



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2022

Computer Science

Sections A & B

Ordinary Level

Wednesday 25 May Morning 9:30 – 11:00

60 marks

Examination Number

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Day and Month of Birth

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For example, 3rd February
is entered as 0302

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:		

The 2022 examination papers were adjusted to compensate for disruptions to learning due to COVID-19. This examination paper does not necessarily reflect the same structure and format as the examination papers of past or subsequent years.

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 six questions All questions carry equal marks	30 marks
Section B	Long Questions	Attempt any one question All questions carry equal marks	30 marks
Section C	Programming	Answer all question parts	50 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.

Attempt any six questions.

Question 1

Given the following variable declarations, state the result of each of the Python `print` statements in the table below.

```
a = 2
b = 4
```

print statement	Result
<code>print(a+b)</code>	
<code>print(b-a)</code>	
<code>print(a*b)</code>	
<code>print(a/b)</code>	
<code>print(a==b)</code>	

Question 2

The traffic at a busy road junction, similar to that in **Figure 1**, is studied using a computer model. Briefly explain **two** reasons why using a computer model might be useful in this situation.

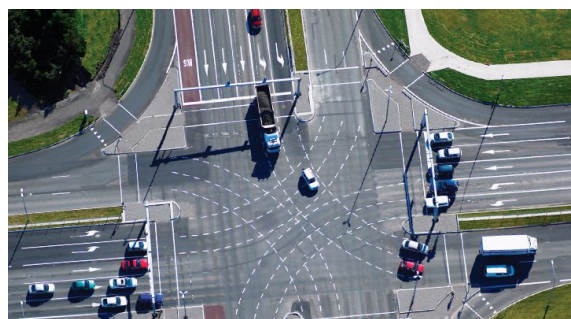


Figure 1

Reason 1:
Reason 2:

Question 3

The pseudocode, shown in **Figure 2** below, has been designed to run on a Microbit or similar embedded system, shown in **Figure 3**. The embedded system has a green LED (light emitting diode) connected to pin 0, a yellow LED connected to pin 1 and a red LED connected to pin 2. Answer the questions that follow.

```
Start
Set all pins to off
Set pin 0 to on
Pause for 2 seconds
Set pin 0 to off
Set pin 1 to on
Pause for 2 seconds
Set pin 1 to off
Set pin 2 to on
```

Figure 2

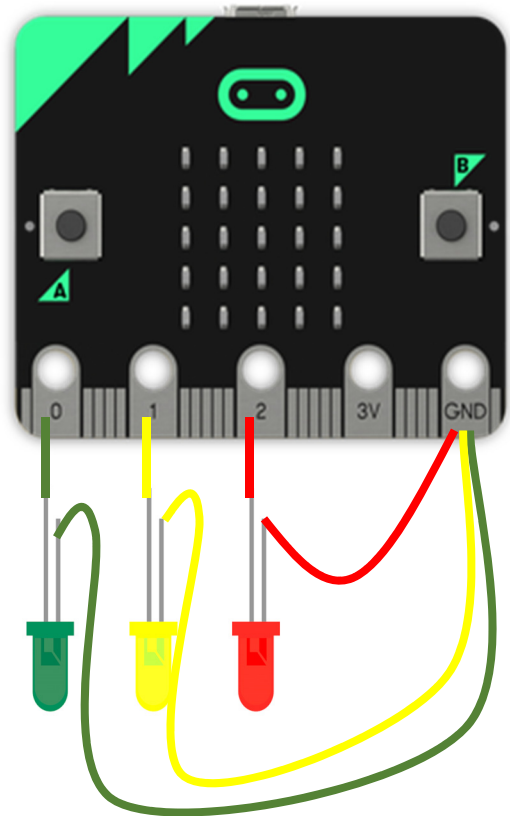


Figure 3

(a) Why are pauses included in this algorithm?

(b) Describe the appearance of the LEDs at the end of the algorithm.

Question 4

If you were to look inside any modern computer, such as that in **Figure 4**, you may be able to identify some of the following components:

- Motherboard
- Central Processing Unit (CPU)
- Fan
- Memory
- Hard drive
- Video card



Figure 4

Select any **three** of the components listed above and briefly describe their purpose.

Component Name 1:
Description 1:
Component Name 2:
Description 2:
Component Name 3:
Description 3:

Question 5

A linear search algorithm, written in Python, is used to search the following list of integers.

```
list = [11, 52, 37, 94, 12, 73, 62, 47]
```

(a) What index value will be returned if you search for the number 94?

