Cambridge Assessment International Education

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CENTRE NUMBER						CANDIDATE NUMBER			

2504848111

COMPUTER SCIENCE **0478/23**

Paper 2 Algorithms, Programming and Logic **October/November 2023**

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.

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1 Tick (✓) **one** box to show which term is an example of a verification check.

A Double entry check ☐

B Format check ☐

C Length check ☐

D Presence check ☐

[1]

2 Tick (✓) **one** box to show which library routine returns the remainder of a division.

A DIV ☐

B MOD ☐

C RANDOM ☐

D ROUND ☐

[1]

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3 **(a)** **Four** pseudocode descriptions and **five** pseudocode keywords are shown.

Draw **one** line to link each pseudocode description to the most appropriate pseudocode keyword. **Not** all pseudocode keywords will be used.

Pseudocode description	Pseudocode keyword
stores data in a file	OUTPUT
retrieves data from a file	WRITE
displays data on a screen	READ
enters data from a keyboard	OPEN
	INPUT

[4]

(b) Give **two** reasons for storing data in a file.

1 .....

.....

2 .....

.....

[2]

4 A programmer is writing a data entry program for booking theatre seats.
The programmer needs the program to accept only whole numbers that are greater than or equal to one and less than or equal to six.

(a) Give the names of **two** validation checks that are required for this program.

1 .....

2 .....
[2]

(b) Complete this pseudocode to perform your **two** validation checks, using your answers given in **(a)**:

```
OUTPUT "Please enter the number of seats you want to book "

INPUT Seats
```

.....

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[5]

(c) Give **one** item of test data to use when testing this program.
State the reason for your choice of test data.

Test data .....

Reason for choice .....

.....
[2]

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5 An algorithm has been written in pseudocode to check if a new password is in a list of previously used passwords `OldList[]`
If the password is **not** found, the new password will be stored at the end of the list to replace `"XXXX"` already stored there.

```
01 OUTPUT "Enter your new password "
02 INPUT NewPassword
03 Posn ← 1
04 Found ← FALSE
05 REPEAT
06     IF Password = OldList[Posn]
07       THEN
08         Found ← TRUE
09       ELSE Posn ← Posn + 1
10     ENDIF
11 UNTIL Found AND OldList[Posn] = "XXXX"
12 IF Found
13   THEN
14     OUTPUT "Password has been used before"
15   ELSE
16     INPUT "New password accepted"
17     OldList[Posn] ← NewPassword
18 ENDIF
```

(a) Identify the **three** errors in the pseudocode and suggest corrections.

Error 1 .....

Correction .....

.....

Error 2 .....

Correction .....

.....

Error 3 .....

Correction .....

.....

[3]

(b) Complete this flowchart for the corrected algorithm:





[6]

6 There are **three** descriptions of logic gates. Each logic gate has two inputs **A** and **B** with one output **X**.
Identify each logic gate.
Complete a truth table for each logic gate.

(a) The only time the output is 1 is when both inputs are 1.

Logic gate .....

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

(b) The output is 1 when both inputs are different.

Logic gate .....

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

(c) The only time the output is 1 is when both inputs are 0.

Logic gate .....

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

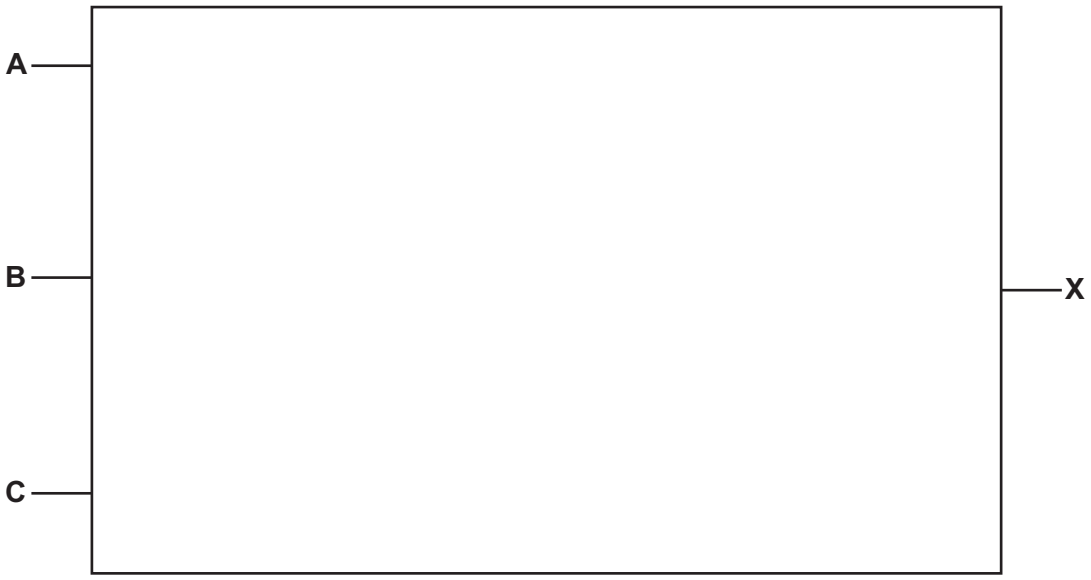
[2]

