



General Certificate of Secondary Education
2025

Centre Number

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Candidate Number

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Digital Technology

Unit 4

Digital Development
Concepts

MV18

[GDG41]

TUESDAY 3 JUNE, AFTERNOON

Time

1 hour 30 minutes, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all ten** questions.

Information for Candidates

The total mark for this paper is 120.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 7.

For Question 1 insert the appropriate letter in the space provided.

1 (a) Select the statement that is true about the string data type. [1 mark]

- A** The string data type can store only numbers.
- B** The string data type can store letters but not numbers.
- C** The string data type can store only letters and special characters.
- D** The string data type can store letters and numbers.

Answer _____

(b) Which of the following conditions will be true if $X=0$, $Y=6$ and $Z=3$? [1 mark]

- A** $(X > Y)$ OR $(Y > 6)$
- B** $Y < Z$
- C** $(X < Y)$ AND $(Y > Z)$
- D** $(Z < Y)$ AND $(X > Z)$

Answer _____

(c) Which **one** of the following IF statements will output "HELLO WORLD" when $X=9$, $Y=2$ and $Z = -1$?
[1 mark]

- A** IF $(X+Y)=Z$
OUTPUT "HELLO WORLD"
- B** IF $(X-Y+Z)<5$
OUTPUT "HELLO WORLD"
- C** IF $(X*Z)<0$
OUTPUT "HELLO WORLD"
- D** IF $(X+Y+Z)<10$
OUTPUT "HELLO WORLD"

Answer _____

(d) Which of the following tables is the correct truth table for $D = \text{NOT}(C \text{ AND } B)$? [1 mark]

A

A	B	$C = \text{NOT}(B)$	$D = \text{NOT}(C \text{ AND } B)$
0	0	1	0
0	1	1	1
1	0	1	0
1	1	1	1

B

A	B	$C = \text{NOT}(B)$	$D = \text{NOT}(C \text{ AND } B)$
0	0	0	0
0	1	0	0
1	0	0	0
1	1	0	1

C

A	B	$C = \text{NOT}(B)$	$D = \text{NOT}(C \text{ AND } B)$
0	0	1	1
0	1	0	1
1	0	1	1
1	1	0	1

D

A	B	$C = \text{NOT}(B)$	$D = \text{NOT}(C \text{ AND } B)$
0	0	1	0
0	1	0	0
1	0	1	0
1	1	0	0

Answer _____

(e) Select the statement that is true about sorting.

[1 mark]

- A** The insertion sort starts by examining the middle element in the array and creates a sorted sub-list before the data is fully sorted.
- B** The bubble sort compares adjacent elements in an array and performs several passes through an array before the data is fully sorted.
- C** The bubble sort creates a sorted sub-list and performs several passes through an array before the data is fully sorted.
- D** The insertion sort compares adjacent elements in an array and performs several passes through an array before the data is fully sorted.

Answer _____

2 (a) Consider the following algorithm.

```
FOR K = 1 TO 10
  IF (K > 4 ) AND (K*3 <24)
    OUTPUT (K*3)
  ENDIF
ENDFOR
```

In the space below, list the output generated by the algorithm. [4 marks]

(b) Consider the following algorithm.

```
FOR K = 1 TO 3
  FOR M = 1 TO 3
    OUTPUT (K * M)
  ENDFOR
  OUTPUT BLANK LINE
ENDFOR
```

Some of the output from the algorithm is shown below.
Complete the output generated by the algorithm by
inserting the correct values in the spaces provided.
[1 mark for each]

1	2	3
2 _____	_____	
3 _____	_____	

(c) The following algorithm has been written to collect values and convert them from inches to centimetres. The loop should exit when the user enters a value of zero. The loop is not working correctly.

DO

 OUTPUT "Enter a value in inches"

 INPUT inches

 centimetres=inches * 2.54

 OUTPUT centimetres

WHILE inches = 0

(i) How many times will the loop run when the user enters a value of 7 for inches? [1 mark]

(ii) What will happen when the user enters a value of 0 for inches? [1 mark]

(iii) What change needs to be made to the loop condition so that it works correctly? [2 marks]

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(Questions continue overleaf)

- 3 Ted creates music recordings for local musicians. He charges an hourly rate based on the hours booked by a musician. Musicians can only book whole hours.

The table below shows the costs for recordings.