--

(b) Describe a limitation of the linear search algorithm.

Question 6

The flowchart, in **Figure 5** below, is that of an algorithm for a game where the user has to guess a number between 1 and 10 that has been randomly selected by the computer.

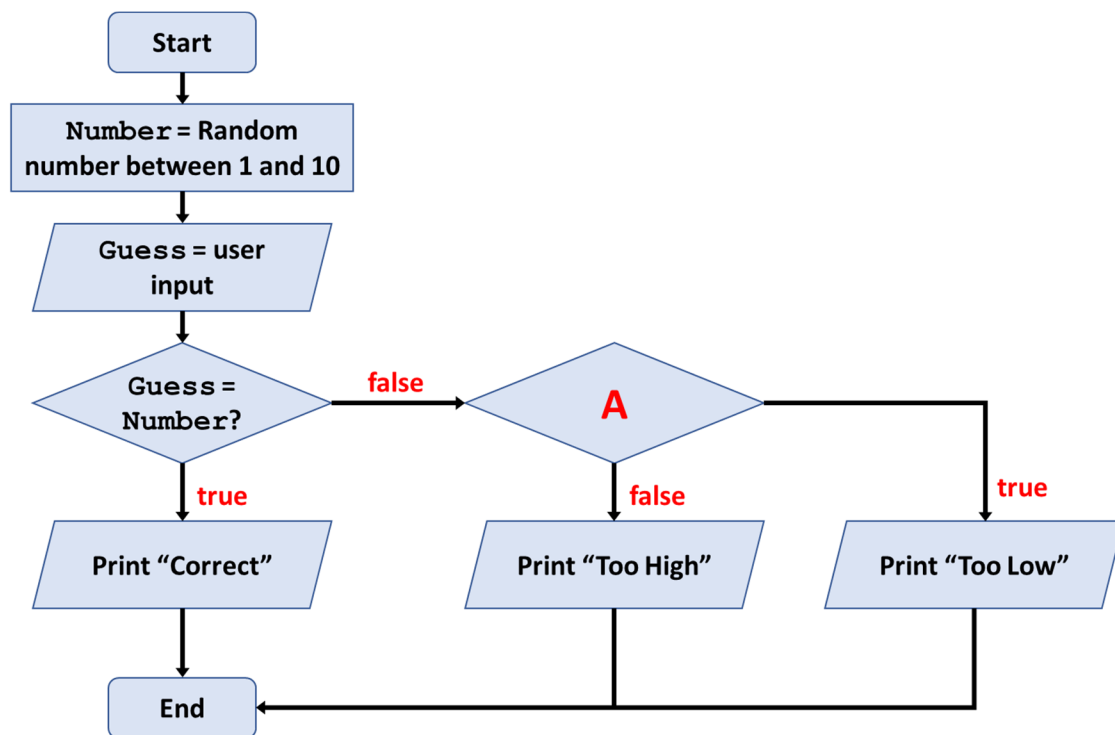


Figure 5

(a) What text is missing from the symbol labelled **A**?

--

(b) This game will end after the user makes one guess. Suggest an improvement to the algorithm.

Question 7

Name **one** female that has made a significant impact on the field of computer science and briefly describe the development she worked on.



Name:
Describe:

Question 8

COVID-19 has had a significant impact on the use of technology and the Internet for remote work in business and education. It has also highlighted issues in the area known as the “digital divide”.

(a) Describe **one** way digital technology has helped us during the COVID-19 Pandemic.

(b) Explain what is meant by the term “digital divide”.

Question 9

Your friend has designed the app in **Figure 6** so that they can ask people to review movies by providing a score out of 10. When the app goes live the following data is collected. Your friend wants to write a Python program to analyse the data.

8
5
Four
9.5
10/10
6
5 or 6

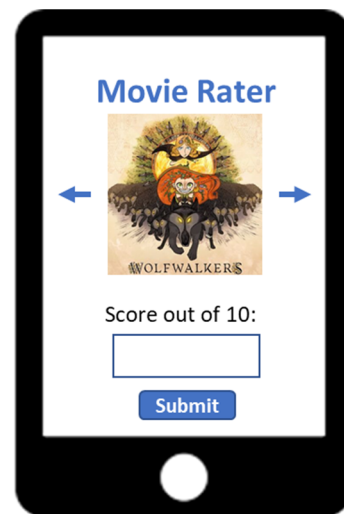


Figure 6

- (a) Identify **three** issues with the dataset that would prevent your friend from being able to analyse it.

1.
2.
3.

