Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0671157253

COMPUTER SCIENCE **0478/21**

Paper 2 Problem-solving and Programming **October/November 2021**

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 **16** 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

A holiday park has eight squash courts that can be booked for an hour at a time. The first booking is from 08:00 to 09:00 and the last booking is from 17:00 to 18:00. All bookings start on the hour and bookings can only be made on the same day that the squash court is used. A screen displays today's date and how many squash courts are available for each hour.

When a booking is made, the name of the guest is recorded together with their mobile phone number. Once the squash court is booked, the guest is shown the court number together with a unique 4-digit code that can be used to unlock the squash court. Each booking is for one squash court for one hour. The 4-digit code must be different for each booking.

Write and test a program or programs for a computer system to manage the daily squash court bookings.

- Your program or programs must include appropriate prompts for the entry of data; data must be validated on entry.
- Error messages and other output 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 – at the start of the day

Write a program to set up arrays to record the following for each hour:
- whether a squash court is booked or available
- the name of the guest
- the mobile phone number of the guest
- the unique 4-digit code for the booking.

Set up a screen to display the court availability at the start of the day.

Task 2 – making a squash court booking

Check if there is a squash court available at the time requested. If a squash court is available, record the guest's name and mobile phone number. Mark the squash court as booked for that hour. Generate and record the unique 4-digit code for the booking. Display the mobile phone number for the guest to check, display the court number and the 4-digit code for the guest to remember. Display the updated court availability, showing an hour as fully booked if all the squash courts are now booked for that hour.

Task 3 – at the end of the day

Calculate the total number of squash court bookings. Find the hour(s) and court(s) with the most bookings. Display this information.

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

(a) Identify **one** constant that you could have used for **Task 1**. Give the value that would be assigned to this constant. State the use of this constant.

Constant .....

Value .....

Use .....

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[3]

(b) Describe the arrays that you have set up in **Task 1** to record today's data about the squash courts.

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(c) Explain how your program generates a unique 4-digit code for each booking.

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(d) Write an algorithm for **Task 2**. You do **not** need to display updated court availability. Use either pseudocode, programming statements or a flowchart. Assume that **Task 1** has been completed.

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(e) Explain how your program completed the part of **Task 3** which calculates the total number of squash court bookings, finds the court(s) with the most bookings and displays this information. Include any programming statements that you have used and fully explain the purpose of each statement.

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Section B starts on Page 8

Section B

2 An algorithm has been written in pseudocode to generate 50 positive random integers with values less than or equal to 100. These random integers are stored in the array `RandNum[ ]`

The function `Rand(X, Y)` generates a random integer greater than or equal to `X` and less than `Y`. For example, `Rand(1, 4)` generates `1` or `2` or `3`.

```
1 Count ← 0
2 REPEAT
3     RandNum[Counter] ← Rand(1, 100)
4     Count ← Count + 2
5 UNTIL Count <= 50
```

(a) Find the **four** errors in the pseudocode and write a correction for each error.

Error 1 .....

Correction .....

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Error 2 .....

Correction .....

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Error 3 .....

Correction .....

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Error 4 .....

Correction .....

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[4]

(b) The pseudocode for this algorithm could be shortened by the use of a `FOR … NEXT` loop.

Rewrite the algorithm using a `FOR … NEXT` loop.

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..... [3]

(c) Identify another loop structure available in pseudocode.

..... [1]

3 A program has been written to check the value of a measurement. The measurement must be a positive number and given to three decimal places, for example, `3.982`

(a) (i) State suitable examples of normal and erroneous test data that could be used to test this program. For each example give the reason for your choice of test data.

Normal test data example .....

Reason .....

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Erroneous test data example .....

Reason .....

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[4]

(ii) Explain why two pieces of boundary test data are required for this program.
Give an example of each piece of boundary test data.

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(b) Explain why verification is needed and how verification could be performed by this program.

