot at the beginning of today's show? [2]

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[Turn over for Question 12]

12 At a conference the 100 delegates were asked to rank three possible menus (A, B and C) in order of preference for dinner. All the delegates completed this ranking.

55 ranked A above B; 65 ranked B above C; 35 ranked C above A.
B was ranked first by 40 delegates.

(a) Megan correctly deduces that the number of delegates who ranked the menus in the order CBA is 5.

Explain how she can know this. [1]

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30 delegates ranked A third.

(b) Deduce the number of delegates who chose each of the other five possible orders of preference. [5]

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