



**ADVANCED SUBSIDIARY GCE
COMPUTING**

Programming Techniques and Logical Methods

F452

**Friday 15 May 2009
Morning**

Duration: 1 hour 30 minutes

Candidates answer on the question paper

OCR Supplied Materials:
None

Other Materials Required:
None



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

1 (a) Programming constructs determine the way in which statements in a program are executed.

Three types of programming constructs are sequence, selection and iteration.

Describe what is meant by each of these.

Sequence
.....
.....
..... [2]

Selection
.....
.....
..... [2]

Iteration
.....
.....
..... [2]

(b) A computer program contains the following instructions

```
X = 5  
Y = 7  
X = Y  
OUTPUT X
```

(i) State which of the constructs in part (a) has been used.
..... [1]

(ii) State the value which will be output.
..... [1]

(c) Another computer program contains the following instructions.

```

INPUT X
INPUT Y
Z = -1
REPEAT
    Z = Z + 1
    Y = Y - X
UNTIL Y < 0
OUTPUT Z
    
```

(i) For each of the following sets of input data, complete the table below showing the values of the variables X, Y and Z **after** the instructions have been executed, and the output.

You may use the extra column for rough work.

INPUTS	X	Y	Z	OUTPUT
3, 9				
5, 7				
8, 2				

[12]

(ii) Explain what this algorithm does.

.....

.....

.....

..... [2]

(iii) The program is given the inputs: - 4, 12

Explain why this will produce an error and state the type of error it will produce.

.....

.....

.....

.....

Type of error: [3]

- (d) A utilities company provides both gas and electricity. Customers whose bills when added together exceed £10 are given a 5% discount on this total.

The following code has been written to calculate the total bill of customers including the discount, if any.

```

01 INPUT GasBill
02 INPUT ElectricBill
03 If GasBill AND ElectricBill > 10 THEN
04  TotalBill = GasBill + ElectricBill * 0.95
05 Else
06  TotalBill = GasBill + ElectricBill
07 END IF

```

This code contains an error in line 03 and another error in line 04.

- (i) Explain why there is an error in line 03 and state the type of error.

Explanation

.....

.....

.....

Type or error [3]

- (ii) Explain why there is an error in line 04 and state the type of error.

Explanation

.....

.....

.....

Type of error [3]

2 A parcel delivery company has a website where customers can arrange for parcels to be collected and delivered.

(a) Using the table below, state and justify **three** separate items of data which the customer will need to provide. An example has been completed.

Item of data needed	Reason why it is needed
Delivery postcode	So that the driver can arrange the most efficient route

[6]

(c) One way to prevent the problem described in part (b) is to use validation when the customer inputs the postcode.

(i) Explain the term validation.

.....
.....
.....
..... [2]

(ii) Describe **three** validation checks that can be used on the postcode.

Validation Check 1
.....
.....
.....
Validation Check 2
.....
.....
.....
Validation Check 3
.....
.....
..... [6]

3 A company is writing a program to control the lift in a 5-storey building.

The program uses an array called LiftCalled() to store whether the lift has been called on each floor.

(a) Explain what is meant by an array.

.....

.....

.....

..... [2]

The structure of the array used is shown in the table below.

Each row represents a floor of the building. The first column stores whether a lift is wanted to go UP from that floor, and the second column stores whether the lift is wanted to go DOWN from that floor.

	1(UP)	2(DOWN)
1	FALSE	FALSE
2	TRUE	FALSE
3	TRUE	FALSE
4	FALSE	TRUE ← LiftCalled(4, 2)
5	FALSE	FALSE

(b) In the table above the value of LiftCalled(4,2) is TRUE. This means that the lift has been called to go DOWN from the fourth floor.

State the value of LiftCalled(2,1) and explain what it means.

Value

Explanation

.....

.....

..... [3]

- (c) When the lift is called from a floor (by pressing either UP or DOWN outside the lift door) the program executes a subroutine ButtonPressed. This subroutine updates the contents of the array LiftCalled by inserting TRUE in the cell which corresponds to the floor on which the lift is called and the direction wanted.

The algorithm for this subroutine is given below in pseudocode.

SubRoutine ButtonPressed (Floor : Integer, Direction : String)

IF Direction = "UP" THEN

LiftCalled(Floor,) = TRUE

ELSE

LiftCalled(..... , 2) =

END IF

End SubRoutine ButtonPressed

- (i) Fill in the **three** spaces in the algorithm. [3]
- (ii) State the names of the parameters of the subroutine.

.....
..... [2]

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4 A programmer is producing a computer program which allocates seats to customers in a small theatre.

(a) The code for the program uses variables and constants.

(i) Describe what is meant by a variable.

.....
.....
.....
..... [2]

(ii) State how a constant is different from a variable.

.....
..... [1]

(iii) Describe how using constants can help improve the maintainability of the code.

.....
.....
.....
..... [2]

(b) Some variables used by the program are given below.
For each variable, state its data type and give **one** reason why this data type is suitable.

(i) Variable: NoTickets (The number of tickets wanted)

Data Type

Reason

..... [2]

(ii) Variable: SeatAvailable (Whether a seat can be booked)

Data Type

Reason

..... [2]

(iii) Variable: SeatNumber (For example F7, meaning the seat is in row F, number 7)

Data Type

Reason

..... [2]

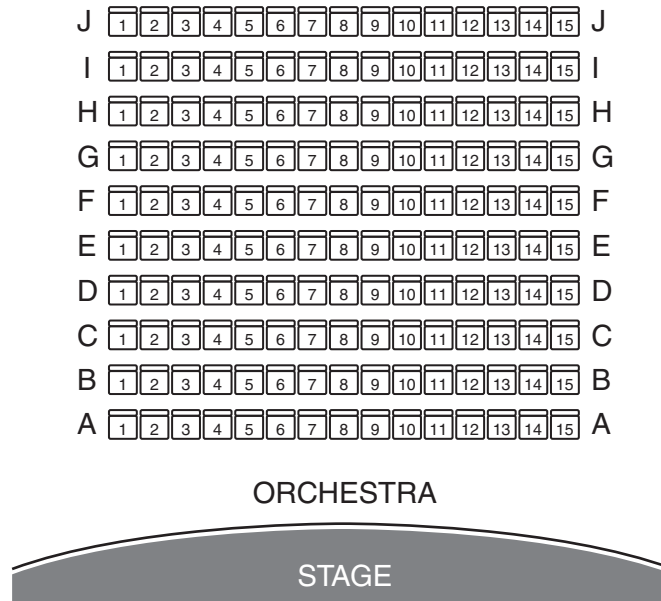
(iv) Variable: TotalPrice (The cost of the tickets booked by the customer)

Data Type

Reason

..... [2]

- (c) The theatre has 10 rows, labelled A to J from front to back, and 15 seats in each row, numbered 1 to 15 from left to right.



The program uses the following rules to choose the best seats.

Rule 1: All seats in one booking must be in the same row, next to each other.

Rule 2: The seats must be as close to the front as possible.

Write an algorithm which takes the number of tickets wanted as an input, and outputs the best seats available.

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