

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	45 marks
Section B	Long Questions	Attempt any two questions	60 marks
Section C	Programming	One question 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	45 marks
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Answer any nine questions.

Question 1

(a) Explain the difference between the World Wide Web and the Internet.

(b) How many gigabits (Gb) are in one gigabyte (GB)?

--

Question 2

What is the output of the following piece of Python code?

1	<code>x = 3</code>
2	<code>y = 4</code>
3	<code>print((x+y)**2)</code>

Output:

--



Question 3

(a) Convert the decimal number 58 to a binary number.

(b) Convert the hexadecimal number F8 to a decimal (denary) (base 10) number.

Question 4

Complete the truth table for the AND logic gate, shown in **Figure 1**.

INPUTS		OUTPUT
A	B	Q
0	0	
0	1	
1	0	
1	1	

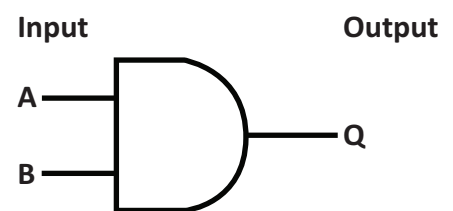


Figure 1



Question 5

Figure 2 shows a pentagon. Each corner is an angle of 108° and each side is 2 cm long.

Using pseudocode or Python, write out the instructions to draw the pentagon, starting at the bottom left corner and moving in the direction of the arrow.

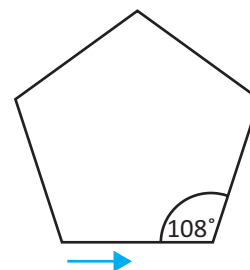


Figure 2

Case No.	Case Name	Case Type	Case Status	Case Date	Case Location	Case Description	Case Notes	Case Attachments
1	John Doe	Medical	Open	2023-01-01	New York	John Doe, 35 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/1/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	John Doe has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	John Doe's medical records from 2022 are attached.
2	Jane Smith	Legal	Closed	2023-01-02	California	Jane Smith, 42 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/2/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Jane Smith has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Jane Smith's medical records from 2022 are attached.
3	Michael Brown	Medical	Open	2023-01-03	Texas	Michael Brown, 55 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/3/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Michael Brown has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Michael Brown's medical records from 2022 are attached.
4	Sarah Johnson	Legal	Closed	2023-01-04	Florida	Sarah Johnson, 38 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/4/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Sarah Johnson has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Sarah Johnson's medical records from 2022 are attached.
5	David Wilson	Medical	Open	2023-01-05	Illinois	David Wilson, 60 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/5/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	David Wilson has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	David Wilson's medical records from 2022 are attached.
6	Emily Davis	Legal	Closed	2023-01-06	Ohio	Emily Davis, 45 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/6/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Emily Davis has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Emily Davis's medical records from 2022 are attached.
7	Robert Miller	Medical	Open	2023-01-07	Georgia	Robert Miller, 50 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/7/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Robert Miller has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Robert Miller's medical records from 2022 are attached.
8	Laura White	Legal	Closed	2023-01-08	Arizona	Laura White, 40 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/8/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Laura White has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Laura White's medical records from 2022 are attached.
9	Christopher Lee	Medical	Open	2023-01-09	Colorado	Christopher Lee, 52 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/9/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Christopher Lee has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Christopher Lee's medical records from 2022 are attached.
10	Amanda Taylor	Legal	Closed	2023-01-10	Idaho	Amanda Taylor, 39 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/10/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Amanda Taylor has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Amanda Taylor's medical records from 2022 are attached.
11	Matthew Garcia	Medical	Open	2023-01-11	Utah	Matthew Garcia, 58 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/11/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Matthew Garcia has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Matthew Garcia's medical records from 2022 are attached.
12	Stephanie Adams	Legal	Closed	2023-01-12	Montana	Stephanie Adams, 41 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/12/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Stephanie Adams has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Stephanie Adams's medical records from 2022 are attached.
13	Kevin Baker	Medical	Open	2023-01-13	Wyoming	Kevin Baker, 53 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/13/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Kevin Baker has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Kevin Baker's medical records from 2022 are attached.
14	Nicole Hall	Legal	Closed	2023-01-14	Nebraska	Nicole Hall, 43 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/14/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Nicole Hall has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Nicole Hall's medical records from 2022 are attached.
15	Brandon King	Medical	Open	2023-01-15	Oklahoma	Brandon King, 56 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/15/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Brandon King has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Brandon King's medical records from 2022 are attached.
16	Christina Scott	Legal	Closed	2023-01-16	Kansas	Christina Scott, 44 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/16/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Christina Scott has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Christina Scott's medical records from 2022 are attached.
17	Gregory Green	Medical	Open	2023-01-17	Missouri	Gregory Green, 51 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/17/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Gregory Green has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Gregory Green's medical records from 2022 are attached.
18	Michelle Carter	Legal	Closed	2023-01-18	Arkansas	Michelle Carter, 46 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/18/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Michelle Carter has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Michelle Carter's medical records from 2022 are attached.
19	Timothy Evans	Medical	Open	2023-01-19	Louisiana	Timothy Evans, 54 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/19/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Timothy Evans has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Timothy Evans's medical records from 2022 are attached.
20	Angela Roberts	Legal	Closed	2023-01-20	Mississippi	Angela Roberts, 47 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/20/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Angela Roberts has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Angela Roberts's medical records from 2022 are attached.
21	Jonathan Clark	Medical	Open	2023-01-21	Alabama	Jonathan Clark, 57 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/21/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Jonathan Clark has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/15/22. He was prescribed medication for his blood pressure and cholesterol.	Jonathan Clark's medical records from 2022 are attached.
22	Kimberly Lewis	Legal	Closed	2023-01-22	South Carolina	Kimberly Lewis, 48 years old, female, reported a sudden onset of chest pain and shortness of breath on 1/22/23. She was taken to the ER and diagnosed with a heart attack. She is currently in the hospital and receiving treatment.	Kimberly Lewis has a history of high blood pressure and cholesterol. She was last seen by a doctor on 12/15/22. She was prescribed medication for her blood pressure and cholesterol.	Kimberly Lewis's medical records from 2022 are attached.
23	Christopher Young	Medical	Open	2023-01-23	North Carolina	Christopher Young, 59 years old, male, reported a sudden onset of chest pain and shortness of breath on 1/23/23. He was taken to the ER and diagnosed with a heart attack. He is currently in the hospital and receiving treatment.	Christopher Young has a history of high blood pressure and cholesterol. He was last seen by a doctor on 12/1	