- (b) Suggest an improvement to the app so that the data is cleaner and can be analysed more easily.

Question 10

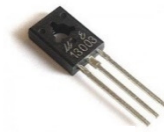
- (a) Match the picture of the electronic component to its name by placing the relevant letter in the second column of the table below.



A



B



C

Name	Component (write the letter)
Transistor	
Capacitor	
Resistor	

- (b) Select any **one** of these electronic components and explain its purpose.

Component Name:
Explain:

Question 11

Complete the truth table for the AND logic gate, shown in **Figure 7**.

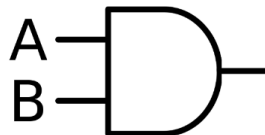


Figure 7

INPUTS		OUTPUT
A	B	A AND B
0	0	
0	1	
1	0	
1	1	

Question 12

In a game, shown in **Figure 8**, a player begins on the Start square, facing towards square 1. They must follow the instructions given to them and see what number square they end up on. There are only three instructions in the game. Instructions for the game are provided in pseudocode.

Instruction	Explanation
Step Forward	Step forward one square
Turn Right	Rotate 90 degrees to the right (Do not move forward)
Turn Left	Rotate 90 degrees to the left (Do not move forward)



Figure 8

(a) What number square will the player finish on when they follow these instructions?

```
Step Forward
Turn Right
Repeat 2 times:
    {Step Forward}
```

Answer:

(b) What number square will the player finish on when they follow these instructions?

```
Repeat 2 times:
    {Step Forward}
Repeat 3 times:
    {Turn Right
    Step Forward}
```

Answer:

Answer any one question.

Question 13

- (a) Computer memory is measured in bits. The more bits combined together the bigger the memory.
- (i) Order the memory sizes in the list below from smallest to largest. The smallest should be placed in row 1 and the largest in row 4.

Terabyte Bit Gigabyte Kilobyte

1 (smallest)	
2	
3	
4 (largest)	

- (ii) A 24-hour digital alarm clock displays 4 digits at a time, as shown in **Figure 9**. Each digit is stored internally as a 4-digit binary code.

The time shown on the clock in **Figure 9** is represented as follows:

0	0	0	1	First digit
0	0	1	0	Second digit
0	0	1	0	Third digit
1	0	0	0	Fourth digit



Figure 9

What time will be shown on the clock with the following binary code?

0	0	1	0	First digit
0	0	0	0	Second digit
0	1	0	1	Third digit
1	0	0	1	Fourth digit

Answer:

This question continues on the next page.

(b) ASCII (American Standard Code for Information Interchange) and Unicode are two different character sets used to encode and decode messages in digital communication.

(i) State whether each of the following statements is true or false, by putting a tick (✓) in the appropriate box.

	True	False
The letter r can be represented in ASCII.	☐	☐
The emoji symbol 😊 can be represented in ASCII.	☐	☐
The number 9 can be represented in Unicode.	☐	☐
The symbol @ can be represented in Unicode.	☐	☐

(ii) Extended ASCII uses 8 bits per character rather than 7 bits. Calculate the number of extra characters that can be represented using 8 bits rather than 7 bits.

--

(c) Data in computers is typically stored in primary or secondary storage.

(i) Describe **two** differences between primary and secondary storage in computers.

1.
2.

This question continues on the next page.

- (ii) The use of Solid State Drives (SSDs) rather than Hard Disk Drives (HDDs) has increased in recent years. List **two** differences between SSDs and HDDs.

1.
2.

Question 14

A secondary school wants to write a computer program that will decide which of its students can leave the school grounds at lunch time.

- (a) The school principal has provided the Computer Science class with the following information to assist with writing the program:

There are 700 students in the school, with 120 of these in 6th year. 60% of students are female and 40% are male. Only students in 6th year or with a brother or sister in 6th year can leave the school grounds at lunch time. Lunch break is 1 hour long. Parents must have signed a consent form to say that the student can leave the school grounds.

- (i) Using the computational thinking skill of abstraction, list **two** pieces of information, provided by the principal, that are not needed to solve this problem.

1.
2.

- (ii) Name **one** other computational thinking skill you will use to solve this problem and how you will use it.

Computational thinking skill:
How it will be used:

This question continues on the next page.

(b) You will need to get data from the school office in order to create the program.

- (i)** Complete the table below with **four** items of data that will be required. You will need to include a suitable variable name, a description of the data and the data type for the variable. The first row has been completed for you.

