Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2023

Digital Technology

Unit 4

Digital Development Concepts

[GDG41]

GDG41

THURSDAY 25 MAY, AFTERNOON

TIME

1 hour 30 minutes.

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 outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all eleven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 120.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **8**.

13858

1 **(a)** ASCII stands for:

A American Standard Code for Internet Interchange

B American Standard Code for Information Internet

C American Standard Code for Information Interchange

D American Standard Code for Internet Information

Answer _____ [1]

(b) Select the statement that is true about 7-bit ASCII code.

A The maximum number of values that can be represented is 7

B The maximum number of values that can be represented is 16

C The maximum number of values that can be represented is 128

D The maximum number of values that can be represented is 256

Answer _____ [1]

(c) Complete the following truth table.

P	Q	R = P AND Q	Q OR R
0	0	0	[1]
0	1	[1]	[1]
1	0	[1]	[1]
1	1	1	[1]

(d) In the table below, place a tick (✓) beside **two** statements that are true about Unicode.

Statement	**Tick (✓)**
Unicode can represent more characters than 7-bit ASCII code	
Unicode only ever uses 8-bits to represent characters	
Unicode can only represent the following characters: 'A'–'Z' and 'a' – 'z'	
Unicode uses 32-bit fixed length encoding	

[2]

[Turn over

2 Consider the following algorithm.

```
If X = 0 and Y>0 Then
  Output X
Else
  If X<9 or Z>11 Then
    Output X+Y
  Else
    Output Z
  Endif
Endif
```

(a) What value is output when X = 3, Y = 6, Z = 0? Circle the correct letter.

A 3

B 6

C 0

D 9

[1]

(b) What value is output when X = 0, Y = 1, Z = 12? Circle the correct letter.

A 0

B 1

C 12

D 13

[1]

(c) What value is output when X = 7, Y = 6, Z = 8? Circle the correct letter.

A 7

B 6

C 8

D 13

[1]

(d) What value is output when X = 12, Y = 2, Z = 4? Circle the correct letter.

A 4

B 14

C 12

D 18

[1]

[Turn over

3 Michael is monitoring the sale of sandwiches at his café at the weekend.

- The cost of all sandwiches, ***SandwichCost***, is £1.50.
- He records the number of sandwiches sold each day and stores these values in variables called ***FridaySales***, ***SaturdaySales*** and ***SundaySales***.
- He stores the total number of sandwiches sold for the weekend, in a variable called ***TotalSales***.
- He calculates the average number of sandwiches sold per day and stores the result in a variable called ***AverageSales***.

(a) Complete the following table by suggesting the most appropriate data type for each variable.

Variable	**Data type**
FridaySales	[1]
AverageSales	[1]

(b) (i) Programs make use of variables and constants. Explain the term constant when used in a computer program.

_____

_____

_____ [2]

(ii) Give **one** advantage of using a constant when writing a program or solution?

_____

_____ [1]

(c) Write an algorithm which will:

- set the value of ***TotalSales*** and ***AverageSales*** to zero
- allow Michael to input the daily sales for ***FridaySales***, ***SaturdaySales*** and ***SundaySales***
- calculate the total sales for the weekend and store it in the variable called ***TotalSales***
- calculate the average sales for the weekend and store it in the variable called ***AverageSales***
- output the value of ***AverageSales***

[7]

[Turn over

4 **(a)** The paragraph below describes the different activities that Jack completed whilst doing his controlled assessment. Complete the paragraph below using terms from the list provided. (Not all terms will be used.)

DATA **COMPUTATIONAL THINKING** **ALGORITHMS**

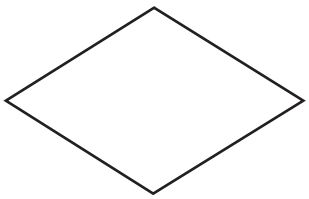
DECOMPOSITION **ABSTRACTION** **SORTING**

Jack used _____ [1] to break the problem down into sub-problems. He then removed specific details which were not needed to solve the problem, this is called _____ [1].

Both of these are key elements of _____ [1].

