



Centre Number

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Candidate Number

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General Certificate of Secondary Education
2019

Digital Technology

Unit 4

Digital Development
Concepts

MV18

[GDG41]

THURSDAY 16 MAY, 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.

Answer **all twelve** 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 **6**.

- 1 John needs a program to calculate his average score across four tests. For each test, he will enter the name of the test and the score. The table below shows the input data that he will use for the program.

Name Of Test	Score
Maths	23
English	17
History	19
Geography	15

- (a) Complete the table below by writing the most appropriate data type for each of the data items listed in the table. [3 marks]

Data Item	Data Type
NameOfTest1	
Score	
Average	

(b) Each of John's tests was marked out of 25. Complete the following sentences by inserting the appropriate word from the list below. (Use each word only once)
[3 marks]

RANGE

VALIDATION

PRESENCE

_____ is the action of checking data to ensure it is acceptable.

A _____ check will be required to ensure that the value entered for the Score is valid.

A _____ check will ensure that NameOfTest1 is actually entered.

(c) John has written part of a simple algorithm to solve the problem. Complete the algorithm in the space provided, so that:

- all four test names and scores are input
- the average test score is calculated and output

[6 marks]

INPUT NameOfTest1

INPUT Score1

INPUT NameOfTest2

INPUT Score2

INPUT NameOfTest3

INPUT Score3

(d) John has written the code for the program using a software development environment. List **three** editing features provided by a software development environment. [3 marks]

1. _____
2. _____
3. _____

(e) The code for the program must be translated.

(i) Why does program code need to be translated?
[2 marks]

(ii) List **two** tasks that are carried out by a language compiler before a program can be executed.
[2 marks]

1. _____

2. _____

- 2 Mary is going on a five day hiking holiday to Switzerland. She will record her daily hiking distance in miles. Mary knows that 1.61 kilometres = 1 mile.

Part of the algorithm for the solution is shown below.

$X = 1.61$

kiloMetres = $X * \text{hikingDistance}$

The calculation makes use of variables and constants.

- (a) List **one** variable and **one** constant used in the calculation above. [2 marks]

Variable _____

Constant _____

- (b) Describe how variables and constants are used in computer programs. [2 marks for each]

Variables _____

Constants _____

(c) Write an algorithm or program code in the space below which will allow Mary to input her daily hiking distance, in miles, for five days and output the distance she has travelled in kilometres. [7 marks]

3 Consider the following algorithm.

```
IF ((X>Y) or (Y<Z)) THEN
  OUTPUT("Test case 1")
ELSEIF ((X<Y) and (Y>Z))
  OUTPUT("Test case 2")
ELSE OUTPUT("Test case 3")
END IF
```

(a) Which statement will be output when $X=16$, $Y=20$ and $Z=10$?

Circle the correct letter. [1 mark]

A Test case 1

B Test case 2

C Test case 3

(b) Which statement will be output when $X=25$, $Y=11$ and $Z=10$?

Circle the correct letter. [1 mark]

A Test case 1

B Test case 2

C Test case 3

(c) Which statement will be output when $X=16$, $Y=20$ and $Z=20$?

Circle the correct letter. [1 mark]

A Test case 1

B Test case 2

C Test case 3

- 4 Complete the table below by inserting the correct program construct beside its definition. (Use each word only once.) [3 marks]

SEQUENCE
ITERATION
SELECTION

Definition	Program Construct
Executing all lines of code in a program in order.	
Executing lines of code based on the outcome of an IF-Statement.	
Executing lines of code repeatedly.	

- 5 Programs often contain syntax errors and logic errors. Explain what syntax and logic errors are within a computer program. [2 marks for each]

Syntax errors _____

Logic errors _____

6 Explain the terms abstraction and decomposition as used in computational thinking. [6 marks]

7 In computer systems, characters can be represented using ASCII code.

(a) What do the letters ASCII stand for? [1 mark]

(b) Write **True** or **False** beside each of the following statements about character representation in computer systems. [1 mark for each]

Statement	True or False
The original ASCII code table used seven bits to represent each character.	
There were 64 characters in the original ASCII code table.	
Unicode was created to increase the number of characters that could be represented in a computer system.	
Unicode incorporates the ASCII character set.	

