Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

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COMPUTER SCIENCE **0478/23**

Paper 2 Problem-solving and Programming **May/June 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 **12** pages.

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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 tasks before the examination to answer Question 1.

Pre-release material

A school would like a system to allow students and staff to show their preference on matters relating to the school, such as a proposal for changing the start and finish times of the school day.

Option	Proposed start and finish times of the school day
A	Start: 08:00 – Finish: 15:00
B	Start: 08:20 – Finish: 15:20
C	Start: 08:40 – Finish: 15:40
D	Start: 09:00 – Finish: 16:00
E	Start: 09:30 – Finish: 16:30

The school has 150 students and 20 members of staff. The system is required to accept preferences, and count and report the results to show student preferences, staff preferences and overall results.

Write and test a program or programs for the system.

- 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 – Setting up the system and recording preferences.
Set up a system to allow preferences to be recorded for each of five different options, labelled A to E.

- Allow a description for each option to be entered.
- Allow students and staff to enter their unique number before their preferences can be entered (everyone is given a unique number by the school).
- Check if the unique number has already been used:
  - if so, supply a suitable message and do not allow preferences to be entered
  - if not:
    - record that the entered unique number has been used
    - allow preferences from 1 to 5 to be entered for each option (1 is ‘strongly agree’ and 5 is ‘strongly disagree’)
    - store the preferences in suitable data structures, keeping student and staff preferences separate.

Task 2 – Totalling the preferences and reporting the results.
Extend **Task 1** to achieve the following:

- Allow the preferences for each of the options to be totalled, keeping student and staff preferences separate.
- Display the results as a list of the options, with the totals given for each one as:
  - student results
  - staff results
  - combined results.

Task 3 – Changing the program to include a counting method.
Extend **Task 2** to achieve the following:

- Count the number of times the preference 1, ‘strongly agree’, was given for each option, counting student and staff preferences separately.
- Display the results as a list of the options, with the number of times preference 1 was given for each option as:
  - student results
  - staff results
  - combined results.

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1 **(a)** All variables, constants and other identifiers must have meaningful names.

(i) Identify **one** constant you could have used for **Task 1.** Give the value that would be assigned to the constant and explain its use.

Constant .....

Value .....

Use .....

.....

.....
[3]

(ii) Identify **one** variable you could have used for **Task 1** and explain its use.

Variable .....

Use .....

.....

.....
[2]

(iii) Describe **one** array you could have used for **Task 1**. Include the name, data type, length, sample data and use for that array.

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..... [4]

(b) Write an algorithm for **Task 2**, using pseudocode, programming statements **or** a flowchart. It is not necessary to show details completed in **Task 1**.

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[6]

(c) Explain how you could change your program in **Task 1** to allow the number of options available to be increased to six.

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..... [2]

(d) Explain how your program counts the number of times students enter preference 1 ('strongly agree') for each option (A to E), part of **Task 3**. Any programming statements used in your answer must be fully explained.

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..... [3]

Section B

2 Draw a line to connect each **Data Type** to the most appropriate **Description**.

Data Type	Description
Real	Must be a whole number
String	Must be one of two values
Integer	May be any number
Boolean	May contain any combination of characters

[3]

3 Identify a suitable validation check that could be used for each piece of normal test data and describe how it would be used. Each validation check must be different.

Test data for entering an email address: **id27@cambridgeuniversity.com**

Validation check name .....

Description of use .....

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Test data for entering a year: **2021**

Validation check name .....

Description of use .....

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Test data for entering a name: **Ericson-Bower**

Validation check name .....

Description of use .....

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[6]

4 The pseudocode algorithm should allow a user to input the number of scores to be entered and then enter the scores. The scores are totalled, the total is output and the option to enter another set of scores is offered.

```
1   Count ← 0
2   REPEAT
3     FullScore ← 20
4     INPUT Number
5     FOR StoreLoop ← 1 TO Number
6       INPUT Score
7       FullScore ← FullScore
8     UNTIL StoreLoop = Number
9     OUTPUT "The full score is ", FullScore
10    OUTPUT "Another set of scores (Y or N)?"
11    OUTPUT Another
12    IF Another = "N"
13      THEN
14        Count ← 1
15    ENDIF
16  UNTIL Count = 1
```

(a) Identify the **four** errors in the pseudocode and suggest a correction for each error.

Error 1 .....

Correction .....

.....

Error 2 .....

Correction .....

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Error 3 .....

Correction .....

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Error 4 .....

Correction .....

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[4]

(b) Show how you could change the algorithm to store the individual scores in the array `ScoreArray[]`, then find and print the average score once the scores have all been entered.

