Cambridge Assessment International Education

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0675164992

COMPUTER SCIENCE **0478/21**

Paper 2 Problem-solving and Programming **October/November 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 **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 program is needed for a swimming club to manage the annual audit of its membership details.

The data stored about each member includes name, age, gender, type of membership, whether a team member or **not**, annual fee and if the fee has been paid. Team members are allowed a discount of 10% on their annual membership fee.

The types of membership available are:

Membership	Age range in years	Annual fee
junior	>= 2 and < 18	$10.00
adult	>= 18 and < 50	$20.00
senior	>= 50 and < 80	$15.00
golden	80 and over	free

Write and test a program or programs for the swimming club annual audit:

- 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 the system to store the membership details

Set up your program to:
- store the members' details in arrays
- populate the arrays with at least 20 members' details
- use the array index as the annual membership number.

Task 2 – providing annual audit statistics

Count the number of current members by membership type. For each type of membership count the number of members who did **not** pay the annual fee. Display these counts as a percentage of the total number of members for each membership type. Calculate and display the total of the annual fees expected and the annual fees received for this year.

Task 3 – updating the membership details for the next year

Extend your program to:
- check if any members have **not** paid and output a list of all these members
    - remove these members from the system
- update the age of all the members by one year and whether they are in a team
    - update the type of membership and the annual fee if required
- set the fee for every member as **not** yet paid
- display lists of current team members grouped by membership type.

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

(a) (i) Describe the arrays you have set up in **Task 1** to record the members' details. Include in your description the name, data type and sample data for each array.

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(ii) Explain how your program for **Task 1** populated the arrays with the members' details.

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(b) Explain how your program removed the members that have **not** paid their fees from the system in **Task 3**.

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..... [2]

(c) Write an algorithm for the part of **Task 3** that checks the age of all the members, and whether they are in a team, then updates the type of membership and the annual fee if required.

Use pseudocode, programming statements or a flowchart.

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(d) Explain how your program completes these parts of **Task 2**:

- Count the number of members of each membership type who did **not** pay the annual fee.
- Display these counts as a percentage of the total number of members for each membership type.

Any programming statements that you include in your answer must be fully explained.

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Section B starts on page 8.

Section B

2 An algorithm has been written to:

- set 100 elements of the array `Reading[1:100]` to zero
- input integer values between 1 and 100
- end the process with an input of –1
- reject all other values
- count and output the number of times each value is input, starting with the largest value.

(a) Complete the pseudocode algorithm:

```
01  FOR Count ← 1 TO .....
02    Reading[Count] ← 0
03  NEXT Count
04  OUTPUT "Please enter next reading "
05  INPUT Value
06  WHILE Value <> -1 DO
07    IF Value <= 0 OR .....
08      THEN
09        OUTPUT "Reading out of range"
10      ELSE
11        Reading[Value] ← .....
12    ENDIF
13    OUTPUT "Please enter next reading "
14    .....
15  ENDWHILE
16  Count ← 100
17  REPEAT
18    OUTPUT "There are ", .....,
             " readings of ", Count
19    Count ← .....
20  UNTIL Count = 0
```

[6]

(b) Describe how the algorithm could be changed so that it does **not** output any counts of zero.

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..... [3]

3 **(a)** A PIN (personal identification number) is input into a banking app by the user. Before the PIN is accepted, the following validation checks are performed:

- check 1 – each character must be a digit
- check 2 – there must be exactly four digits
- check 3 – the value of the PIN must be between 1000 and 9999 inclusive.

Describe each validation check.

Check 1 .....

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Check 2 .....

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Check 3 .....

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[6]

(b) The PIN can be changed by the user.

Describe how the new PIN could be verified before use.