8 Computers make use of binary and hexadecimal numbering systems.

(a) Convert the denary number 21 to an 8 bit binary pattern.
(Working out must be clearly shown) [2 marks]

(b) Convert the denary number 31 to a hexadecimal code.
(Working out must be clearly shown) [3 marks]

(c) List **one** use for hexadecimal codes in a computer system. [1 mark]

(d) (i) Using binary arithmetic add the following bytes together. In your answer circle where overflow occurs. [3 marks]

10010011 and **11101111**

(ii) What is overflow? [2 marks]

(iii) How can overflow affect the result of a calculation? [2 marks]

(e) Complete the following truth table based on the input values P and Q. [1 mark for each]

P	Q	R = P and Q	S = R or Q
0	0	0	0
0	1		
1	0		
1	1	1	1

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(Questions continue overleaf)

9 FrameMagic is a company which supplies large wooden picture frames to customers.

- The cost to the customer is calculated using the price of the frame and the number of each frame required.
- The company gives a 5% discount to customers who buy 20 frames or more.
- Customers must buy at least 10 frames but they cannot buy more than 40 frames.
- Prices and sizes are shown in the table below:

Frame size	Price of frame
A1	£10.00
A2	£4.00
A3	£2.00

The company requires a program to help calculate customer bills.

(a) (i) The program should be robust. How can the robustness of a program be tested? [2 marks]

(ii) Below is a section of the test plan which the software developer has created to test the validation for numberOfFrames. Complete the test plan.

[1 mark for each]

Test number	Item to be tested	Reason for test	Test data	Expected outcome
1.	numberOfFrames	Extreme value	10	
2.	numberOfFrames		39	Value accepted
3.	numberOfFrames		45	
4.	numberOfFrames	NULL data		

(c) The program can calculate the discount due on each order. Complete the algorithm below so that it will correctly calculate the total cost for Sally's order.

cost = _____ * priceOfFrame	[1 mark]
IF numberOfFrames _____ THEN	[2 marks]
discountDue= _____ * 0.05	[1 mark]
END IF	
totalCost = cost - _____	[1 mark]

10 (a) Explain the following approaches to testing.

(i) Black box testing. [2 marks]

(ii) White box testing. [2 marks]

(b) In the table below tick (✓) the **two** statements which are correct about testing. [2 marks]

Statement	Tick (✓)
System testing is carried out as the individual components are being developed.	
System testing is carried out when all the individual components have been developed.	
Integration testing is used to ensure that all units of code are working together as expected.	
Integration testing is used to ensure that each individual unit of code is working as expected.	

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11 Evaluation is an important stage in the development of a system.

(a) List **two** aims of the evaluation process. [2 marks]

1. _____

2. _____

(b) Identify **two** individuals who should be involved in the evaluation process. [2 marks]

1. _____

2. _____

(c) Explain how each of the following can help in the evaluation process:

(i) User requirements [2 marks]

(ii) Testing outcomes [2 marks]

(iii) Design documents [2 marks]

12 Sorting and searching are important techniques used to process data.

(a) Complete the table below by circling the search technique described in the definition.

[1 mark for each]

Definition	Search Technique
A search technique which requires a sorted list of items.	Linear Search / Binary Search
A search technique which examines every item in a list until the required item is found.	Linear Search / Binary Search

(b) (i) Explain why a binary search is considered to be more efficient when searching large volumes of data.
[2 marks]

- (ii) Using the Bubble Sort, demonstrate how the data in the array ClassroomTemperatures would be organised from smallest to largest during the sorting process. Show clearly the array content after each pass. [4 marks]

ClassroomTemperatures

22	18	23	17	20
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Pass 1

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Pass 2

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Pass 3

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Pass 4

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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	
11	
12	

Total Marks	
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Examiner Number

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