Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

8113932485

COMPUTER SCIENCE **0478/23**

Paper 2 Problem-solving and Programming **May/June 2022**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- **Do not attempt Tasks 1, 2 and 3** in the copy of the pre-release material on page 2; these are for information only.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- 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.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **12** pages. Any blank pages are indicated.

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Section A

You are advised to spend no longer than 40 minutes answering this section.

Here is a copy of the pre-release material.

DO NOT attempt Tasks 1, 2 and 3 now.

Use the pre-release material and your experience from attempting the following tasks before the examination to answer Question 1.

Pre-release material

Seaview Castle Visitor Centre is open seven days a week. It offers a range of facilities and activities including meeting rooms, a permanent fossil exhibition, supervised walks along the cliff tops and an old stone quarry.

There are three meeting rooms, which can each be booked separately. There is one large room that can be used for a variety of activities such as showing films, holding presentations, displaying exhibitions or wedding receptions. There are also two smaller meeting rooms. Each room can be booked by the day according to the following tariff:

Room	Cost per day
large	$295
small 1	$175
small 2	$150

Write and test a program or programs to arrange meeting room bookings:
- Your program or programs must include appropriate prompts for the entry of data. Data must be validated on entry.
- All outputs, including error messages, need to be set out clearly and understandably.
- All variables, constants and other identifiers must have meaningful names.

You will need to complete these **three** tasks. Each task must be fully tested.

Task 1 – setting up a booking system structure for the meeting rooms

Set up suitable data structures for each of the three meeting rooms to store:
- when it is booked during a fixed eight-week period
- the client's name (the person making the booking)
- a unique booking code
- the cost of the booking.

Task 2 – booking a meeting room

Extend the program in **Task 1** to enable bookings to be made so that the client enters their name, the meeting room required and the day of the booking. After the data has been entered, the program should check if the requested day is available for the required meeting room and if **not**, the client should be allowed to enter an alternative day or exit the program.

If the requested day is available, the booking details and cost of the booking should be output for the client to confirm. Once confirmed, a unique booking code should be generated and stored in both the appropriate meeting room data structure and the unique booking code data structure. The client's name and cost of the booking should be stored in the appropriate data structures set up in **Task 1**.

Bookings of more than one day must be entered as separate single day bookings.

Task 3 – using the booking data

Extend the program in **Task 1** and **Task 2** to make use of the data that is available, to:
- select a meeting room and output the days when it is free
- total and output the amount of money currently taken for all three meeting rooms
- check the bookings for a specific client.

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1 All variables, constants and other identifiers must have meaningful names.

(a) Identify **one** variable and **one** array you could have used for **Task 1** or **Task 2**.

Give the use for the variable and array.

Variable .....

Use .....

.....

Array .....

Use .....

..... [4]

(b) Describe how you could test if the validation of the input to choose a meeting room works (**Task 2**).

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..... [2]

(c) Explain how your program in **Task 2** could be altered to allow a 30% discount on bookings for the same meeting room of two to six days, inclusive.

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..... [4]

(d) Write an algorithm to show how your program completes the following parts of **Task 2**:

- output the booking details and cost of the booking
- take confirmation from the client
- generate a unique booking code
- store the booking details.

Assume that **Task 1** and the first part of **Task 2** have been completed.

Assume that the booking is for a single day and that the requested booking day is available.

Use pseudocode, programming statements or a flowchart.

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(e) Explain how your program selects a meeting room, finds and then outputs the days when it is available (part of **Task 3**). Any programming statements used in your answer must be fully explained.

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Section B

2 Tick (✓) **one** or more boxes in each row to match the type(s) of test data to each description.

Description	Types of test data			
	Boundary	**Erroneous / Abnormal**	**Extreme**	**Normal**
test data that is always on the limit of acceptability				
test data that is either on the limit of acceptability or test data that is just outside the limit of acceptability				
test data that will always be rejected				
test data that is within the limits of acceptability				

[4]

3 Describe what is meant by the terms variable and constant and give an example of each in your answer.

Variable .....

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Constant .....

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[4]

4 The pseudocode represents an algorithm.

The pre-defined function `DIV` gives the value of the result of integer division.
For example, `Y = 11 DIV 4` gives the value `Y = 2`

```
Count ← 0
INPUT Limit
FOR In ← 1 TO Limit
  Logic ← TRUE
  Test ← 2
  INPUT Number
  REPEAT
    IF Number / Test = Number DIV Test
      THEN
        Logic ← FALSE
      ELSE
        Test ← Test + 1
    ENDIF
  UNTIL NOT Logic OR Test >= Number DIV 2
  IF Logic
    THEN
      Store[Count] ← Number
      Count ← Count + 1
  ENDIF
NEXT In
FOR Out ← 0 TO Count - 1
  OUTPUT Store[Out]
NEXT Out
```

(a) Complete the trace table for the algorithm using this input data:
5, 9, 5, 8, 10, 7

In	Logic	Test	Number	Store [Count]	Count	Limit	Out	OUTPUT

[7]

(b) State the purpose of this algorithm.