Jack used _____ [1] to specify the step-by-step instructions involved in the solution.

(b) Jack is going to use a flowchart to create a solution to the problem. Explain how the following symbols are used when creating flowcharts to solve problems.

Symbol	Explanation
	[2]
	[2]

(c) (i) When creating the code for the solution, Jack corrects all syntax errors. In the table below, place a tick (✓) beside **two** statements which are true about syntax errors.

Statement	**Tick (✓)**
All syntax errors must be corrected before a program can run	
Syntax errors allow a program to run but the program will crash when the user enters data	
Syntax errors can only be corrected when a program is running	
An example of a syntax error is dividing by zero	
An example of a syntax error is mis-spelling a key word in the code	

[2]

(ii) Circle the term below which describes an error which causes unexpected output from the program when it is running.

LOGICAL ERROR **RUN-TIME ERROR**

[1]

(iii) Jack has decided to include user-defined functions in the code. Describe **two** advantages of including user-defined functions in program code.

1. _____

_____

2. _____

_____ [4]

[Turn over

(d) Jack created the following screen, for a MAIN MENU, as part of his controlled assessment.

MAIN MENU

1. Enter Client Details
2. Search for a Client
3. Update Client Details
4. Exit

He needs to ensure that only a value between 1 and 4 is accepted when choosing an option from the MAIN MENU.

Write the algorithm that will:

- allow the user to enter a value between 1 and 4 and store it in a variable called ***option***
- validate the value entered for ***option*** to ensure that it is a number between 1 and 4
- output an error message if the user enters an invalid value for ***option***
- include a loop to allow the user to re-enter a value for ***option*** if it has been entered incorrectly

[8]

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(Questions continue overleaf)

5 Amelia is changing her password for logging onto her computer system. The following screen appears. A password must contain:

- more than 10 characters
- a capital letter
- a special symbol at the end

New Password: Confirm New Password:

(a) When she enters the new password for the first time into the 'New Password:' box, it is validated. Describe how the following validation checks could be used when validating Amelia's new password.

(i) Length Check

_____ [1]

(ii) Presence Check

_____ [1]

(iii) Format Check

_____

_____ [2]

(b) The new password that Amelia enters is stored as a string. List **two** string functions and explain how each could be used when validating her password.

String function	**Explanation**
[1]	[1]
[1]	[1]

6 Debbie runs a small business and sells scented candles at £3.50 each.

- She gives a customer 10% discount if they order more than 5 candles in one order.
- Customers must pay 20% of the cost before discount when they are placing an order.

Debbie needs a program that will process customer orders and output a bill for customers.

- ***NumberOfCandles*** will store the number of candles that a customer orders.
- ***CostBeforeDiscount*** will store the cost of the candles ordered before discount is applied.
- ***Discount*** will store the amount of discount that a customer will get.
- ***Deposit*** will store the deposit that a customer must pay when placing an order.
- ***TotalCostPayable*** will store the total amount of money that a customer must pay for the order.

(a) Complete the algorithm below.

```
OUTPUT "Enter the number of candles ordered "

INPUT NumberOfCandles

CostBeforeDiscount = NumberOfCandles * _____ [1]

IF _____ [1] > _____ [1]

    Discount = _____ [1] * _____ [1]

Deposit = _____ [1] * 0.2

TotalCostPayable = CostBeforeDiscount – _____ [1] – _____ [1]
```

(b) Debbie is going to store order details and use the details to produce reports at a later date. Explain how Debbie could store order details when the program is not running.

_____

_____ [2]

[Turn over

7 Binary patterns are used to represent data in computer systems.

(a) What does the term 'bit' mean when describing binary numbers?

_____

_____ [2]

(b) Convert the denary number 47 to an 8-bit binary pattern. (Working out must be clearly shown)

Answer: _____ [2]

(c) Data can also be represented using hexadecimal codes.

(i) Convert the denary number 66 to a hexadecimal code. (Working out must be clearly shown)

Answer: _____ [3]

(ii) Give **one** advantage of representing data in hexadecimal codes rather than binary patterns.