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(d) Consider this logic expression:

X = (NOT **A** OR NOT **B**) OR NOT **C**

Draw a logic circuit for this logic expression. Each logic gate must have a maximum of **two** inputs. Do **not** attempt to simplify this logic expression.



[5]

7 A program uses both local variables and global variables.

Describe **two** differences between local variables and global variables.

Difference 1 .....

.....

.....

.....

Difference 2 .....

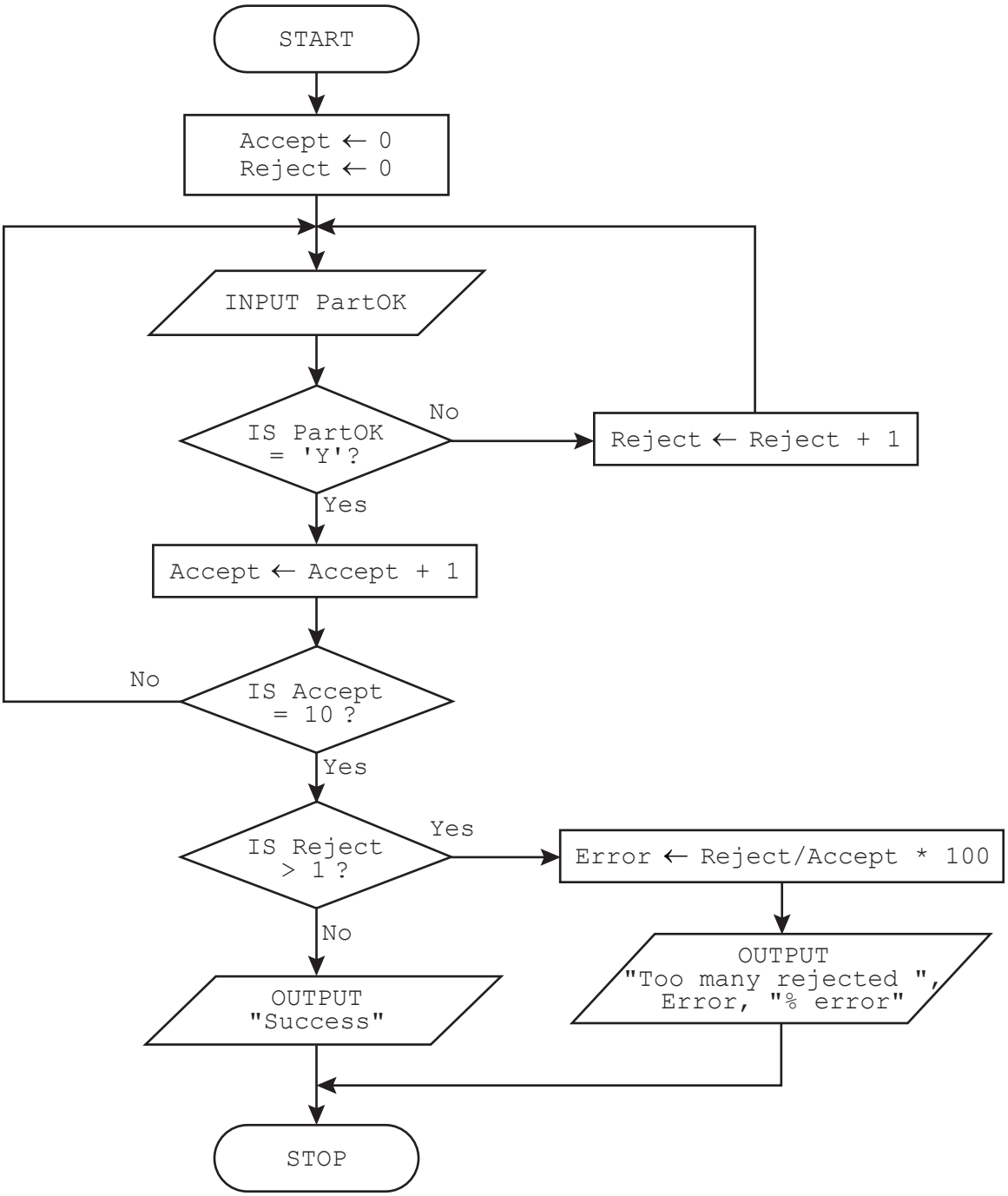
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[4]

