

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

INTERNATIONAL GCSE COMPUTER SCIENCE

Paper 2 Concepts and principles of computer science

Wednesday 15 November 2023

07:00 GMT

Time allowed: 2 hours

Materials

You will need no other materials.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of the page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this booklet. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may use a bilingual dictionary.
- You may **not** use an English dictionary.

For Examiner's Use

Question	Mark
1	
2	
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8	
9	
10	
11	
12	
TOTAL	



N 0 V 2 3 9 2 1 0 2 0 1

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9210/2

Answer **all** questions in the spaces provided.

0 1 . 1 **Table 1** lists the definitions of three terms.

Complete **Table 1** by stating the names of the terms that are defined.

[2 marks]

Table 1

Definition of term	Term name
The process of removing unnecessary details from a problem.	
A sequence of steps that can be followed to complete a task.	
Breaking a problem down into sub problems so that each sub problem accomplishes an identifiable task.	

0 1 . 2 A computer program needs to accept the input of the percentage mark that a student has achieved in a test. The percentage mark must be between 0 and 100 inclusive.

In the box on the **next page**, draw a flowchart for an algorithm that:

- displays a message asking the user to input a mark
- gets the user to input a mark
- if the mark is less than 0 or above 100, then:
 - the error message `Invalid mark` should be displayed
 - the user should be made to input a mark again until the mark is in the allowed range
- displays the message `Mark accepted` and then ends once a mark in the allowed range has been entered.

[4 marks]

Do not write in this space



DRAW FLOWCHART FOR QUESTION 01.2 HERE

6

Turn over for the next question

Turn over ►



[1 mark]

[4 marks]

[illegible]

0 2 . 3

Write **True or False on each row** of **Table 2** to indicate whether each of the statements about solid state storage devices (SSDs) is true or false.

[2 marks]**Table 2**

Statement	True or False?
Data stored in solid state storage can be accessed more quickly than data stored in magnetic storage.	
Data stored on a solid state storage device can be accessed directly by the CPU.	
Solid state storage is volatile.	
Solid state storage has no moving parts.	
Solid state storage represents bits using electrical charge.	

7

Turn over for the next question

Turn over ►



0 3

Figure 1 shows the contents of the array `Items` and **Figure 2** shows pseudocode for a version of the bubble sort algorithm.

Figure 1 – Contents of array `Items`

[0]	[1]	[2]	[3]	[4]
10	6	4	12	8

Figure 2 – Pseudocode algorithm for bubble sort

```

Swap ← True
WHILE Swap = True
  Swap ← False
  FOR Position ← 0 TO 3
    IF Items[Position] > Items[Position + 1] THEN
      Temp ← Items[Position]
      Items[Position] ← Items[Position + 1]
      Items[Position + 1] ← Temp
      Swap ← True
    ENDIF
  ENDFOR
ENDWHILE

```



0 3 . 1

Complete the trace table below to show the values of the variables and the contents of the array `Items` when the bubble sort algorithm in **Figure 2** is executed on the array contents shown in **Figure 1**.

The initial contents of the array `Items` have been entered into the table for you. You may not need to use all of the rows.

[4 marks]

Swap	Position	Temp	Items				
			[0]	[1]	[2]	[3]	[4]
			10	6	4	12	8

Question 3 continues on the next page

Turn over ►



0 3 . 2

State **one** advantage of the bubble sort algorithm over the merge sort algorithm.**[1 mark]**

0 3 . 3

State **one** advantage of the merge sort algorithm over the bubble sort algorithm.**[1 mark]**

6

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ANSWER IN THE SPACES PROVIDED**

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0 4 . 1

Tick (✓) **one** box to indicate which of these statements is **false**.**[1 mark]**

	Statement	False? (Tick)
A	1 Hertz (Hz) means one sample per second.	
B	Computers store data as digital values.	
C	Sampling is the process of converting digital data into analogue data.	
D	Sound waves are analogue data.	

