Pre-Leaving Certificate Examination 2025

Computer Science

Sections A & B

Higher Level

Time: 1 hour, 30 minutes

130 marks

Name:	
School:	
Address:	
Class:	
Teacher:	

For Examiner use only								
Section	Question	Mark	Section	Question	Mark	Section	Question	Mark
A	1		A	7		B	13	
	2			8			14	
	3			9			15	
	4			10		Section B Total:		
	5			11		C	16	
	6			12		Section C Total:		
Section A Total:						Total:		

Instructions

There are **three** sections in this examination. Section A and B appear in this booklet. Section C is in a separate booklet that will be provided for the computer-based element.

Section A	Short Answer Questions	Attempt any **nine** questions All questions carry equal marks	54 marks
Section B	Long Questions	Attempt any **two** questions All questions carry equal marks	76 marks
Section C	Programming	Answer **all** question parts	80 marks

Calculators may **not** be used during this section of the examination

The superintendent will give you a copy of page 78 (Logic gates) of the *Formulae and Tables* booklet on request. You are **not** allowed to bring your own copy into the examination.

Write your answers for Section A and Section B in the spaces provided in this booklet. There is space for extra work at the end of the booklet. Label any such extra work clearly with the question number and part.

Answer any **nine** questions.

Question 1

An example of a logic gate is the NOT Gate. The logic of the NOT gate can be described as follows:

The NOT Gate is an inverter. If the input is 0 then the output will be 1. If the input is 1 then the output will be 0.

Describe the logic of the following logic gates in a similar manner as above:

AND:
OR:
XOR:

Question 2

RAM and ROM are two types of memory found in computing systems. State **two** differences between RAM and ROM.

Difference 1
RAM:
ROM:
Difference 2
RAM:
ROM:

Question 3

The hexadecimal and binary systems are two systems used to represent data.

(a) Convert the following base 16 number to its base 2 equivalent.

B9
Binary Number:

(b) Briefly explain why the binary number system is used in computing.

Explanation:

Question 4

The ASCII and UNICODE systems are methods to represent data.

(a) Give **one** advantage of using the ASCII system.

Advantage of ASCII:

(b) State **one** advantage of using UNICODE over ASCII.

Advantage of UNICODE over ASCII:

Question 5

(a) What is meant by the term 'artificial intelligence'?

(b) Suggest a way that artificial intelligence can be used to help a Leaving Certificate student to study for their examinations.

Question 6

(a) Computers and computer systems should follow the principles of good Universal Design (UD). What is meant by Universal Design (UD)?

(b) User Experience (UX) is another set of principles that software developers try to follow when designing a website. Give an example of how a website could be designed to allow for good User Experience (UX).

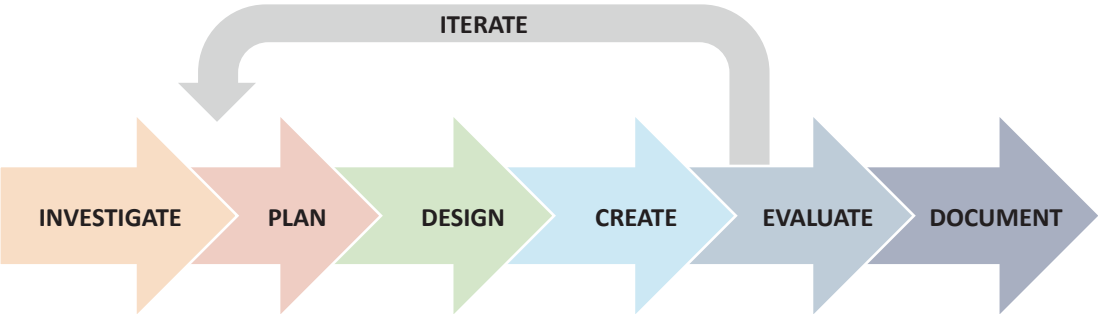| Example of good UX on a website: |
|---|
| |
| |
| |

Question 7

Figure 1

The diagram above identifies some of the main stages of an iterative **software development design process**. Describe briefly what happens at the following stages of the design process:

(i)   Document stage

| |
| |
| |
| |

(ii)   Plan stage

| |
| |
| |
| |

Question 8

Two common methods of solving problems in coding are <u>iteration</u> and <u>recursion</u>. Explain what is meant by the underlined terms.

| Iteration: |
| |
| |

| Recursion: |
| |
| |

Question 9

Examine the headline from *The Irish Times* below and read the accompanying adapted sections of the article and answer the questions that follow.

What neo-Luddites get right – and wrong – about Big Tech

Technology is quite capable of destroying livelihoods, creating unintended consequences and concentrating power in the hands of a few.