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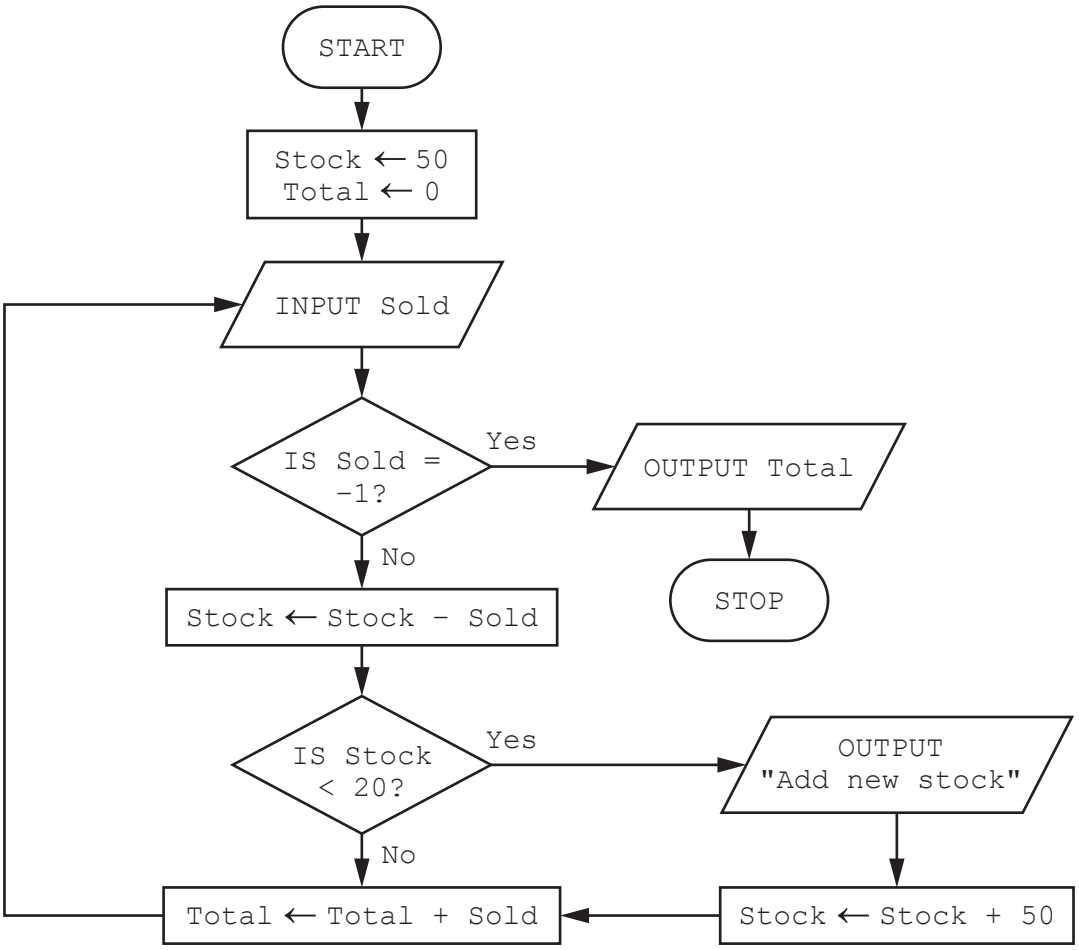
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..... [3]

Question 4 starts on page 12.

4 This algorithm makes sure that there are enough fresh bread rolls available for customers to buy.



(a) Complete the trace table for the algorithm using this input data:
24, 12, 6, 30, 12, 18, –1, 24

Sold	Stock	Total	OUTPUT

[4]

(b) Identify the problem that will occur if the input data starts with a value of 70.
Explain how you would correct this problem.

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5 A database table, WAREHOUSE, is used to keep a record of items for sale. The table has these fields:

- ItemCode – code to identify each type of item
- Description – brief description of each item
- Manufacturer – name of manufacturer
- Level – number in stock
- Price – price in dollars ($).

(a) State which field you would choose for the primary key. Give a reason for your choice.

Field .....

Reason .....

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[2]

(b) Complete the query-by-example grid to display only the item code and the manufacturer where the number in stock is below 10.

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

[3]

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