A recording is made of a sound that lasts for 10 seconds using a 16-bit sample resolution and a sample rate of 20 000 Hz.

0 4 . 2

Calculate the amount of memory, in kilobytes, that will be needed to store the entire recording.

Show your working.

[3 marks]

Answer _____ kilobytes



0	4	.	3
---	---	---	---

Increasing the sample resolution would mean that when the recording is played back the quality of the sound is improved.

Explain why this is the case.

[1 mark]

0	4	.	4
---	---	---	---

State **one** other effect of increasing the sample resolution.

[1 mark]

6

Turn over for the next question

Turn over ►



0 5 . 2

The full 33-character string was represented in 123 bits using the Huffman tree in **Figure 3**. It could have been represented using 7-bit ASCII instead.

Calculate how many bits of memory have been saved by using the Huffman code to represent the full 33-character string instead of using ASCII.

Show your working.

[2 marks]

0 5 . 3

An alternative method of compression is run-length encoding (RLE).

Describe how run-length encoding compresses data.

[2 marks]

7

Turn over for the next question

Turn over ►



0 6

A relational database has been created to store data about reward points issued to students at a school.

There are two tables in the database **Student** and **Reward**.

Figure 4 shows the data in the two tables.

Figure 4

Student

StudentID	Forename	Surname	Year
1	Oluwaseni	Adewole	3
2	Drishti	Vekaria	6
3	Anyia	Patel	8
4	Farhan	Najimi	9
5	Ethan	Burrows	7
6	Emily	Taylor	6
7	Farhan	Saeed	8
8	Atharv	Najimi	4

Reward

StudentID	DateIssued	Department	PointsAwarded
3	07/09/2023	Mathematics	1
1	07/09/2023	History	1
2	08/09/2023	Mathematics	2
5	08/09/2023	Geography	1
5	08/09/2023	Science	1
6	09/09/2023	Science	2
3	09/09/2023	Mathematics	1
2	09/09/2023	Music	1
5	09/09/2023	Mathematics	3
1	10/09/2023	Mathematics	1

0 6

. 1

The foreign key of the **Reward** table is **StudentID**.

Explain the purpose of a foreign key.

[1 mark]



0 6 . 2

Tick (✓) **one** box to indicate which of the data types in the table below could **not** be used to represent some of the data stored in the database in **Figure 4**.

[1 mark]

	Data type	Could not be used (Tick one)
A	Boolean	
B	Integer	
C	Real	
D	String	

0 6 . 3

List the records that would be found when the SQL query below is carried out on the data shown in the tables in **Figure 4**.

```
SELECT Forename, Surname, PointsAwarded
FROM Student, Reward
WHERE Department = "Mathematics" AND Year >= 7
AND Student.StudentID = Reward.StudentID
```

[4 marks]

0 6 . 4

The student Farhan Najimi has left the school. His record needs to be deleted from the **Student** table.

Complete the following SQL command to delete his record.

[2 marks]

DELETE

 Student

WHERE

Turn over ►



07

Figure 5 shows a list of numbers.

Figure 5

12	14	15	13	18	24	29	32	38
----	----	----	----	----	----	----	----	----

07.1

State the minimum number of comparisons that must be made when using a linear search for the number 18 in the list in **Figure 5**.

[1 mark]

07.2

State the number of comparisons that will be made when using a linear search for the number 16 in the list in **Figure 5**.

[1 mark]

07.3

State **one** advantage of the binary search algorithm over the linear search algorithm.

[1 mark]

07.4

State **one** advantage of the linear search algorithm over the binary search algorithm.

[1 mark]

4



0 8 . 1

Convert the decimal number 129 into binary.

[1 mark]

Answer

0 8 . 2

Convert the decimal number 129 into hexadecimal.

[1 mark]

Answer

0 8 . 3

Convert the hexadecimal number B3 into decimal.