_____

_____ [1]

(d) Binary arithmetic is used to add two bytes together.

(i) Using binary arithmetic, add the following bytes together. Ensure you show any carry values and circle where overflow occurs.

10101111 and **11110101**

[3]

(ii) Describe how overflow affects the result of a calculation.

_____

_____ [2]

[Turn over

8 Explain, using examples, how a software development environment helps a programmer when creating and running program code. Your answer should include reference to:

- editing features
- high level code translation and execution

[6]

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(Questions continue overleaf)

9 Matthew is creating a program to process an array or list structure called ***PupilHeights***.

It contains the height in centimetres (cm) of the 10 pupils in his Digital Technology class. The data is as follows:

170	171	160	158	169	174	167	162	176	159

(a) (i) Suggest an appropriate data type for ***PupilHeights***.

_____ [1]

(ii) Write a statement that will change the value of the fifth height recorded in ***PupilHeights*** to 173.

_____ [2]

(iii) Matthew has decided to set all the values in ***PupilHeights*** to 0, at the start of the program.
Write an algorithm that uses a loop and that will set all of the values in ***PupilHeights*** to 0.

_____

_____

_____

_____

_____ [4]

(b) Complete the algorithm below which will find and output the maximum pupil height stored in ***PupilHeights***.

maxheight = 0

FOR element = 0 to 9

IF ***PupilHeights*** [_____] > _____ THEN

maxheight = _____

ENDIF

END FOR

OUTPUT _____

[4]

(c) **(i)** Matthew wants to sort the heights smallest first. He has decided to use the bubble sort. Write the numbers 2 to 6 beside the following algorithm statements showing the order in which they should be carried out to complete the bubble sort. The first statement has been done for you.

Algorithm Statement	**Order**
For K = 0 to 8	[1]
For J = 0 To 9	**1**
PupilHeights[K] = PupilHeights[K + 1]	[1]
TEMP = PupilHeights[K]	[1]
IF PupilHeights[K] > PupilHeights[K + 1]	[1]
PupilHeights[K + 1] = TEMP	[1]

(ii) Suggest **one** other sort method that Matthew could use.

_____ [1]

(iii) Once the data has been sorted Matthew will search through it to find values. What search technique is efficient when used on sorted data?

_____ [1]

[Turn over

10 Caitlin has created a program for the local ladies' soccer club. It records details about players, their attendance at training and their performance in fitness trials. The program will provide the club manager with a menu of options as follows:

1. Register New Player
2. Record Attendance
3. Record Fitness Trial Data
4. Player Performance Report
5. Player Attendance Report
6. Exit

Caitlin creates a test plan for the program.

(a) Complete the paragraph below, about testing Caitlin's program, using terms from the list provided.
(Use each term only once)

Black box **System** **Integration** **White box** **Unit**

Caitlin uses _____ [1] testing to test the logic of the code.

She can identify problems with the user interface, inputs and outputs by using

_____ [1] testing.

_____ [1] testing is used to test the tiny module of code which validates the menu options presented. In order to ensure that options 3 and 4 work together Caitlin uses _____ [1] testing. Caitlin has discovered through _____ [1] testing that the program does not meet the user requirements because she has not included the code for the Player Attendance Report.

(b) Caitlin creates a test plan for the menu.

Complete the table below, by explaining each type of test data and giving an example of each. The first one has been done for you.

Test data type	Explanation	Example
Valid	Used to ensure that the system operates as expected with normal data	3
Invalid	[1]	[1]
Extreme	[1]	[1]

[Turn over

11 Evaluation is an important part of application development.

(a) Describe how each of the following documents can be used by the developer when they are evaluating the application.

User requirements

_____

_____ [2]

Design documents

_____

_____ [2]

(b) Complete the table below by stating whether each statement about evaluation is TRUE or FALSE.

Statement	**TRUE / FALSE**
Evaluation is only carried out at the end of the development process	
Evaluation can help ensure all user requirements are met	
Evaluation can be used to help get feedback from the end user	

[3]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
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Total Marks	

Examiner Number