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CENTRE NUMBER

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* 9 5 2 0 3 3 7 8 7 7 *

COMPUTER SCIENCE **9618/21**

Paper 2 Fundamental Problem-solving and Programming Skills **May/June 2026**

2 hours

You must answer on the question paper.

You will need: Insert (enclosed)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- 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.
- You may use an HB pencil for any diagrams, graphs or rough working.
- 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.
- The insert contains all the resources referred to in the questions.

This document has **24** pages. Any blank pages are indicated.

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Refer to the **insert** for the list of pseudocode functions and operators.

1 Study this pseudocode:

```
FOR i ← 3 TO 12 STEP 3
   OUTPUT i, i * i
NEXT i
```

(a) Identify the type of construct used in this pseudocode.

..... [1]

(b) State how many iterations are performed by this pseudocode.

..... [1]

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2 A washing machine contains:

- two trays for the washing powder
- a user interface display
- five sensors.

The washing machine control program includes the following variables:

variable	description
`MainsOn`	`TRUE` when the mains power is on
`WaterOn`	`TRUE` when the water supply to the machine is turned on
`DisplayOn`	`TRUE` when the user interface display is active
`Tray1`	`TRUE` when it detects washing powder in tray 1
`Tray2`	`TRUE` when it detects washing powder in tray 2

(a) (i) Identify the data type used for the **five** variables.

..... [1]

(ii) The display is only active when both the mains power is on and the water supply is turned on.

Complete the pseudocode statement.

`DisplayOn` ← .....
[1]

(iii) The washing machine control program will start when a new variable `WashStart` is assigned the value `TRUE`

`WashStart` is assigned the value `TRUE` when the mains power is switched on and there is washing powder in tray 1 or tray 2 or both trays.

Write the pseudocode statement for the given description.

.....

..... [3]

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(b) The user will select from three possible wash options.

The pseudocode for the washing machine program contains a procedure `WashCycle()`

```
PROCEDURE WashCycle()
   // declaration of variables has been omitted
   // TimeSoFar is a global variable which changes
   // as the procedure is executed
   Finished ← FALSE
   TimeSoFar ← 0.0

   OUTPUT "Option (1/2/3)"
   INPUT OptionNumber

   CASE OF OptionNumber:
      // WashTime is the total wash time in minutes
      1 : WashTime ← 60
      2 : WashTime ← 90
      3 : WashTime ← 120
   ENDCASE

   WHILE Finished = FALSE
      TimeRemaining ← WashTime - INT(TimeSoFar)


   ENDWHILE

ENDPROCEDURE
```

(i) The programmer uses an Integrated Development Environment (IDE) to develop and run the washing machine program.

State the IDE feature to display the current value for any variable during the execution of the program.

..... [1]

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(ii) When option 3 is selected, the programmer interrupts execution when the `TimeSoFar` is 17.6 minutes.

State the current value for `TimeRemaining`

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3 A business operates five call centres. The software currently in use in each call centre is to be replaced; a new system will be developed by a software company.

(a) The analysis stage included a feasibility study.

State **three** other activities carried out during the analysis stage.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(b) The analysis stage has ended.

Complete the statements about the development of the new system.

Before any programming is started, the ..... stage for the proposed new system must be completed.

For this large project, the tasks will be broken down into several ..... ; each will be coded by a different programming team.

Once each team has completed its work, ... testing must be carried out.

Before the new system is delivered to the business, ... testing will be carried out in-house.

It is decided to install the software initially in only one of the call centres where ..... testing will be carried out.

The new software is finally rolled out to all five call centres. In the first week of its use, staff report that the software still requires extra features which were not originally agreed. The software is withdrawn until ..... maintenance is completed.

[6]

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4 An algorithm is expressed as:

- A user inputs a sequence of integer values.
- The process will calculate the number of positive integers.
- The user will input value 0 to indicate there are no more numbers to be input.
- Output the number of positive integers after the terminating 0 is input.

Write a structured English description for this algorithm as a sequence of steps.

Do **not** include pseudocode statements in your description.

Your answer might **not** require all **six** steps shown.

step 1 .....

.....

step 2 .....

.....

step 3 .....

.....

step 4 .....

.....

step 5 .....

.....

step 6 .....

.....

[4]

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5 Electric light bulbs are advertised online with the price showing:

$1.75 each or 20 bulbs for $30.00

A pseudocode function `BulbCost()`

- takes the quantity of bulbs purchased as its single parameter
- returns the total cost in dollars.

Pseudocode for the main program:

- inputs the number of bulbs purchased
- returns the total cost from the function `BulbCost()`
- outputs the total cost.

(a) Write pseudocode for the function `BulbCost()`

.....

.....

