



Cambridge IGCSE™

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/23

Paper 2 Algorithms, Programming and Logic

May/June 2024

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- 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 75.
- 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.

1 Tick (✓) **one** box to complete this sentence.

This flowchart symbol



A represents a subroutine.

B represents a decision.

C represents an input/output.

D represents a terminator.

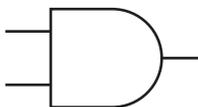
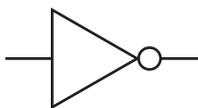
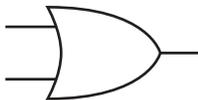
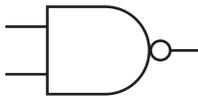
[1]

2 (a) **Four** logic gate symbols and **five** logic functions are shown.

Draw **one** line to link each logic gate symbol to the appropriate logic function.

Not all logic functions will be used.

Logic gate symbol



Logic function

AND

XOR

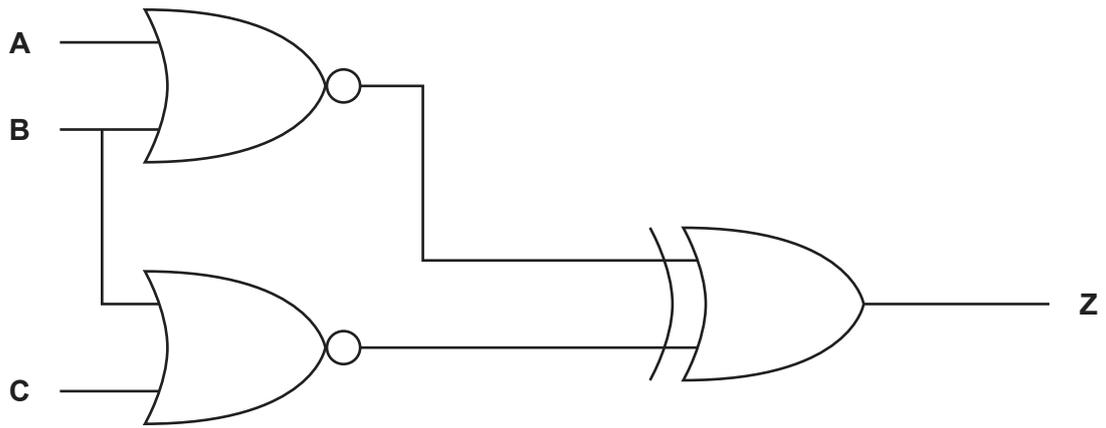
NOT

NAND

OR

[4]

(b) Complete the truth table for this logic circuit.



A	B	C	Working space	Z
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

3 Describe the characteristics of the string and char data types and give an example of each.

String

.....

Example

Char

.....

Example

[4]

- 4 This pseudocode algorithm is intended to allow data for up to 50 people to be entered and stored in a two-dimensional (2D) array. The data is their last name, first name and the city in which they live.

```

01 DECLARE People : ARRAY[1:50, 1:3] OF REAL
02 DECLARE Count : INTEGER
03 DECLARE Response : CHAR
04 DECLARE Continue : BOOLEAN
05 FOR I ← 1 TO 50
06     FOR J ← 1 TO 3
07         People[I, J] ← ""
08     NEXT J
09 NEXT I
10 Count ← 100
11 Continue ← TRUE
12 CASE OF
13     OUTPUT "Enter the last name"
14     INPUT People[Count, 1]
15     OUTPUT "Enter the first name"
16     INPUT People[Count, 2]
17     OUTPUT "Enter the city"
18     INPUT People[Count, 3]
19     OUTPUT "Do you want to enter another name (Y or N)?"
20     INPUT Response
21     IF Response = 'N'
22         THEN
23             Continue ← FALSE
24         ELSE
25             Count ← Count + 1
26     ENDIF
27 UNTIL NOT Count

```

- (a) Identify the line numbers of the **four** errors in the pseudocode and suggest corrections.

Error 1 line number

Correction

.....

Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

Error 4 line number

Correction

.....

[4]