"...the Future of Employment study from Oxford academics Carl Frey and Michael Osborne in 2013 found that 47 percent of jobs were susceptible to automation. Then it was all the taxi and truck drivers whose jobs would be gobbled up by self-driving vehicles. Now it's 'generative' artificial intelligence, which has struck fear into the hearts of creatives everywhere.

Adapted from: irishtimes.com

Do you agree with the above passage? Explain your answer.

Question 10

Modelling and simulation are two important methods of applying computer science to solve real-life problems.

(a) What is meant by a computer model?

Computer model:

(b) What is meant by a simulation?

Simulation:

Question 11

When conducting analytics, it often involves the collection and cleaning of <u>raw data</u> into transformed data.

(a) Explain the underlined term.
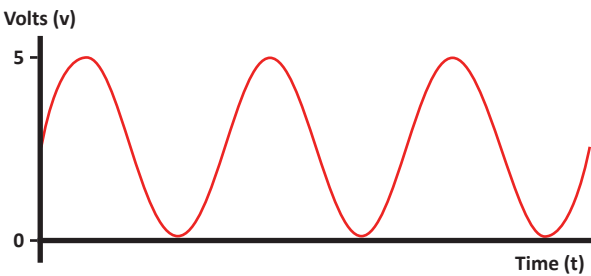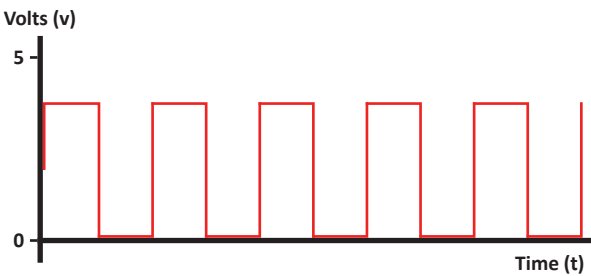
Raw data:

(b) Explain **one** method of cleaning data. Describe how you can clean data for it to be ready for further analysis.

Question 12

Examine the images below and answer the questions that follow.

Volts (v)

5

0

Time (t)

Figure 2

Volts (v)

5

0

Time (t)

Figure 3

Which of the above figures corresponds to the transmission of a digital signal?

Figure:
Briefly explain your answer:

Section B	Long Questions	76 marks

Answer any **two** questions.

Question 13

(a) The Von Neumann Architecture and an associated memory unit are shown below:
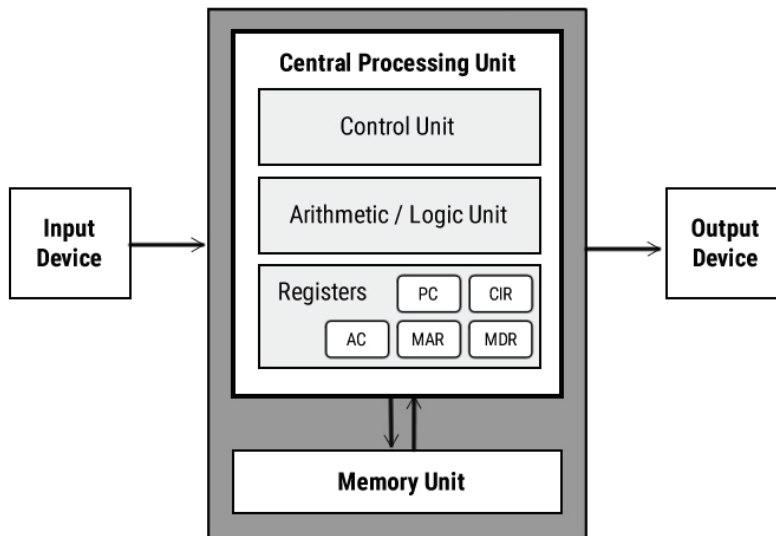
Source: computerscience.gcse.

Figure 4

Study **Figure 4** above and answer the following questions:

(i) Give an example of an input device.

Input device:

(ii) Give an example of an output device.

Output device:

(iii) What is the function of general registers within the Von Neumann Architecture?

Function of general registers:

(iv) What is the function of the Control Unit (CU)?

Function:

(b) **(i)** What is meant by the speed of a processor? What are the units of processor speed?

Processor speed:
Units:

(ii) In computing terms, what is meant by 'software'? Give an example of a piece of computing software and what it is used for.

Software:
Example:

(iii) What is meant by an 'Operating System'?

State a function of an Operating System.

Function:

(iv) What is the function of the ALU component of the CPU?

Function:

(v) What is meant by a 'User Interface (UI)'? Give an example of a type of user interface software.

User Interface:
Example:

(c) (i) What is meant by the term 'internet'?

(ii) The World Wide Web is built on top of the Internet. The World Wide Web uses protocols for communication.

