2024L219G1EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Computer Science

Sections A & B

Ordinary Level

Wednesday 22 May Morning 9:30 – 11:00

130 marks

Examination Number

Date of Birth / /

For example, 3rd February 2005 is entered as 03 02 05

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.

Section A — Short Answer Questions — 54 marks

Answer any **nine** questions.

Question 1

State the output from the following Python program in the box below.

```
1 x = 9
2 y = 3
3
4 print(x + y)
5 print(x * y)
6 print(x / y)
```

Question 2

In computer science four bits of binary data is known as a ‘nibble’.

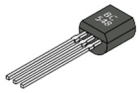
(a) What is the largest binary number that can be represented by a nibble?

(b) Convert the binary number from **part (a)** above into a decimal value.

Question 3

(a) Choose the appropriate electronic component from the list below and place it in Column B to match the correct component image in Column A.

Resistor **Transistor** **Capacitor**

Column A Component Image	Column B Component Name
	
	
	

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

Component:
Explain:

Question 4

HTTP stands for Hypertext Transfer Protocol. HTTP is an important protocol in terms of networks and internet. Explain the purpose of this protocol.

Question 5

There are three different ticket prices available for attending a concert. A full price adult ticket costs €20. Children under 16 receive a 20% discount. Anyone aged 16 to 21, who is also a student, receive a 10% discount.

The flowchart for this algorithm is shown in **Figure 1** below with some information missing.