Variable Name	Description	Data Type
firstName	Student's first name	String

- (ii)** When the program is complete you will need to test that it works as expected. Describe **two** fictional students that you will use as test cases. One should pass the test and be permitted out of the school grounds for lunch; the other should fail the test.
- For example, the student John Doe in fifth year, with a sister in sixth year but no parental consent will fail the test.

Student 1 (pass):
Student 2 (fail):

This question continues on the next page.

- (c) Using either pseudocode or a flowchart, design the algorithm to solve the problem for the school principal.

Question 15

- (a) Computing and technology has made huge progress over the last 100 years. Computers are getting faster, smaller and more powerful. **Figure 10** shows a timeline with some of the main computing developments over the last century.

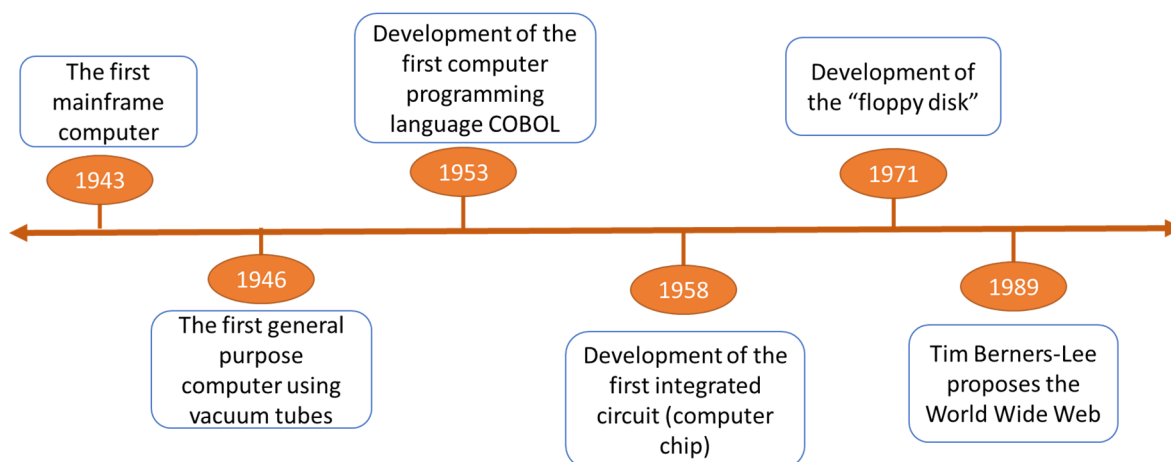


Figure 10

- (i) Describe **one** other development from the last 100 years that has been very important for computing and technology.

- (ii) Select a development from either **Figure 10** or the development you described in part (i) and provide **two** reasons why you think this development was important.

Development:
1.
2.

- (b) The World Wide Web and the Internet are often thought to be the same thing but they are different. Explain the difference between the World Wide Web and the Internet.

- (c) It is very important to have a website that has a good user interface and is easy for the user to use. Examine the screenshot of the website www.irishwrecksonline.net, shown in **Figure 11** on the next page, and answer the questions that follow.

- (i) Identify **one** good feature and **one** poor feature of user interface design on the website.

Good feature:
Poor feature:

- (ii) Suggest **three** improvements to the design of this website.

1.
2.
3.




WWW.IRISHWRECKSONLINE.NET[©]

10,336 vessels approx. wrecked and/or stranded!

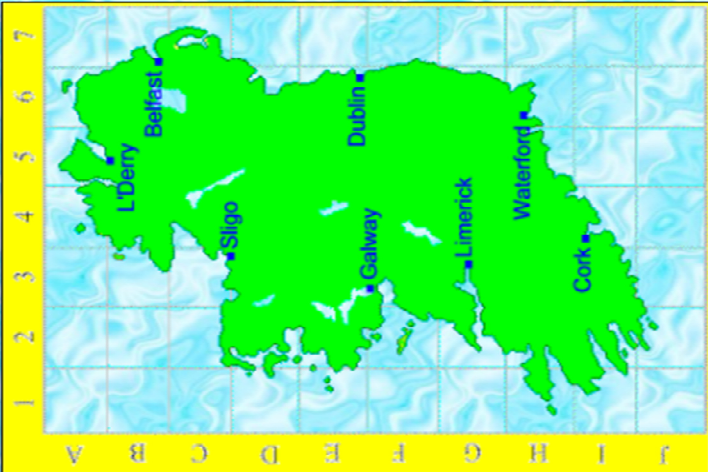
A DIVER'S GUIDE TO THE SHIP WRECKS AROUND IRELAND

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Compiled by Randal Armstrong

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Figure 11

- (d) Accessibility features are vitally important when designing websites and apps so that they can be used by all users. Describe **three** ways by which designers of websites and apps can make them accessible to users with different needs.