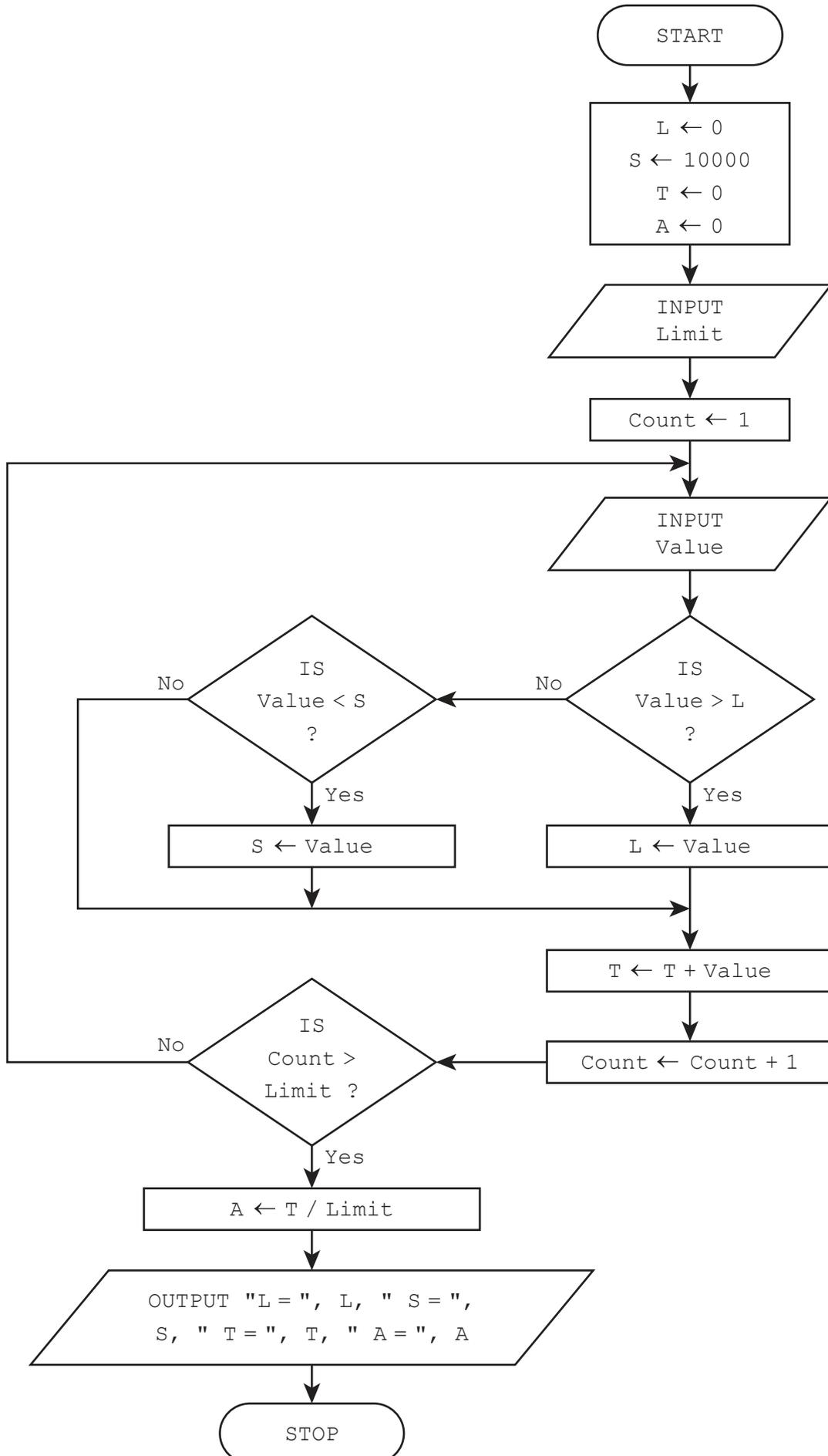
(b) Write the pseudocode that you could add to the end of this algorithm to output the contents of the array. Make sure that the output ends when the data in the array ends.

.....
.....
.....
.....
.....
.....
.....
..... [4]

(c) Explain how you could alter the original corrected algorithm to make sure that the number of elements being added to the array does not exceed the maximum size of the array (50 elements).

.....
.....
.....
.....
.....
.....
.....
..... [4]

5 The flowchart represents an algorithm.



(c) Explain why the identifiers L, S, T and A may **not** be appropriate to use as identifiers and how they could be improved.

.....

.....

.....

.....

.....

.....

..... [3]

(d) State a more appropriate identifier for each of the variables L, S, T and A

Original identifier	Improved identifier
L	
S	
T	
A	

[2]

6 A program is to be written that will accept integers that are between the values of 1 and 80 inclusive.

(a) Give examples of normal, abnormal and extreme test data that could be used to make sure the program only accepts valid data.

Normal test data

Abnormal test data

Extreme test data

[3]

(b) Describe what is meant by extreme test data.

.....

.....

.....

..... [2]

7 (a) The string operation `SUBSTRING(FullText, X, Y)` returns a string from `FullText` beginning at position `X` that is `Y` characters long. The first character in `FullText` is in position 1.

Write the pseudocode statements to:

- store the string "IGCSE Computer Science at Cambridge" in `FullText`
- extract and display the words "Computer Science" from the string and store it in a suitable variable
- output the original string in upper case.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Write the pseudocode statements to:

- store the content of the variable you created in part (a) to a text file named "Subjects.txt"
- close the text file at the end of the algorithm.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (c) Complete the SQL statement to display only the ID and model of all the aircraft that are airworthy.

```
SELECT ID, .....  
.....  
.....  
..... ;  
[4]
```

9 A one-dimensional (1D) array `Teams []` contains the names of 10 football teams in a local league. A two-dimensional (2D) array `Results []` stores, for each team, the total number of:

- games won
- games drawn
- games lost
- points.

The position of any team's data is the same in both arrays. For example the data in index 3 of `Results []` belongs to the team in index 3 of `Teams []`

The array data will be used to find the current leader of the league.

The variable `Played` stores the number of games played by each team. Each team plays the same number of games.

Write a program that meets the following requirements:

- allows the number of games played to be input and stored, with a maximum of 18 games
- allows the names of the teams to be input and stored
- allows the number of games won, drawn and lost to be input and stored for each team
- validates the number of games played and the number of games won, drawn or lost against the number of games played
- calculates and stores the number of points for each team using three points for a win and one point for a draw; there are no points for a loss
- sorts the array `Results []` into descending order of number of points, ensuring the corresponding parallel array `Teams []` is kept in the same order
- determines how many teams have the highest number of points
- outputs the name(s) of the winning team(s) along with the number of points achieved.

You must use pseudocode or program code **and** add comments to explain how your code works.

You do **not** need to declare any arrays, variables or constants; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.