Category	hoursBooked	hourlyRate(£)
Category 1	8 hours or more	50.00
Category 2	5 hours or more	60.00
Category 3	3 hours or more	70.00
Category 4	Less than 3 hours	80.00

- (a) Complete the algorithm which will allow Ted to input the hoursBooked and calculate and output the cost of the booking together with the Category. [7 marks]

All IF Statements **should contain only one condition.**

```
OUTPUT ("Enter the number of hours booked by the musician")
INPUT hoursBooked
IF hoursBooked >= 8
    Category = "Category 1"
```

(b) Suggest the most appropriate data type for the following variables. [1 mark for each]

Variable	Data Type
Category	
hoursBooked	

(c) Ted has asked a programmer to write the code for the algorithm. The programmer will make use of a software development environment.

(i) Apart from colour coding of keywords, list **two** editing features of a software development environment. [2 marks]

1. _____

2. _____

- (ii) The programmer will have to fix syntax and logic errors as the program is developed. Complete the table below by identifying whether each error listed is a syntax or logic error. [1 mark for each]

Error	Syntax or logic error?
A keyword in the code has been misspelt.	
When a value of 9 is entered for hoursBooked the program tells Ted that this is a Category 2 booking.	
A bracket has been omitted from a statement.	
The cost for bookings is incorrect in some cases.	

4 (a) Convert the hexadecimal value 1F to:

(i) an 8-bit binary pattern [2 marks]

(show all working out clearly)

Answer _____

(ii) a denary number [2 marks]

(show all working out clearly)

Answer _____

(b) The following calculation adds two binary patterns together.

(i) Complete the calculation by entering the correct values in the empty boxes. [3 marks]

		1	1	1	1	0	1	1	0
+		1	1	1	1	1	1	1	1
Carry		1	1	1	1		1		
	(1)	1	1	1	1	0		0	

(ii) Why is the result of the calculation in **b(i)** likely to be incorrect? [2 marks]

(c) Complete the following table by inserting the number of bits associated with each unit of storage. [1 mark for each]

Unit of Storage	Number of Bits
Byte	
Nibble	

(d) Describe **two** differences between ASCII and Unicode.
[4 marks]

1. _____

2. _____

Blank Page

(Questions continue overleaf)

- 5 Consider the following algorithm which will output a message based on a value input.

1.	A=0, B=16
2.	WHILE (A < B)
3.	IF (A*2 > 10)
4.	OUTPUT (A)
5.	ENDIF
6.	A=A+2
7.	END WHILE

The programmer will carry out a dry run to test the algorithm.

- (a) How can a dry run help when testing a program?
[2 marks]

(b) Part of the dry run is shown below. Complete this section of the dry run by inserting the appropriate values in the empty boxes provided. [1 mark for each]

Line number	Value of variable A	Value of variable B	Output
2	6	16	—
3	6	16	—
4	6	16	
5		16	—
6		16	—
7		16	—

(c) What value will variable A have when the loop ends?
[1 mark]

6 RentTents is a small business which rents camping equipment and tents to holidaymakers.

- Tents can be rented with cooking equipment or without it.
- Tents cost £30.00 per night without cooking equipment.
- Tents cost £40.00 per night with cooking equipment.
- Customers cannot rent a tent for more than 7 nights.
- All customers must pay £7.00, at the time of booking, for cleaning the tent after use.

A program is required which will process a customer booking and calculate and output the cost of the booking. The program should output an error message if the number of nights requested for the booking is greater than 7.

- **NumberOfNights** will store the number of nights that a customer wishes to book a tent for.
- **EquipmentRequired** will store a character value, 'Y' or 'N', indicating whether or not the customer requires cooking equipment with the tent.
- **HireCost** will store the nightly hire cost of the tent.
- **TotalCost** will store the total amount of money that a customer has to pay for the tent hire.

(a) Complete the algorithm below.

```
OUTPUT "How many nights hire are required?"
INPUT NumberOfNights
OUTPUT "Is cooking equipment required with the tent?"
INPUT EquipmentRequired
IF NumberOfNights <= _____ [1 mark]
    IF EquipmentRequired = _____
    [1 mark]
        HireCost = _____ [1 mark]
    ELSE
        HireCost = _____ [1 mark]
    ENDIF
    TotalCost = ( _____ [1 mark]
    * _____ ) [1 mark] + _____
    [1 mark]
    OUTPUT _____ [1 mark]
ELSE
    OUTPUT _____ [1 mark]
ENDIF
```

(b) (i) List **one** feature of the Boolean data type?