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..... [4]

(b) The main program accepts a user input for the quantity of bulbs purchased and calls function `BulbCost()`

Complete the pseudocode for the main program.

```
// Main program
DECLARE NumberPurchased : INTEGER
DECLARE TotalCost : REAL

OUTPUT "How many bulbs? "
INPUT NumberPurchased

TotalCost ← .....

OUTPUT '$' , TotalCost
// end main program
```

[1]

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6 Fence parts are manufactured by a number of similar machines. The length of the part must fall within a certain range. Parts **not** within the length range are rejected.

The data for each rejected part forms a data packet made up of three data items, each separated by the '/' character delimiter. The format of a data packet is:

<length>/<machine ID>/<description of the fault>

- The length is 3 digits (in millimetres).
- The machine ID is a single character ('A', 'B', or 'C').
- The description of the fault is a variable length string.

A pseudocode program will process the data for several data packets.

The program contains the statement:

```
DataPacket ← "563/B/the fence length is too long"
```

(a) Complete the **two** pseudocode expressions which extract the appropriate data item.

```
PartLength ← .....

MachineID ← .....
```

[2]

(b) The program will create a module `RejectDescription()` to return the fault description.

Write the pseudocode for the module `RejectDescription()`

.....

.....

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..... [4]

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(c) The data packets for all rejected parts are saved in this format in a text file `Rejects.txt`. The file stores one data packet per line.

Write pseudocode to:

- find all the rejected parts with a length greater than 560 millimetres and that were produced on machine 'B' or machine 'C'
- output the description for each matching rejected part.

Your pseudocode will include a module call to `RejectDescription()` and the answers given for **6(a)**.

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..... [6]

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7 Different data structures will be suitable for different computing applications.

(a) (i) Identify a computing application where a queue data structure is suitable.

.....

..... [1]

(ii) Justify why a queue is suitable for your application identified in **7(a)(i)**.

.....

.....

..... [2]

(b) A programmer designs a circular queue.

- The data items are stored in a 1D array, `MyQueue`
- The queue is managed using two pointers.

The diagram shows the circular queue populated with four items.

MyQueue

1	"PIG"	← Front
2	"DOG"	
3	"RAT"	
4	"SPIDER"	← Rear
5		
6		
7		
8		

(i) Write **three** pseudocode declaration statements to implement this circular queue.

1 .....

2 .....

3 .....

[2]

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(ii) Two program modules are available to add and remove items to and from the queue.

module	description
`EnQueue(<value>)`	when `<value>` is added to the queue
`DeQueue()`	when an item is removed from the queue

Complete the state of `MyQueue` after the following sequence of changes:

- `DeQueue()`
- `EnQueue("HORSE")`
- `EnQueue("CAT")`

MyQueue

1	
2	
3	
4	
5	
6	
7	
8	

[2]

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(iii) On a different occasion, the state of `MyQueue` is:

MyQueue

1		
2		
3		
4	"LION"	← Front
5	"GIRAFFE"	
6	"TIGER"	
7	"ANT"	← Rear
8		

Complete the state of `MyQueue` after the following sequence of changes:

- `EnQueue("GERBIL")`
- `EnQueue("MONKEY")`
- `EnQueue("SNAKE")`
- `DeQueue()`

MyQueue

1	
2	
3	
4	
5	
6	
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8	

[2]

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(c) `MyQueue` will be initially empty.

Write a pseudocode procedure `InitialiseQueue()` to set up the empty `MyQueue`, using a loop.

The initial array contents will be set to empty strings.

You are **not** required to repeat the declaration statements in **7(b)(i)**.

```
PROCEDURE InitialiseQueue()
```

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```
ENDPROCEDURE
```

[3]

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8 Global array `MyData` contains the values shown.

Study the pseudocode algorithm and array `MyData`

```
FUNCTION MyTrace(Target : INTEGER) RETURNS INTEGER
   DECLARE LeftPointer, RightPointer, MidPointer : INTEGER
   LeftPointer ← 1
   RightPointer ← 15
   WHILE LeftPointer <= RightPointer
      MidPointer ← (LeftPointer + RightPointer) DIV 2
      IF MyData[MidPointer] = Target THEN
         OUTPUT "Found " & NUM_TO_STR(MidPointer)
         RETURN MidPointer
      ELSE
         IF Target > MyData[MidPointer] THEN
            LeftPointer ← MidPointer + 1
         ELSE
            RightPointer ← MidPointer - 1
         ENDIF
      ENDIF
   ENDWHILE
   OUTPUT "Not found"
   RETURN -1
ENDFUNCTION
```

	MyData
1	2
2	8
3	9
4	12
5	13
6	15
7	18
8	19
9	20
10	23
11	25
12	26
13	39
14	38
15	40

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(a) Complete the trace table for the function `MyTrace` when the following pseudocode statement is executed.

