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2831613016

COMPUTER SCIENCE **0478/22**

Paper 2 Algorithms, Programming and Logic **February/March 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 word accurately describes the scope of a variable declared in a procedure.

A Function ☐

B Global ☐

C Local ☐

D Subroutine ☐

[1]

2 **(a)** **Four** descriptions and **five** pseudocode statements are shown.

Draw **one** line to link each description to its most appropriate pseudocode statement. **Not** all pseudocode statements will be used.

Description	Pseudocode statement
a statement to count	`FOR Count ← 1 TO 10`
a statement to total	`Value ← Value + NewValue`
a statement to start a pre-condition loop	`WHILE Value > 10 DO`
a statement to start a post-condition loop	`Value ← Value + 1`
	`REPEAT`

[4]

(b) Write an algorithm in pseudocode, using a single loop, to output the average of 50 numbers that have been stored in the array `Number[]`

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..... [5]

3 Describe the purpose of test data. Include an example of a type of test data in your answer.

Description .....

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Example .....

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[3]

4 Describe how variables and constants are used in programming.

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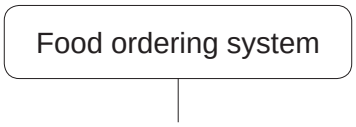
..... [3]

5 A food ordering system is an example of a computer system that is made up of sub-systems.

The food ordering system:
- allows the user to enter the details of the food they want to order and to pay for the order
- displays food available as pictures or as a list.

Complete the structure diagram for the given parts of the food ordering system.



[4]

6 The energy efficiency of an electrical appliance is the percentage of useful energy out compared with the total energy in.

An algorithm has been written in pseudocode to calculate the energy efficiency of an appliance. Values for total energy in and useful energy out are input. The efficiency is calculated and output as a percentage.
The entry of the number –1 for either value stops the algorithm.

```
01 REPEAT
02     OUTPUT "Enter total energy in "
03     INPUT TotalEnergyIn
04     OUTPUT "Enter useful energy out "
05     OUTPUT UsefulEnergyOut
06     IF TotalEnergyIn <> -1 AND UsefulEnergy <> -1
07       THEN
08         Efficiency ← (UsefulEnergyOut / TotalEnergyIn) * 100
09         OUTPUT "Efficiency is ", Efficiency, "%"
10     ENDIF
11 UNTIL TotalEnergyIn <> -1 OR UsefulEnergyOut <> -1
```

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

Error 1 .....

Correction .....

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Error 2 .....

Correction .....

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Error 3 .....

Correction .....

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[3]

(b) Write pseudocode to check for an efficiency of 92% or over for this appliance and to output "A-rated" if the efficiency is 92% or over.

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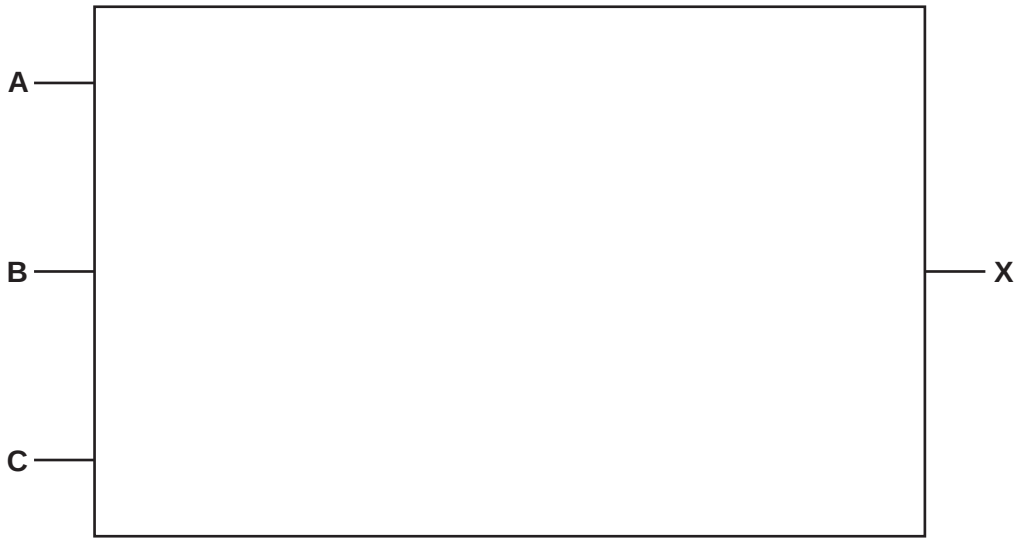
..... [2]

7 Consider this logic expression.

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

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



[5]

(b) Complete the truth table from the given logic expression.