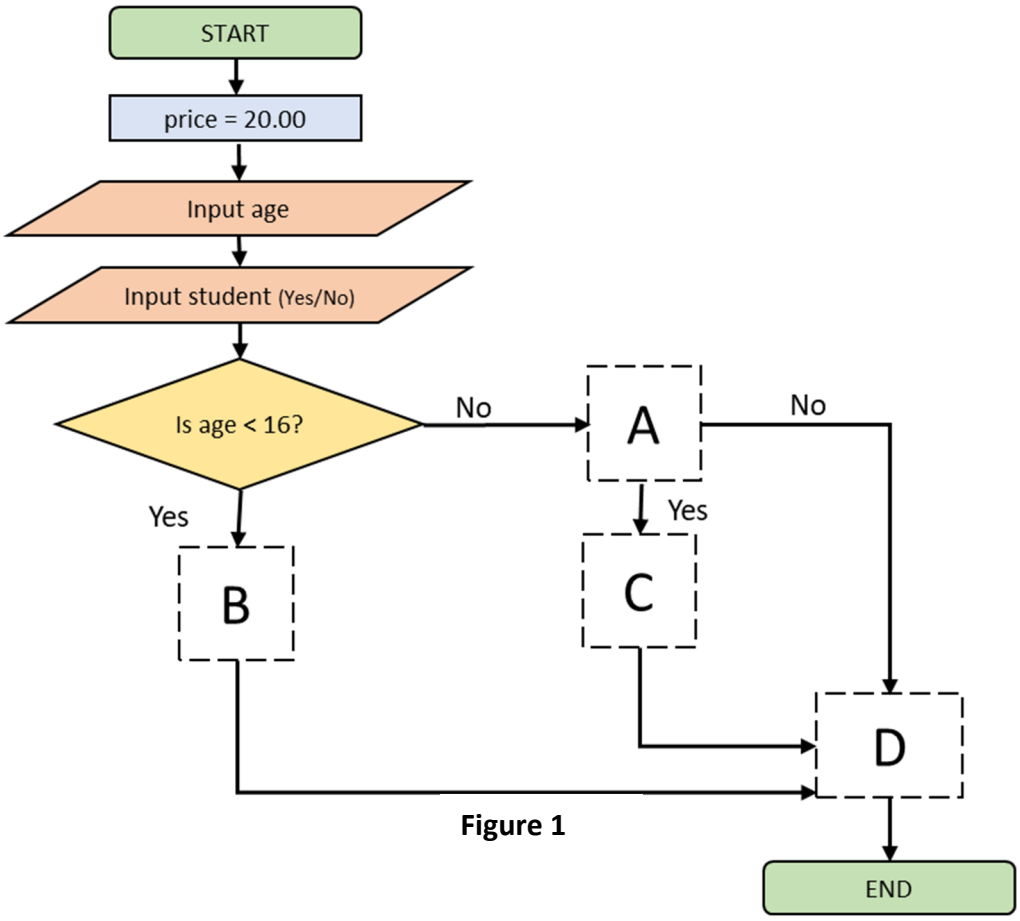


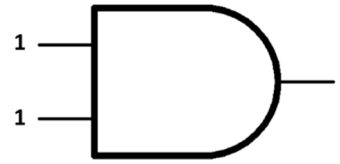
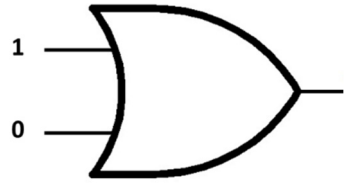
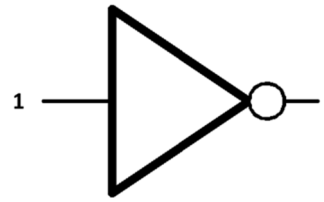
Figure 1

Select the appropriate letter from the flowchart and enter it in Column B in the table below to match it to the correct statement in Column A.

Column A **Statement**	**Column B** **Flowchart Letter (A, B, C or D)**
PRINT(price)	
Is age < 21 AND student = “yes”?	
price = price – (20% of price)	
price = price – (10% of price)	

Question 6

Three different logic gates with inputs are shown in Column A in the table below. For each logic gate in Column A enter the output, either 0 or 1, in Column B.

Column A Logic Gate	Column B Output (0 or 1)
	
	
	

Question 7

Jack has been selected as a project manager for a school project where a group are creating a student wellbeing app. List **three** specific tasks that a project manager would be responsible for on this project.

Task 1:
Task 2:
Task 3:

Question 8

Examine the incomplete Python program below and answer the questions that follow.

```
1  num1 = int(input("Enter first number: "))
2  num2 = int(input("Enter second number: "))
3  if num1 > num2:
4      print(num1, "is greater")
5  elif num2 > num1:
6      print(num2, "is greater")
7  else:
8
```

(a) Why is the `int` function used in lines 1 and 2?

(b) What is an appropriate `print` statement that could be entered in line 8?

Question 9

Drones are an example of a computing technology that can have a positive and negative impact on society. Explain **one** positive and **one** negative impact of drone technology on society.

Positive:
Negative:

Question 10

The data set below shows the raw data collected from a school survey on how teachers travel to work.

Name	Distance (Km)	Driver's License (Y/N)	Mode of Transport
Mr. Murray	3	Y	Cycle
Mrs. Woods	15	yes	Car
Mr. Murphy	23	Y	
Ms. Jones	340	N	Walk
Bn Uí Fhlanagáin	11	N	Bus
Mr. Murray	3	Y	Cycle
Ms. O'Neill	-18	Y	Car
Mrs. Lavery	4	Y	Walk

You want to use this data as part of a computer science project. List **three** issues with the data in the data set.

1.
2.
3.

Question 11

Provide **one** example of a digital input and **one** example of an analogue input on an embedded system you have used, such as those shown in **Figure 2**.

Figure 2

Digital input:
Analogue input:

Question 12

A teacher has asked you to design a website to capture information for a school trip. The teacher has provided you with the user interface mockup shown in **Figure 3** below.