```
Result ← MyTrace(15)
```

LeftPointer	RightPointer	MidPointer

[4]

(b) Give the output.

..... [1]

(c) Give the value assigned to `Result`

..... [1]

9 A hotel has three floors numbered 0 to 2 (floor 0 is the ground floor). There are 15 rooms on each floor.

The hotel gets many enquiries from customers to check if a room is available that day.

The availability data for that day is stored in a 2D array `Version1`

- The first index is the floor number.
- The second index is the room number.
- On each of the three floors, the room numbers are 1 to 15.

Each cell of the array stores either:

- 'A' – the room is available
- 'B' – the room is already booked.

(a) Write the declaration statement for the 2D array `Version1`

..... [2]

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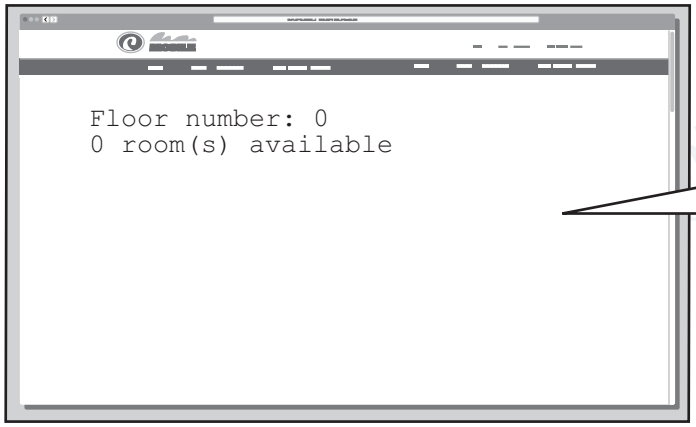
(b) An enquiry program will:

- input a floor number
- output all room numbers that are available on that floor
- output the number of rooms that are available.

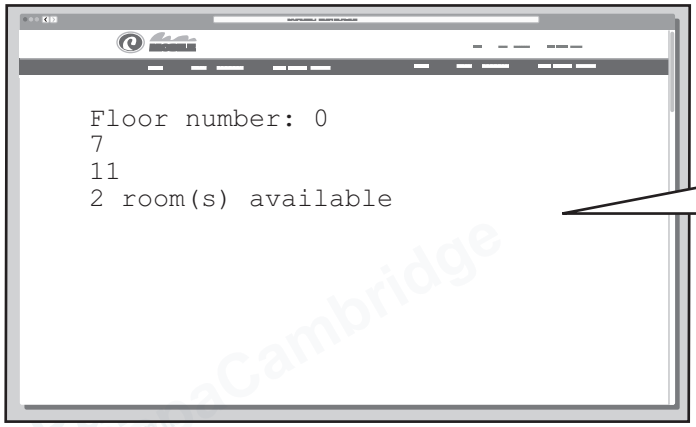
The output must be in the format shown in the two examples.

A wheelchair user makes an enquiry. She requires a room on the ground floor only.

Example program outputs:



There are no available rooms on the ground floor.



Shows two rooms available on the ground floor:

• rooms 7 and 11.

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Write pseudocode for this enquiry program.

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(c) Customers are becoming more selective with their enquiries when searching for an available room.

A new program design is required. It will create a record to define the data for a room.

Each room:

- may have a sea view
- is classified as: single room ('S'), double room ('D') or family room ('F')
- is either standard ('ST') or deluxe ('DL').

(i) Complete the pseudocode.

```
TYPE RoomData
```

.....

.....

.....

.....

.....

.....

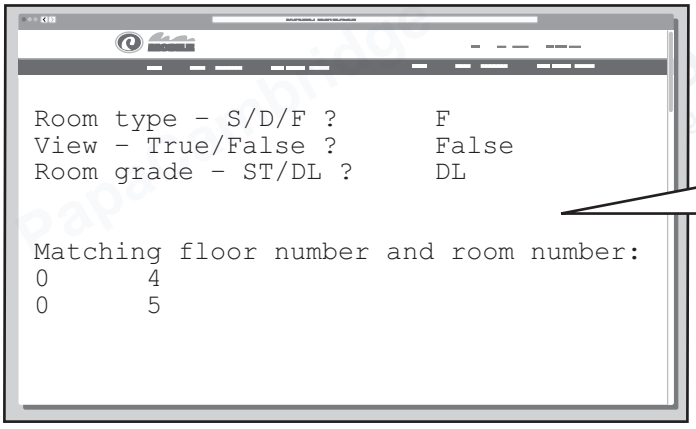
[3]

(ii) The room data is stored in a 2D array `Version2` of type `RoomData`

The new enquiry program uses this new data design and will:

- input the **three** customer requirements
- output the floor number(s) and room number(s) for all matching available rooms.

Example program output:



The customer asks for a deluxe family room; no need for a sea view.

The new enquiry program has found two matching rooms on the ground floor.

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Write pseudocode for the new enquiry program.

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