1.
2.
3.

Space for extra work.

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

[illegible]

Space for extra work.

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

[illegible]

Space for extra work.

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

[illegible]

Acknowledgements

Images

Image on page 3: www.activeme.ie/tourism-media-services/coakley-consulting-engineers/traffic-and-transport-reports/

Image 1 on page 9: www.instructables.com/Resistors/

Image 2 on page 9: www.indiamart.com/proddetail/100-uf-electrolytic-capacitor-21635733762.html

Image 3 on page 9: www.indiamart.com/proddetail/mje13003d-npn-power-transistor-19498797562.html

Image on page 11: www.banggood.com/12-LED-Display-Alarm-Clock-Timer-AMFM-Radio-24-Hour-System-Multi-function-p-1349571.html?cur_warehouse=CN

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Leaving Certificate – Ordinary Level

Computer Science – Sections A & B

Wednesday 25 May

Morning 9:30 – 11:00



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2022

Computer Science

Section C

Ordinary Level

Wednesday 25 May Morning 11:30 – 12:30

50 marks

Do not hand this up.
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State Examinations Commission.

Instructions

There is one section in this paper.

Section C	Programming	One question	50 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 the question.

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 booklet is not to be handed up and will **not** be reviewed by an examiner.

At the end of the examination it is your responsibility to ensure that you have saved your file onto your external media.

You will be provided with a brown envelope for your external media. Write your examination number on this envelope and place your external media into it before sealing. Place this envelope in the pouch at the front of the red envelope that contains your examination booklet from Section A and B.

There is no examination material on this page

Answer all question parts.

Question 16

- (a) Open the program called **Question16_A.py** from your device. The source code is shown and described briefly below.

Before making any changes, you should save your working copy of the file using the format **ExaminationNumberQuestion16_A.py**. For example, you would save the file as **123456Question16_A.py** if your Examination Number was 123456.

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

```
1  # Question 16 (a)
2  # Examination Number:
3
4  firstName = input("What is your first name? ")
5
6  print("Hello", firstName)
7  print("Please select from the list of items.\n")
8  # \n creates a new line
9
10 print("\tItems Available") # \t creates a tab
11 print("1 = Book")
12
13 shoppingItem = int(input("\nEnter the number of the item you
14 would like: "))
15
16 if shoppingItem == 1:
17     print("You bought a book")
```

The program above is to simulate an automated shop. The aim of the program is to accept the name of the user and then to ask the user to choose what item they would like to buy. The user will select the number of the item they wish to buy and the program outputs a message confirming the item they chose.

This question continues on the next page.

Make the following changes to the program:

- (i) Insert a comment in an appropriate place to say “user enters first name”.
- (ii) Amend the program to ask for and accept the user's surname. Store the user's surname in a variable called `surname`.

When the program is run the output may now look as follows:

```
What is your first name? Mary
What is your surname? Murphy
```

- (iii) Amend the program so that the user's first name and their surname are printed when they are asked to select their item.

When the program is run the output may now look as follows:

```
What is your first name? Mary
What is your surname? Murphy
Hello Mary Murphy
Please select from the list of items.
```

- (iv) Amend the program so that the items **2 = Ruler** and **3 = Pen** appear in the shopping list under the item **1 = Book**.

When the program is run the output may now look as follows:

```
Items Available
1 = Book
2 = Ruler
3 = Pen
```

- (v) Amend the program so that a dashed line appears above and below the available items.

When the program is run the output may now look as follows:

```
Items Available
-----
1 = Book
2 = Ruler
3 = Pen
-----
```

This question continues on the next page.

- (vi) Amend the program so that the correct message is printed if the user purchases a ruler or pen.

When the program is run the output may now look as follows:

```
Enter the number of the item you would like: 2
You bought a ruler
```

- (vii) Amend the program to deal with invalid number entries. If the user enters any number other than the numbers 1, 2 or 3 they should be presented with an error message.

When the program is run the output may now look as follows:

```
Enter the number of the item you would like: 5
Invalid choice. Goodbye.
```

Save your file using the format **ExaminationNumberQuestion16_A.py**. For example, you would save the file as **123456Question16_A.py** if your Examination Number was 123456.

Space for rough work.

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Leaving Certificate – Ordinary Level

Computer Science – Section C

Wednesday 25 May

Morning 11:30 – 12:30