A	**B**	**C**	Working space	**X**
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]

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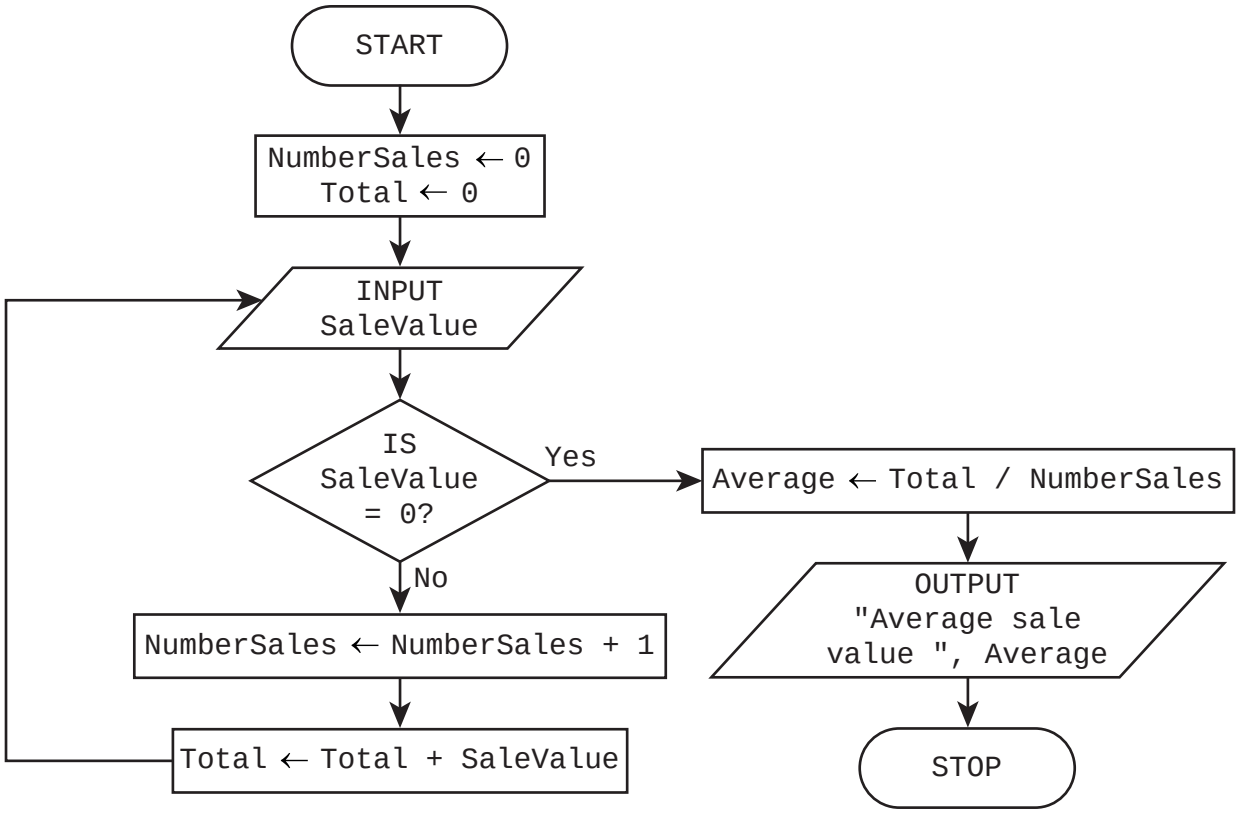
8 This flowchart represents an algorithm to find the average value of a number of sales.