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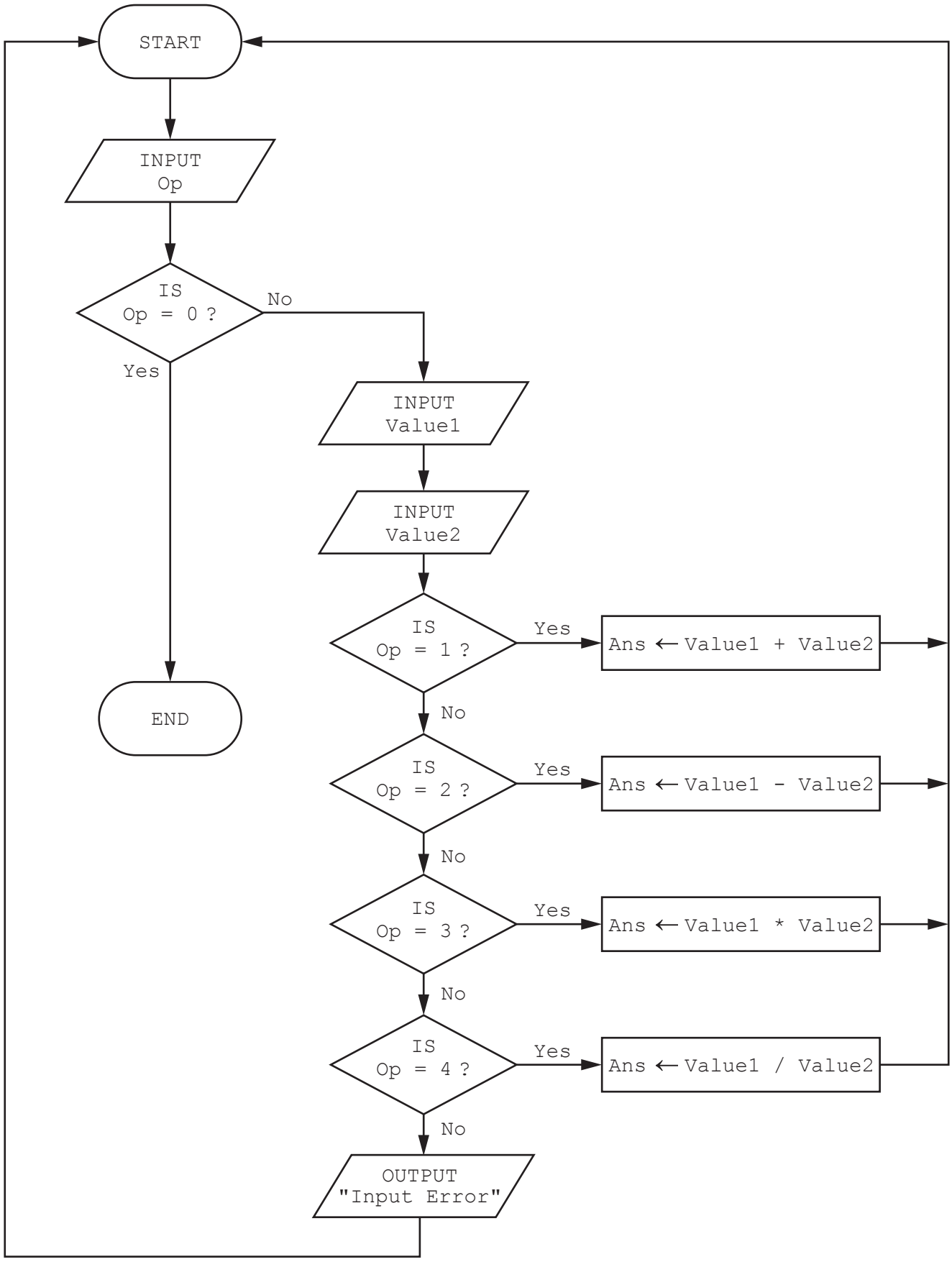
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..... [4]

5 The flowchart represents an algorithm.

The algorithm will terminate if 0 is entered at the `Op` input.



(a) Complete the trace table for the algorithm using this input data:

1, 87, 14, 3, 2, 30, 5, 10, 6, 4, 10, 2, 0, 2, 90, 6

Op	Value1	Value2	Ans	OUTPUT

[5]

(b) State the purpose of the algorithm.

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..... [1]

(c) Suggest an addition that could be made to the algorithm to make it more useful.

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..... [1]

6 A car hire company uses a database table, TREAD, to store details of the cars. The table has fields to represent each car's licence number, mileage, and the tread depth of each of its four tyres.

(a) Suggest suitable names for each of the fields described.

Field name

[2]

(b) Complete the query-by-example grid to display cars where all four tyres have a tread depth of less than 2. Display all the fields, using the field names you created in **part (a)**. The output should be sorted by licence number.

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

[4]

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