Show your working.

[2 marks]

Answer

0 8 . 4State **one** reason why programmers often use hexadecimal instead of binary.**[1 mark]**

Question 8 continues on the next page**Turn over ►**

0 8 . 5

A solid state disk has a capacity of 31.5 GB. 31 GB of storage space on the disk has been used. A user wants to store another file that has a size of 700 MB.

State, in kilobytes, how much data they will have to remove from the disk so that they can store the 700 MB file.

Show your working.

[2 marks]

Answer _____ kilobytes

0 8 . 6

State **two** functions of an operating system.

[2 marks]



0 9 . 1 Machine code is a low-level language.

State another low-level language.

[1 mark]

0 9 . 2 Describe the advantages of using a low-level language over using a high-level language.

[3 marks]

0 9 . 3 Tick (✓) **two** boxes in **Table 3** to indicate which statements about program translators are **true**.

[2 marks]

Table 3

Statement	True? (Tick two)
All programs need to be translated before they can be executed.	
Assemblers and interpreters convert the entire source code in one block.	
Compilers and assemblers are used to convert a high-level language into machine code.	
Interpreted program code will execute more slowly than compiled code.	
Interpreters do not save the result of the translation process.	
The compiler needs to be installed on the computer where a compiled program is being executed.	

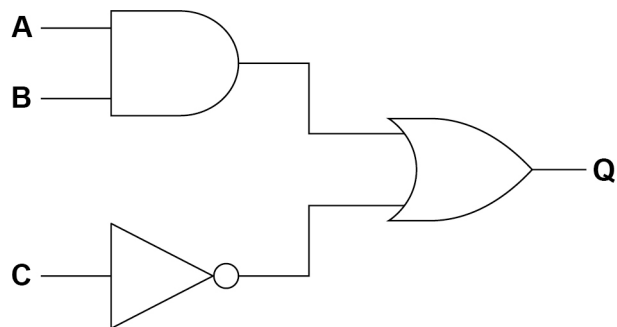
Turn over ►



1 0

Figure 6 shows a logic circuit diagram.

Figure 6



1 0 . 1

Represent the logic circuit diagram as a Boolean expression.

[3 marks]

Q = _____

1 0 . 2

State what the value of **Q** will be when **C** is 0

[1 mark]

1 0 . 3

There are eight different possible input combinations for this logic circuit.

State how many of these combinations will result in the output **Q** from the logic circuit having a value of 1

[1 mark]

5



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1	1	.	1
---	---	---	---

Define cyber security.

[2 marks]

1	1	.	2
---	---	---	---

Describe what penetration testing is used for **and** how penetration testing is carried out.**[2 marks]**



1 1 . 3

State **three** advantages of biometric systems over password systems.**[3 marks]**

1 1 . 4

State **two** risks of using a network.**[2 marks]**

9

Turn over for the next question**Turn over ►**

1 2**Figure 7** shows HTML code used to create a web page.**Figure 7**

```

<html>
  <head>
    <title>Fencing</title>
  </head>
  <body>
    <h1>Introduction</h1>
    <p>Fencing is an Olympic sport</p>
    <p>There are three types of sword</p>
  </body>
</html>

```

1 2**. 1**Sketch what the web page in **Figure 7** will look like when displayed in a web browser.

You may use labels to make your layout clearer, if necessary.

[3 marks]


1 2 . 2 CSS is to be used to change the text in paragraphs so that the text has a blue colour.

Fill in the gaps in the CSS so that the text in paragraphs is blue.

[2 marks]

_____ { _____ : blue; }

1 2 . 3 Write HTML code so that the bulleted list in **Figure 8** would be added to the web page.

You do not need to rewrite any of the code from **Figure 7**.

Figure 8

- epee
- foil
- sabre

[2 marks]

7

END OF QUESTIONS



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Question number	Additional page, if required. Write the question numbers in the left-hand margin.
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