(a) Complete the trace table using this data:
5.50, 3.40, 6.25, 3.85, –11.00, 0

NumberSales	Total	SaleValue	Average	OUTPUT

[4]

(b) Identify the error in the algorithm and describe how to correct it.

Error .....

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Correction .....

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[3]

9 A shop that sells books has set up a new database table called `BookList` to store book details. Part of this table is given.

CatNo	Title	Fiction	Author	PaperBack	Price	StockLevel
BK01	The Princes' Story	Yes	B Penn	Yes	4.50	500
BK02	The Princesses' Story	Yes	B Penn	Yes	4.50	350
BK03	Computer Science	No	Way Yu	Yes	19.99	20
BK04	The Modern World	No	P Patel	No	25.00	5
BK05	The Ancient World	Yes	P Patel	No	25.00	5
BK06	Computer Science	No	R Dale	Yes	27.35	8
BK07	The Princes' Story	Yes	B Penn	No	12.50	3
BK08	The Princesses' Story	Yes	B Penn	No	12.50	0
BK12	Famous Five	Yes	E Bly	Yes	2.75	45
BK15	Secret Seven	Yes	E Bly	Yes	2.75	25
BK16	The Last Knight	Yes	P Mann	Yes	5.99	7
BK17	The Dark Tower	Yes	P Mann	Yes	5.99	5
BK19	The Final Chase	Yes	P Mann	Yes	5.99	5
BK21	Maths Today Part 1	No	B Ward	Yes	6.75	25
BK22	Maths Today Part 2	No	B Ward	Yes	6.75	15
BK23	Maths Today Part 3	No	B Ward	Yes	6.75	10
BK26	Maths Today Workbook	No	B Ward	Yes	6.75	30
BK27	Knitting for Beginners	No	A Smith	Yes	6.99	3
BK30	Woodwork for Beginners	No	A Smith	Yes	6.99	4
BK31	Networking for Beginners	No	A Smith	Yes	6.99	0

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

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

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(ii) State the reason for choosing this field for the primary key.

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..... [1]

(c) Complete the table to identify the most appropriate data type for each field based on the data shown in the table `BookList`

Field	Data type
`CatNo`	
`Title`	
`Fiction`	
`Price`	

[2]

(d) Write the output from this structured query language (SQL) statement.

```
SELECT CatNo, Title, Author
FROM BookList
WHERE StockLevel = 0;
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..... [2]

(e) Complete this SQL statement to display all the titles by the author B Penn.

```
SELECT .....
FROM .....
WHERE .....;
```

[2]

10 The variables X, Y and Z are used in a program: X stores a whole number, Y stores a decimal number and Z stores a flag that can be set to TRUE or FALSE

(a) Write pseudocode statements to declare the variables X, Y and Z

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..... [3]

(b) The function Same(A,B) returns TRUE if the value of A is the same as the value of B when B is rounded to the nearest whole number and FALSE otherwise.

Write pseudocode statements to:
- define the function
- call the function with X and Y and store the return value in Z

Function definition .....

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Function call .....

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[6]

(c) State the difference between defining and calling a function.

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11 The one-dimensional (1D) array `TeamName[]` contains the names of teams in a sports league. The two-dimensional (2D) array `TeamPoints[]` contains the points awarded for each match. The position of each team's data in the two arrays is the same. For example, the team stored at index 10 in `TeamName[]` and `TeamPoints[]` is the same.

The variable `LeagueSize` contains the number of teams in the league. The variable `MatchNo` contains the number of matches played. All teams have played the same number of matches.

The arrays and variables have already been set up and the data stored.

Each match can be played at home or away. Points are recorded for the match results of each team with the following values:

- 3 – away win
- 2 – home win
- 1 – drawn match
- 0 – lost match.

Write a program that meets the following requirements:

- calculates the total points for all matches played for each team
- counts the total number of away wins, home wins, drawn matches and lost matches for each team
- outputs for each team:
  - name
  - total points
  - total number of away wins, home wins, drawn matches and lost matches
- finds and outputs the name of the team with the highest total points
- finds and outputs the name of the team with the lowest total points.

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.

You do **not** need to initialise the data in the arrays `TeamName[]` and `TeamPoints[]` or the variables `LeagueSize` and `MatchNo`

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