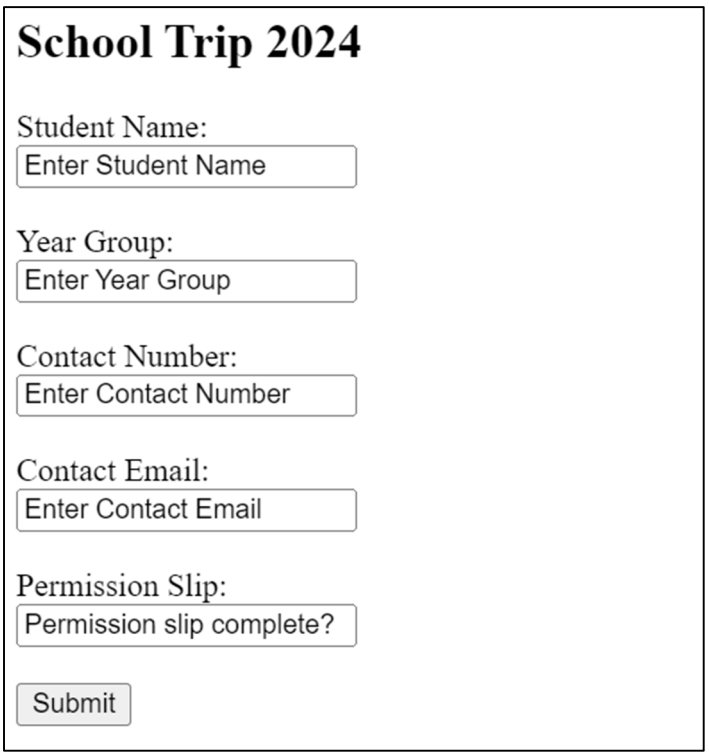


Figure 3

Suggest **three** possible data validation methods that could be applied to the form to try and eliminate any input errors.

1.
2.
3.

There is no examination material on this page

Section B — Long Questions — 76 marks

Answer any **two** questions.

Question 13

(a) The pseudo code below shows the step-by-step process that a machine follows. The machine is used in a medical lab to repeatedly shake bottles.

The machine reads the program line by line. It always reads one line and then executes it immediately. If the line contains the command '`go to X`', the machine jumps to line `X` and continues reading and executing.

```
1  set A to 0
2  set B to FALSE
3  add 1 to A
4  go to 7
5  if A equals 60 go to 9
6  set A to 0
7  add 1 to A
8  go to 3
9  shake the bottle A times
10 set B to TRUE
11 end
```

(i) `A` and `B` are both variables. What is a variable?

(ii) Choose suitable data types for the variables `A` and `B`.

A:
B:

(iii) In lines 1 and 2 in this program the variables are initialised. Explain the term "initialised" in relation to variables.

This question continues on the next page.

(iv) This program has a conditional statement. On what line number is the conditional statement?

(v) This program enters an “infinite loop”. Explain this term with reference to the code.

(vi) The infinite loop in the program above is an example of a “logic error”. In programming, what is the difference between a logic error and a syntax error?

(b) The bottles are numbered and are stored electronically in a list. Below is the list of the bottle numbers.

12	**5**	**59**	**23**	**7**	**42**	**60**	**19**	**67**	**31**

(i) Why would a programmer use a linear search to find a specific bottle from this list?

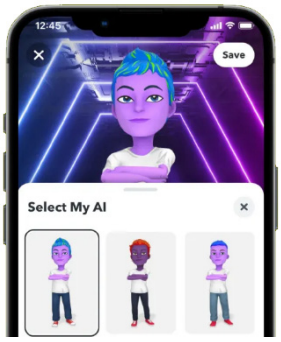
(ii) The following pseudo code is a basic implementation of a linear search.

```
1  for each element in the list
2     if element equal target value then
3        return its index
4  if element is not found then
5     print "Value not found"
```

Demonstrate the steps to show how bottle number 23 would be found in the list of bottles using this pseudo code.

(iii) Explain **one** disadvantage of the linear search algorithm when searching large data sets.

Question 14



In April 2023, Snapchat began rolling out a new feature called My AI. This experimental artificial intelligence (AI) chatbot can carry out tasks including responding to queries, giving advice, and organising travel. This is an example of the increasing influence of AI in our daily lives.

(a)

(i) List **three** other examples of the use of AI in our day-to-day lives.

1.
2.
3.

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

	True	False
Artificial intelligence and machine learning are exactly the same thing.	☐	☐
There are some jobs that could potentially be replaced by AI in the future.	☐	☐
AI algorithms can make decisions based on patterns and data without being programmed for each single decision.	☐	☐
AI always makes fair and unbiased decisions.	☐	☐
AI technology is commonly used in self-driving vehicles to help them make decisions on the road.	☐	☐

(iii) Artificial intelligence applications such as My AI and ChatGPT use machine learning models that have to be trained. Explain what it means to train a machine learning model.

(b) When creating a piece of software, the quality of the user experience is an important design consideration.

(i) Universal design should be used to ensure a good level of user experience. Describe **two** principles of universal design that might be considered in the design of apps such as Snapchat's My AI.

1.
2.

(ii) An article on the RTE website, published in April 2023, began with the following:

> Safeguarding concerns over the introduction by Snapchat of its own artificial intelligence chatbot have been raised by CyberSafeKids, which claims the service has not been properly tested.
>
> *Aengus Cox, RTE, 30 April 2023*

Explain **one** risk of My AI to children if it has not been properly tested.