Two examples of protocols that are used for communication on the World Wide Web are HTTP and VOIP. State the function of HTTP and VOIP.

Function HTTP:
Function of VOIP:

Question 14

(a) Flowcharts are often used in the software development process.

(i) What is meant by a 'flowchart'?

(ii) State **two** advantages of using flowcharts

Flowchart advantage one:
Flowchart advantage two:

(b) Using the following standard flowchart symbols (seen below in **Figure 5**), draw a flowchart in the space provided to log in to a social media account. The user must enter the URL for the social media account on their web browser. The user must then enter their username and password. The login credential is then checked. If it is correct, the profile is shown. If the login credential is wrong, an error message appears and we are asked to enter our login information again. The program ends upon successfully entering the correct login information.

Source: smartdraw.com

Figure 5

(c) Pseudocode is also used during the software design process.

    (i) What is pseudocode?

| |
| |
| |
| |

    (ii) State an advantage of using pseudocode.

| Advantage: |
| |

    (iii) State a disadvantage of using pseudocode

| Disadvantage: |
| |

Question 15

(a) Algorithmic thinking is an important process in the Computational Thinking Process.

    (i) What is meant by an 'algorithm'?

| |
| |
| |
| |

    (ii) Give **two** applications of algorithms that can be used in everyday life.

| 1. |
| |
| 2. |
| |

(b) Examine the Python code below.

```python
1   n1, n2 = 0, 1
2
3   n3 = 50
4
5   print(0)
6
7   while n2 < n3:
8
9       print(n2)
10
11      n1, n2 = n2, n1+n2
```

The Python code above can be used to generate the following sequence of numbers:

0	1	1	2	3	5	8	13	21	34

(i) Based on the above code and the pattern of numbers, describe the rules of the algorithm.

(ii) Based on the code and the rules of the algorithm, what is the value of the missing number **x**?

0	1	1	2	3	5	8	13	21	34	x

Value of x:

(iii) Pattern recognition is another important part of the process of Computational Thinking. What is meant by 'pattern recognition'?

(c) **(i)** Time Complexity is an important measure of the efficiency of an algorithm. In terms of algorithmic efficiency, what is meant by 'Time Complexity'?

(ii) Sorting and Searching are two types of algorithms.

Study the Python code below carefully and answer the questions that follow.

```python
1  def mystery_function(numbers,v):
2      x = 0
3      y = len(numbers) - 1
4      z = 0
5      while x <= y:
6          z = (x+y)//2
7          if numbers[z] < v:
8              x = z + 1
9          elif numbers[z] > v:
10             y = z - 1
11         else:
12             return z
13     return -1
14 numbers = [0,2,4,6,8,10,12,14,16,18,20]
15 v = int(input("Enter a number: "))
16 result = mystery_function(numbers, v)
17 if result != -1:
18     print(v,"index: ", str(result))
19 else:
20     print("Element is not present in array")
```

1. When the function `mystery_function` is called on line 16, what is the value of y (there is only 1)?

Value of "y":

2. Identify **one** relational operator in the code above. State the function of the relational operator.

Relational Operator:
Function:

3. What is the function of the // operation in Line 6 above?

Function of //:

4. Identify **one** parameter in the code above.

5. Which sorting or searching algorithm does this code represent?

6. What is the worst-case time complexity for the above algorithm?

7. What would the output be if you entered the following after running the code?

```
Enter a number: 23
```

Output:

Space for extra work.

Indicate clearly the number and part of the question(s) your are answering.

Space for extra work.

Indicate clearly the number and part of the question(s) your are answering.

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Pre-Leaving Certificate Examination, 2025

Computer Science

Section C

Higher Level

Time: 1 hour

80 marks

Instructions

There is **one** section in this paper.

Section C	Programming	One question	80 marks
		Answer **all** question parts.	

Answer **all** parts of the question on your digital device.

Calculators may be used during this section of the examination.

The *Formulae and Tables* booklet cannot be used for this section of the examination.

The superintendent will give you a copy of the *Python Reference Guide.*

Ensure that you save your work regularly.

Save your files using the naming structure described at the beginning of each question part.

If you are unable to get some code to work correctly, you can comment out the code so that you can proceed. The code that has been commented out will be reviewed by the examiner.

Rough work pages are provided at the end of this booklet. Please note that this work will **not** be reviewed by an examiner.

At the end of the examination it is your responsibilty to ensure that you have saved all of your files onto your external media.

Answer all question parts.

Question 16

(a)   Open the program called **Question16_A_HL.py** from your device. The source code is shown below.