[1 mark]

(ii) Which data item in the RentTents program could be stored as a Boolean variable? [1 mark]

(c) The programmer has suggested using a constant to store the cost of cleaning the tent after use. Explain **one** advantage of storing this cost as a constant.

[2 marks]

(d) Data validation has been included in the code.

(i) Write **True** or **False** beside each of the following statements about validation. [1 mark for each]

Statement	True/False
Validation will ensure that the program never crashes.	
Validation cannot tell if the data is correct.	
During validation the data entered is checked to ensure it is sensible and reasonable.	
Validation is carried out when data is output.	

(ii) The validation must ensure that only the characters 'Y' or 'N' are entered for **EquipmentRequired**.

Write the algorithm that will: [8 marks]

- allow the user to enter a value of 'Y' or 'N' and store it in the variable **EquipmentRequired**.
- validate the value entered for **EquipmentRequired** to ensure that it is either 'Y' or 'N'.
- output an error message if the user enters an invalid value for **EquipmentRequired**.
- include a loop to allow the user to re-enter a value for **EquipmentRequired** if it has been entered incorrectly.

- 7 Describe the **two** programming approaches known as object-oriented and procedural. [6 marks]

Quality of written communication will be assessed in this question.

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(Questions continue overleaf)

- 8 (a) Write **True** or **False** beside each of the following statements about an array or list structure.
[1 mark for each]

Statement	True/False
The contents of an array or list structure cannot be changed.	
An array or list structure holds only one value.	
Data held in an array or list structure is stored together in memory.	
The index of an array element stores the value of that element.	

- (b) Oran needs a program to provide information about ticket sales for a school concert. Tickets have been sold for 5 nights.

He will collect the data and store it in an array or list structure called **sales**.

- (i) Oran wants to start by setting each value in **sales** to zero, as shown in **Fig. 1**.

Fig. 1

sales	0	0	0	0	0
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Write a section of the algorithm which will use a loop to initialise the values in **sales** to the numbers shown in **Fig. 1**. [4 marks]

- (ii) Oran has collected the ticket sales data for each night of the concert. It is shown in **Fig. 2**.

Fig. 2

sales	101	110	99	130	120
--------------	-----	-----	----	-----	-----

The concert will only take place if at least 105 tickets have been sold.

Complete the following section of the algorithm which will count the number of nights on which the concert will definitely take place and store it in a variable called **concertOn**.

concertOn=0

FOR X = 0 TO _____ [1 mark]

IF sales[_____] [1 mark]

_____ [1 mark] 105

concertOn= _____ + 1

[1 mark]

- 9 (a) Testing is an important part of developing a computer program. Complete the paragraph below about test plans using words or phrases from the list provided. (Not all words or phrases will be used.)

Observed Output
Expected Output
Features and Variables
Extreme Data
Test Data Values
Reason
Document
Valid Data
Validation

A test plan identifies the _____
[1 mark] of the software to be tested and provides a
_____ [1 mark] for each test.
_____ [1 mark] is included to
test that the system can cope with data values on the
boundary of a range. _____
[1 mark] is included to test that the system operates
correctly with normal data. The test plan also specifies
the _____ [1 mark] to be
entered and the _____ [1 mark]
following this.
The _____ [1 mark] must also
be recorded in the test plan. This will help determine if
the program is working as it should.

(b) Black box and white box testing are used to test programs. In the table below, circle the test type which matches the description. [1 mark for each]

Description	Test Type	
This type of testing focuses on inputs and outputs.	Black box	White box
This type of testing aims to test every possible pathway through the code.	Black box	White box
The tester has no knowledge of the internal code in this type of testing.	Black box	White box
This type of testing is usually undertaken by a programmer.	Black box	White box

10 Georgia has received her new engineering software package. She has noticed that there are some features missing from the package. She has contacted the developer who does not agree with her.

(a) Explain to Georgia why she should make use of the User Requirements document when speaking to the developer. [2 marks]

(b) The new software package is not robust. How can a system's robustness be evaluated? [2 marks]

This is the end of the question paper

For Examiner's use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Total Marks	
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Examiner Number

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