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..... [2]

(c) This algorithm only works for numbers that are 3 or greater.

Describe how you could change this algorithm to make sure that only numbers that are 3 or greater are entered. Any pseudocode statements used in your answer must be fully described.

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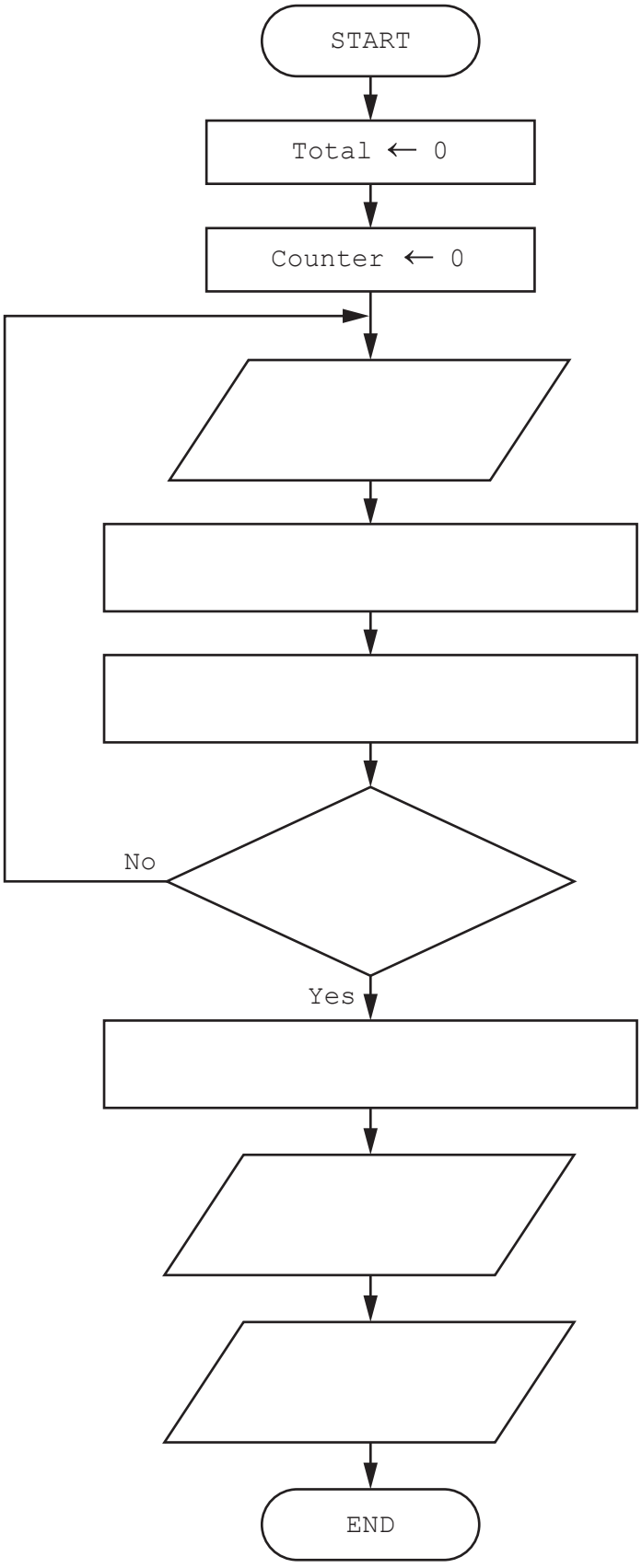
..... [3]

5 The flowchart shows an algorithm that should:

- allow 100 numbers to be entered into the variable `Number`
- total the numbers as they are entered
- output the total and average of the numbers after they have all been entered.

Complete this flowchart:



[6]

6 Data about planets in the solar system is stored in a database table called PLANETS. The fields used in the table are shown.

Name of field	Contents of field
PlanetName	the name of the planet
PlanetMass	the planet's mass in kilograms
Larger	whether or **not** the planet has a greater mass than Earth
MaxDistance	the maximum distance the planet is from Earth in kilometres
MinDistance	the minimum distance the planet is from Earth in kilometres
YearLength	the length of time it takes for the planet to orbit the Sun in Earth days

(a) State the name of the field that could contain Boolean data.

..... [1]

(b) Complete the query-by-example grid to output the planets with a longer year length and greater mass than Earth. Assume Earth's year length is 365 days.

Display only the name of the planets sorted in alphabetical order.

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

[3]

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