Enter your name in the space provided on **line 2** in your Python file. The program initialises a variable called "s" and assigns it a value of 0 in Line 4 of the code. The user is asked to enter a string input to be stored in the variable "sentence".

```
1   #Question_16_A_HL
2   #Enter your name here:
3
4   s = 0
5
6   sentence = input("Please enter a sentence: ")
```

Make the following changes to the program:

(i)   Modify the code to count the number of times the character "S" or "s" appears in the sentence entered by the user. When the code is run, it may look as follows:

```
Please enter a sentence: She sells sea shells by the sea shore
The number of s's was: 8
```

(ii)   Modify the code to count the number of vowels in the sentence entered by the user. In this part, the sentence should be converted to lowercase. When the code is run, it may look as follows:

```
Please enter a sentence: She sells sea shells by the sea shore
Your sentence was: She sells sea shells by the sea shore
Your lowercase sentence is: she sells sea shells by the sea shore
The number of vowels was: 10
```

(iii)   Modify the code so that the program will count the number of letters and digits that appear in the user's sentence. When the code is run, it may look as follows:

```
Please enter a sentence: Hello World 123
The number of letters was: 10
The number of digits was: 3
```

(iv)   Modify the code so that the program will count the number of words in a sentence. When the program is run, it may look as follows:

```
Please enter a sentence: Computer Science is the best subject
The number of words was: 6
```

Save and close your file before moving on to the next part.

(b) In many supermarkets, customers have the opportunity to "Scan as you shop". This involves a customer using a handheld device (as seen in the image) to scan the items as they go around the shop.

The price for each item appears on the screen, the total cost and the number of items already scanned are displayed on the scanner.

Open the program called **Question16_B_HL.py** from your device. The source code is shown below. A function called shopping() is defined, a variable called `total` is initialised to 0 and two empty lists `item_list` and `item_prices` are also created.

Enter your name in the space provided on **line 2** in your Python file.

```
1   #Question_16_B_HL
2   #Enter your name here:
3
4   import random
5   print("Welcome to my shop")
6   total = 0
7   item_list = []
8   item_prices = []
```

(i) Modify the code that will ask the user to enter a shopping item as a string. It should store the item names in `item_list`. It should also ask the user to enter the price of the item as a float. The price should be stored in the list `item_prices`.

The "running total" should be displayed, that is, the current total cost of the shopping while you shop.

If the user enters "stop" in the item list the full list of items should be printed to the screen and the grand total should also be displayed as you are now telling the program you are ready to checkout your shopping at the till. Sample output is shown below:

```
Welcome to my shop
Please enter the item: Apple
Please enter the price of the item: 1.5
The current total is €1.5
Please enter the item: Pear
Please enter the price of the item: 1.3
The current total is €2.8
Please enter the item: Orange
Please enter the price of the item: 2
The current total is €4.8
Please enter the item: Kiwi
Please enter the price of the item: 0.9
The current total is €5.7
Please enter the item: Stop
Your items are: ['Apple', 'Pear', 'Orange', 'Kiwi']
The prices are: [1.5, 1.3, 2.0, 0.9]
Grand total € 5.7
```

(ii) When the customer goes to the scan as you shop checkout (after they have entered "stop"), they may be asked to call a member of staff to check random items in their trolley to make sure the customer scanned everything correctly. Modify your code so that it will now print 1 random item from that items list for the checkout assistant to check.

Sample output is shown below:

```
Welcome to my shop
Please enter the item: Apple
Please enter the price of the item: 1.5
The current total is €1.5
Please enter the item: Pear
Please enter the price of the item: 1.3
The current total is €2.8
Please enter the item: Orange
Please enter the price of the item: 2
The current total is €4.8
Please enter the item: Kiwi
Please enter the price of the item: 0.9
The current total is €5.7
Please enter the item: Stop
Your items are: ['Apple', 'Pear', 'Orange', 'Kiwi']
The prices are: [1.5, 1.3, 2.0, 0.9]
Grand total € 5.7
Your random item to be checked is: Apple
```

(iii) From the shopping list above, modify your code so that it will find the most expensive and cheapest item in the item list. Sample output is shown below:

```
Welcome to my shop
Please enter the item: Apple
Please enter the price of the item: 1.5
The current total is €1.5
Please enter the item: Pear
Please enter the price of the item: 1.3
The current total is €2.8
Please enter the item: Orange
Please enter the price of the item: 2
The current total is €4.8
Please enter the item: Kiwi
Please enter the price of the item: 0.9
The current total is €5.7
Please enter the item: Stop
Your items are: ['Apple', 'Pear', 'Orange', 'Kiwi']
The prices are: [1.5, 1.3, 2.0, 0.9]
Grand total € 5.7
Your random item to be checked is: Kiwi
The most expensive item is: Orange
The cheapest item is: Kiwi
```

Save your file.

Ensure that you have saved and closed all files before you finish the examination.

Space for rough work.

This page will not be reviewed by an examiner.

Space for rough work.

This page will not be reviewed by an examiner.

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