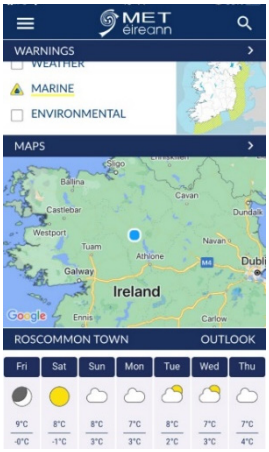
(iii) Snapchat conducted user acceptance testing (UAT) on My AI before its full release. Explain UAT?

This question continues on the next page.

(c) In September 2023, it was announced that teacher-based assessment of Leaving Certificate coursework would be postponed. The reason for this was due to “accelerated evolution and growth in generative AI".

Discuss the positive and negative impact that AI could have for students in school.

Question 15



(a) The Met Éireann app allows the Irish public to keep up to date with weather conditions across Ireland. Weather forecasts are based on predictions which use models and simulations.
The simulations allow the app to alert the public about dangers such as storms, floods and snow.

(i) Provide **one** other example of a computer simulation and state the benefit of using such a simulation.

Simulation example:
Benefit:

(ii) The first time that Met Éireann provided weather forecasts for the public was in 1948. Name and explain **two** important computing developments that have taken place since then that allow us to be informed of weather information instantly.

Name 1:
Explain 1:
Name 2:
Explain 2:

This question continues on the next page.

(b) In the design phase of the development of the app Met Éireann may have created a data table such as the one shown below. Fill in the missing data types in Column C in the table. The first row has been completed for you.

Column A Name	Column B Description	Column C Data type
Rainfall	Amount of rainfall in mm. Not a decimal number.	Integer
Temperature	Should accept a decimal number	
Province	Any one of the following: [Leinster, Munster, Connacht, Ulster]	
Wind speed	Should not be a decimal number	
Issue weather warning	Yes or No	
Weather description	Written description of today's weather e.g. It will be warm and sunny today	

(c) When designing an app such as this it is important to consider ways to make the app more accessible. List **three** features that could be included to ensure increased accessibility for all users.

1.
2.
3.

(d) Met Éireann will issue a yellow, orange or red wind warning based on the criteria in the table below.

Yellow Wind Warning	Orange Wind Warning	Red Wind Warning
Speed between 90 and 110km/h	Speed between 111 and 130km/h	Speed greater than 130km/h

(i) Based on this information create an algorithm, using a flowchart or pseudo code, that will calculate if a warning should issue and if so what colour the warning should be.

(ii) Which of the following is the best set of data values to test your algorithm with? Select your answer by putting a tick (✓) in the appropriate box.

`[89, 90, 100, 110, 111, 129, 130, 131]` ☐

`[20, 70, 80, 90, 95, 135, 145, 165]` ☐

`[19, 60, 65, 115, 116, 138, 139, 140]` ☐

Justify your answer below.

Space for extra work.

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

Space for extra work.

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

Space for extra work.

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Space for extra work.

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

Acknowledgements

Images
Image on page 7: https://aerosystemswest.com/product/asw-heavy-lift-quadcopter-industrial-drone/
Image 1 on page 8: https://makelearn.org/2019/02/07/exporting-microbit-sensor-data/
Image 2 on page 8: https://ie.farnell.com/raspberry-pi/rpi3-modbp/sbc-board-raspberry-pi-3-model/dp/2842228
Image on page 14: https://techcrunch.com/2023/04/24/snapchat-sees-spike-in-1-star-reviews-as-users-pan-the-my-ai-feature-calling-for-its-removal/

Texts
Text on page 15: https://www.rte.ie/news/2023/0430/1380005-snapchat-ai/

Leaving Certificate – Ordinary Level

Computer Science – Sections A & B

Wednesday 22 May
Morning 9:30 – 11:00

2024L219G2EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Computer Science

Section C

Ordinary Level

Wednesday 22 May Morning 11:30 – 12:30

80 marks

Do not hand this up.

This document will not be returned to the State Examinations Commission.