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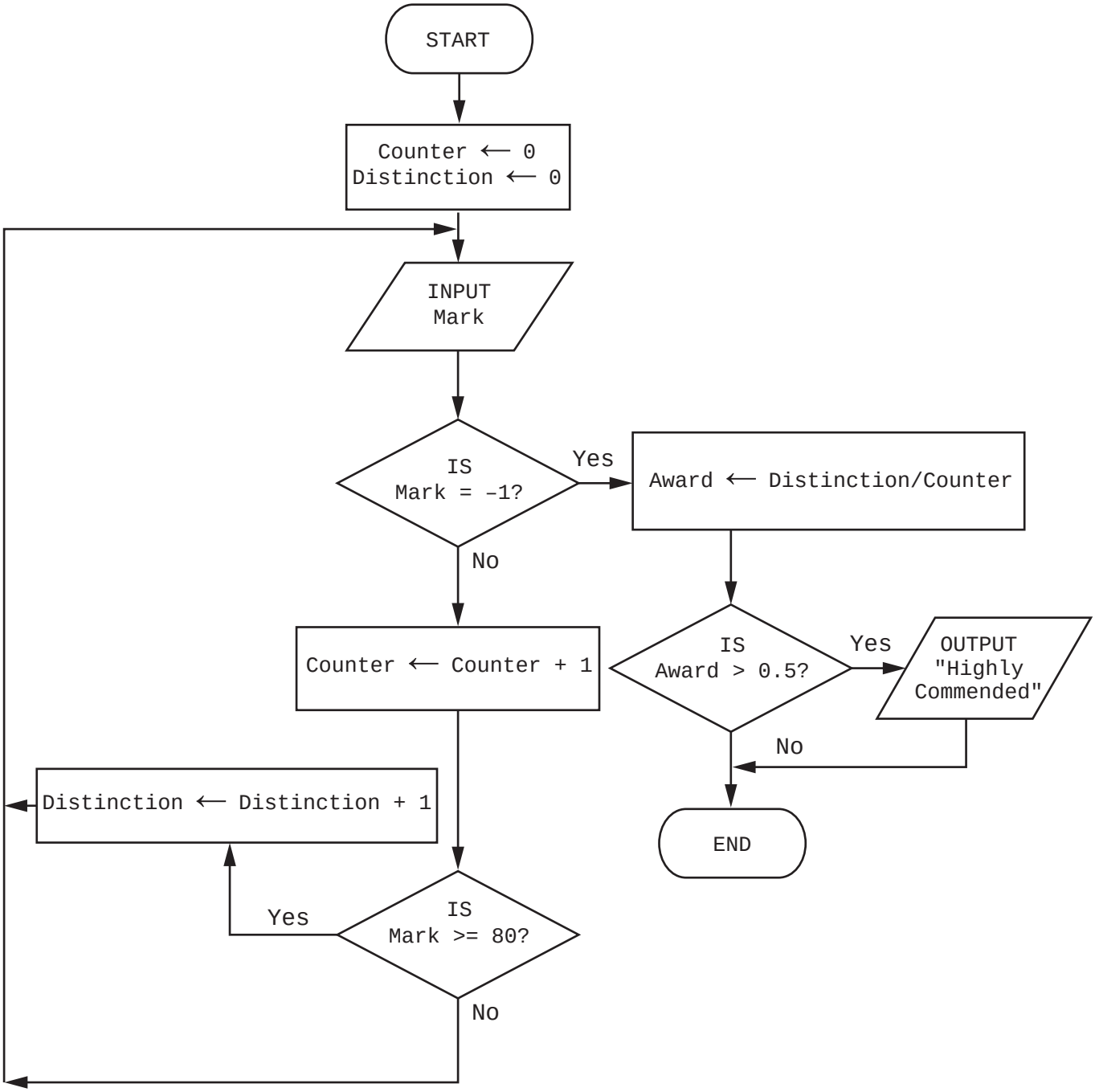
..... [3]

Question 4 starts on Page 12

4 The algorithm shown by this flowchart allows the input of examination marks for a class of students. A mark of –1 ends the process. If a mark is 80 or over then a distinction grade is awarded. The number of distinctions for the whole class is calculated. If this is over 50% of the class, the class is awarded a highly commended certificate.



Complete a trace table for the algorithm using this input data:
88, 74, 60, 90, 84, 87, 95, 72, 84, 66, –1

Counter	Distinction	Mark	Award	OUTPUT

[5]

5 A database table, APPLIANCE, is used to keep a record of kitchen appliances available for sale.

The following data is stored for each appliance:

- CATEGORY – washer, dishwasher, fridge or freezer
- ECONOMYRATING – A, B, C or D
- MANUFACTURER – Baku or ABC
- PRICE – price in $
- CODE – a unique code allocated by the manufacturer e.g. B982
- STOCK – number in stock.

The database management system uses these data types:

Text Number Currency Boolean

The ECONOMYRATING field and MANUFACTURER field have a data type of text.

(a) Identify the most appropriate data type for each field from the **four** types shown. State the reason why you chose each data type.

CATEGORY data type .....

Reason .....

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PRICE data type .....

Reason .....

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CODE data type .....

Reason .....

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STOCK data type .....

Reason .....

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[4]

(b) Complete the query-by-example grid to display only the category, manufacturer and code of the appliances with an economy rating of A.

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

[3]

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