8 This is an algorithm to find if a batch of parts has been manufactured successfully.



(a) Complete the trace table using this data:
Y, Y, Y, N, Y, Y, Y, Y, N, Y, Y, Y, Y

Accept	Reject	PartOK	Error	OUTPUT

[5]

(b) Describe how the algorithm should be changed to accept 'Y' or 'y' for a successfully manufactured part.

.....

.....

.....

.....

.....

..... [3]

9 A sanctuary for pheasants has set up a new database table called `PheasantList` to store details of the different species of bird at the sanctuary. Part of this table is given, showing: species, description, number of birds at the sanctuary, if the birds are breeding or **not**, and number of young born this year.

Species	Description	NumberBirds	Breeding	Young
Edwards	blue-black with white tail	5	Yes	0
Japanese green	dark green with pale grey tail	2	Yes	2
Reeves	golden, white and red scaled plumage	4	Yes	1
Crawfords Kalij	glossy blue-black plumage	4	No	0
Crested fireback	blue-black with black tail	3	No	0
True silver	white laced top half and black lower half	7	Yes	1
Siamese fireback	grey plumage with crimson legs and feet	5	No	0
Mikado	iridescent plumage with white striped wings	3	Yes	4
Red junglefowl	many colours	2	Yes	0
Himalayan monal	many colours with metallic green crest	3	Yes	2
White eared	white with ear tufts	5	Yes	3
Brown eared	brown with ear tufts	9	Yes	1
Ring necked	long tail with white ring neck	2	Yes	2
Golden	rainbow coloured	3	Yes	4

(a) State the number of records and fields in this part of the database table.

Records .....

Fields .....
[2]

(b) **(i)** Give the name of a field that could be used for the primary key.

..... [1]

(ii) Explain why the sanctuary might decide **not** to use the field in **(b)(i)** as the primary key.

.....

..... [1]

(iii) A new field `SpeciesID` is added to the database table.
This field contains a six-character code, for example Ph0001.

Give a reason why this field would be a better primary key.

.....

..... [1]

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(c) Write the output that would be given by this structured query language (SQL) statement:

```
SELECT Species, Description

FROM PheasantList

WHERE NumberBirds > 6;
```

.....

..... [2]

(d) Complete this SQL statement to display all the species of pheasant where the birds are breeding and there were no young born this year:

```
SELECT .....

FROM .....

WHERE .....

..... ;
```

[4]

10 A weather station takes temperature readings once an hour for a week. These temperatures are stored in a two-dimensional (2D) array `Temperatures[]`
Each column contains 24 readings for a single day. The first temperature is recorded at 00:00 and the final temperature at 23:00. There are seven columns, one for each day of the week, starting with Monday and ending with Sunday.

The variables `MaxDay`, `MinDay` and `AvDay` are used to store the maximum, minimum, and average temperatures for a day. The variables `MaxWeek`, `MinWeek` and `AvWeek` are used to store the maximum, minimum, and average temperatures for the week.

The array has already been set up and the data stored.

Write a program that meets the following requirements:

- finds the maximum and minimum temperatures for each day
- calculates the average temperature for each day
- outputs for each day:
  - name of the day, for example Monday
  - maximum temperature
  - minimum temperature
  - average temperature
- finds the maximum and minimum temperatures for the week
- calculates the average temperature for the week
- outputs:
  - maximum temperature for the week
  - minimum temperature for the week
  - average temperature for the week.

All temperatures output must be rounded to two decimal places.

You must use pseudocode or program code **and** add comments to explain how your code works. All inputs and outputs must contain suitable messages.

You do **not** need to declare any arrays or variables; you may assume that this has already been done.
You do **not** need to initialise the data in the array `Temperatures[]`

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