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Instructions

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

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

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

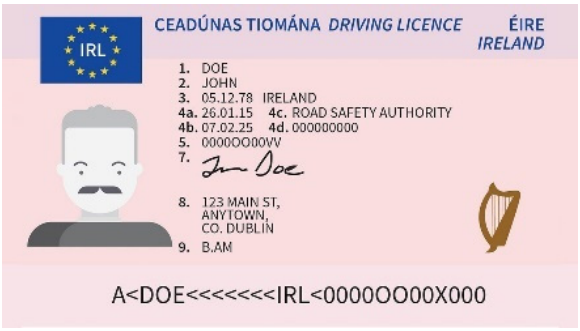
At the end of the examination it is your responsibility to ensure that you have saved your files onto your external media.

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.

Section C — Programming — 80 marks

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 **CandidateNumberQuestion16_A.py**. For example, you would save the file as **123456Question16_A.py** if your candidate number was 123456.

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

The program below is the start of a program to check if a person is eligible for their driving licence. The code works by taking the user's age as an input and checking if it meets a condition.

```
1  # Question 16(a)
2  # Examination Number:
3
4  print("The program")
5
6  age = int(input("What age are you? "))
7
8  if (age >= 17):
9      print("You are entitled to apply for a driving licence.")
```

Make the following changes to the program:

(i) Modify the program so that it first prints out "Welcome to the driving licence eligibility checker" instead of "The program". When the program is run the output should now look as follows:

```
Welcome to the driving licence eligibility checker
What age are you?
```

(ii) Insert a comment in the code that explains what is happening on line 6.

(iii) Print a message stating the age that the user entered. When the program is run the output may now look as follows:

```
Welcome to the driving licence eligibility checker
What age are you? 17
You entered 17
You are entitled to apply for a driving licence.
```

(iv) Currently the program will only output a message when the entered age is 17 or over. Change the program so that if an age less than 17 is entered a suitable message is output. When the program is run the output may now look as follows:

```
Welcome to the driving licence eligibility checker
What age are you? 16
You entered 16
You are not entitled to apply for a driving licence.
```

(v) Amend the program to ask for the user's name. The name should be stored in an appropriate variable. The user's name should be output along with the message about eligibility to apply for a licence.
When the program is run the output may now look as follows:

```
Welcome to the driving licence eligibility checker
What is your name? Sarah
What age are you? 16
You entered 16
Sarah you are not entitled to apply for a driving licence.
```

(vi) Update your program so that it outputs a message to the user based on the criteria in the table below. The output should continue to display the user name. The name Sarah is used in the examples below.

Condition	Output
Age is less than 17	Sarah you are not entitled to apply for a driving licence.
Age between 17 and 74 inclusive	Sarah you are entitled to apply for a driving licence.
Age is more than 74	Sarah you are entitled to apply for a three-year driving licence.

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

```
Welcome to the driving licence eligibility checker
What is your name? Sarah
What age are you? 75
You entered 75
Sarah you are entitled to apply for a three-year driving
licence.
```

Save your file using the format **CandidateNumberQuestion16_A.py**. For example, you would save the file as **123456Question16_A.py** if your candidate number was 123456.

(b) Open the program called **Question16_B.py** from your device. This file only contains two comments on lines 1 and 2.

Before making any changes, you should use the format **CandidateNumberQuestion16_B.py** to save your file. For example, you would save the file as **123456Question16_B.py** if your candidate number was 123456.

Enter your Examination Number in the space provided on **Line 2.**

Implement a program that will help you to split a restaurant bill with your friends.

You should use comments throughout your program to explain your code. You may wish to reuse some of the code you used in part **(a)** as part of your solution.

Your program should do the following:

- The program should display an output of "Split Bill Calculator" at the start.
- The user can enter the total amount of the bill.
- The user can enter the number of people that will be splitting the bill.
- Divide the total amount of the bill by the number of people. The amount owed by each person should be printed with a suitable message.

A sample output is shown below:

```
Split Bill Calculator
How much is the bill?: 100
How many people?: 5
You each owe 20.0
```

Save your file using the format **CandidateNumberQuestion16_B.py**. For example, you would save the file as **123456Question16_B.py** if your candidate number was 123456.

Space for rough work.

This page will not be reviewed by an examiner.

Acknowledgements

Images
Image on page 4: https://static.aviva.io/content/dam/aviva-public/ie/articles/car/your-driving-licence-debunked-article-2.jpg
Image on page 6: https://www.louisianafcu.org/articles/the-polite-persons-guide-to-splitting-the-bill

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Leaving Certificate – Ordinary Level

Computer Science – Section C

Wednesday 22 May
Morning 11:30 – 12:30