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COMPUTER SCIENCE

0478/21

Paper 2 Algorithms, Programming and Logic

May/June 2026

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. Do **not** use correction fluid or tape.
- 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 identify the type of validation check to test whether a number entered into a computer system is between two set values.

A length check

☐

B presence check

☐

C type check

☐

D range check

☐

[1]

- 2 Identify **four** operators that are **not** arithmetic operators from the list.

/

>

<=

+

*

^

AND

DIV

MOD

NOT

1

2

3

4

[4]

- 3 Complete the table by writing the most appropriate data type for each variable described.

variable	description	example data	data type
Age	the age of the student	16	
TelephoneNumber	the telephone number of the student	+44 7846398573	
Teenager	whether the student is a teenager or not	TRUE	

[3]



- 4 The following pseudocode algorithm uses a bubble sort to sort the array `Names[50]`

Complete the algorithm.

`Last` $\leftarrow$

REPEAT

`Swap` $\leftarrow$

 FOR $\leftarrow$ 1 TO `Last` - 1

 IF `Names[Index]` > `Names[Index + 1]`

 THEN

`Temp` $\leftarrow$ `Names[Index]`

`Names[Index]` $\leftarrow$ `Names[Index + 1]`

`Names[Index + 1]` $\leftarrow$ `Temp`

`Swap` $\leftarrow$ TRUE

 ENDIF

 NEXT `Index`

`Last` $\leftarrow$ `Last` - 1

UNTIL `Swap` OR `Last` = 1

[4]

- 5 A computer system automatically creates usernames for new users. A new user enters their first name and their last name.

The system:

- takes the first letter of the first name
- takes the first two letters of the last name
- converts all the letters to upper case
- generates a random whole number between 1 and 1000 inclusive.

For the following example:

The first name is `Muhammed`

The last name is `Hann`

The generated number is `492`

The username will be `MHA492`

- (a) Write the pseudocode to generate a whole random number between 1 and 1000 inclusive and store it in the variable `GeneratedNumber`

.....

 [2]

- (b) The last name is input into the variable `LastName`

Write the pseudocode to:

- take the first two letters from `LastName`
- convert the letters to upper case
- store the result in the variable `Temp`

.....

 [3]

- (c) The new username is stored in the variable `NewUsername`

Write the pseudocode to store `NewUsername` to the file `Username.txt`

.....

 [3]





(d) Identify and describe verification checks that could be applied to the inputs of the first name and the last name of the user.

.....

.....

.....

.....

.....

..... [4]

6 Give programming examples for a count-controlled loop and a post-condition loop. Describe each of the loops.

count-controlled loop example

description

.....

.....

post-condition loop example

description

.....

..... [4]



- 7 An algorithm has been written in pseudocode for a user to repeatedly input positive whole numbers and store them in an array called `Values[]` until `-1` is input or until the array is full. The algorithm outputs the average of the numbers to 2 decimal places.

```

01 DECLARE Counter : INTEGER
02 DECLARE Total : INTEGER
03 DECLARE Average : INTEGER
04 DECLARE Values : ARRAY[1:100] OF INTEGER
05 Counter ← 1
06 Total ← 0
07 OUTPUT "Please enter a positive whole number or -1 "
08 INPUT Number
09 WHILE Number = -1 AND Counter ≤ 100 DO
10     Values[Counter] ← Number
11     Total ← Total + 1
12     Counter ← Counter + 1
13     INPUT Number
14 ENDWHILE
15 Counter ← Counter - 1
16 Average ← Counter / Total
17 OUTPUT "The average is ", ROUND(Average, 2)

```

Identify the line numbers of **four** errors in the pseudocode and suggest a correction for each error.

error 1 line number

correction

error 2 line number

correction

error 3 line number

correction

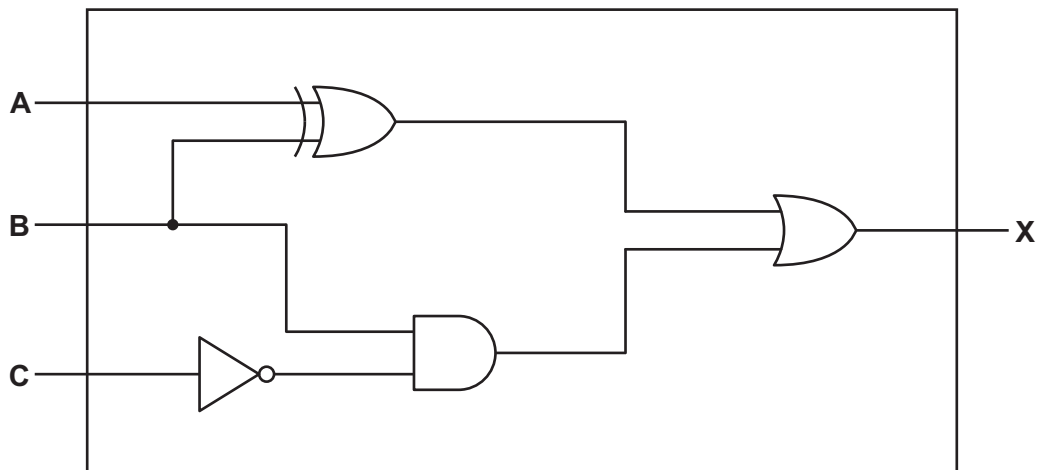
error 4 line number

correction

[4]



8 Consider the logic circuit:



(a) Write the logic expression for the given logic circuit.

.....

..... [3]

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

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]

- 9 A swimming club wants to set up a new database table to store details of the members of the club and the maximum distance each member swam in metres.

The table is called `SWIMMERS` and will contain these fields:

- `Distance` – distance the member swam, for example 1500
- `Date` – date the member swam the distance
- `Time` – time taken to swim the distance
- `MemberID` – the code to identify a member, for example TH749
- `MemberName` – name of the member.

- (a) (i) State why `MemberName` would **not** be appropriate for a primary key.

.....
 [1]

- (ii) Give the name of the most appropriate field for the primary key.

.....
 [1]

- (b) Complete the table to identify the most appropriate data type for these fields in the table `SWIMMERS`. Each data type must be different.

field	data type
Distance	
Date	
MemberID	

[2]

- (c) Complete the structured query language (SQL) statement to display only the names of the members who swam a distance of 1500 metres or more.

SELECT
 FROM
 WHERE
 ;
 [3]





Turn over



- 10 (a) Draw a flowchart to input six whole numbers and output the highest. You do **not** need to validate the inputs.

START



(b) Describe how the flowchart could be changed to only accept positive whole numbers.

.....

.....

.....

.....

.....

..... [3]

11 The function `Power(FirstNumber, SecondNumber)` returns the value of `FirstNumber` raised to the power of `SecondNumber`. `FirstNumber` and `SecondNumber` are integers.

Write pseudocode statements to:

- define the function
- call the function with the variables `A` and `B` and store the return value in the variable `Value`

function definition

.....

.....

.....

.....

.....

.....

function call

.....

..... [5]





12 A weather monitoring station records the number of minutes of sunshine for each day of a month.

The one-dimensional (1D) array `Sunshine[]` is used to store the number of minutes of sunshine for each day. The index of the array represents the day.

The one-dimensional (1D) array `MonthDays[]` contains the number of days in each month. The index of the array represents the month. In this array, 28 is stored in index 2 for the month of February. However, there are 29 days in February in a leap year.

In this program, a leap year is a year that divides by 4 with no remainder. For example, 2026 is **not** a leap year but 2028 will be a leap year.

Write a program that meets the following requirements:

- allows the user to input a year, calculates whether it is a leap year and updates the number of days in February as appropriate
- allows a user to input the name of one of the first three months of the year: January, February or March
- allows a user to input the number of minutes of sunshine for each day of the month and validates the input
- calculates the total amount of sunshine for the month in hours and minutes
- finds the highest amount of daily sunshine for the month
- outputs the:
 - year
 - month
 - total amount of sunshine for the month in hours and minutes
 - the highest amount of daily sunshine for the month.

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

Do **not** declare any arrays or variables; assume that this has already been done.

All inputs and outputs must contain suitable messages.

.....

.....

.....

.....

.....

.....

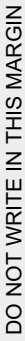
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[15]







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