Question 6

The Unicode representation for the ‘winking face’ character shown in **Figure 3** is the hexadecimal number 1F609.

Describe **two** differences between American Standard Code for Information Interchange (ASCII) and Unicode.



Figure 3

1.	
2.	



Question 7

(a) As of May 2021, there are 70 operational data centres in Ireland, with a further eight under construction.

(i) Identify **one** advantage of having data centres in Ireland.

(ii) Identify **one** disadvantage of having data centres in Ireland.

(b) Describe the role of a data controller within an organisation.



Question 8

The image in **Figure 4** shows a printed circuit board (PCB).

Describe **two** advantages of using a PCB in a computer or an embedded system.

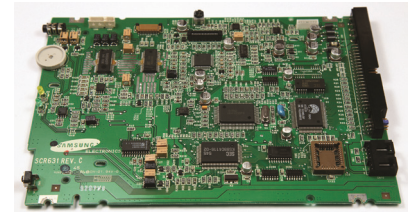


Figure 4

Advantage 1:
Advantage 2:

Question 9

List **three** datatypes that may be used in Python programming.

1.
2.
3.



Question 10

(a) Explain the difference between primary and secondary data storage.

(b) Describe **two** advantages of solid state drives (SSDs) over hard disk drives (HDDs).

Advantage 1:
Advantage 2:



Question 11

Figure 5 shows a map of a new fibre optic link between Europe and North America, which is due to go live in 2022. The Grace Hopper cable is named in honour of pioneering computer scientist Grace Brewster Murray Hopper.

Describe **two** advantages and **one** disadvantage of using fibre optic cable rather than copper cable for the transmission of data.

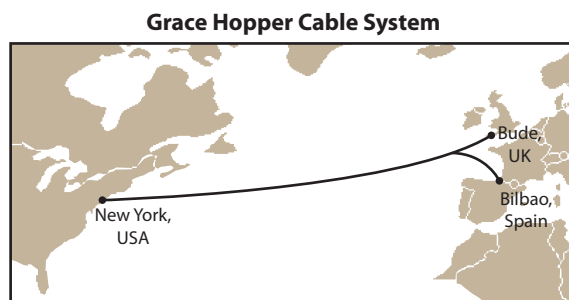


Figure 5

Advantage 1:
Advantage 2:
Disadvantage 1:

Question 12

Which one of the following is the odd one out?

Operating System

Semiconductor

Serial Bus

Hard Drive

--

Justify your answer.



Answer any two questions.

Question 13

- (a) A bubble sort is a type of sorting algorithm. What is an algorithm?

- (b) The table below sets out the operation of the ascending bubble sort algorithm to sort the list of integers [5, 3, 2, 4, 1].

Complete the table below to show the state of the list after passes 1 and 2.

5	3	2	4	1
---	---	---	---	---

Original	5	3	2	4	1
Pass 1					
Pass 2					



- (c) Facial recognition software uses algorithms to recognise people.

This type of software can be installed in CCTV cameras.

Describe **two** potential advantages and **two** potential disadvantages of using facial recognition software.

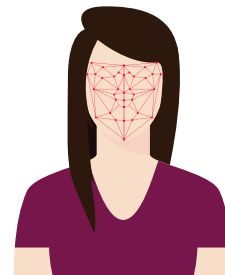


Figure 6

Advantage 1:
Advantage 2:
Disadvantage 1:
Disadvantage 2:



Question 14

- (a) User-centred design (UCD) is an iterative design process in which designers focus on the users and their needs in each phase of the design process.

You are part of a design team working on a new smart home device that allows users to control other smart devices by voice control.

Describe **two** aspects of UCD that the design team should focus on for the project.
Explain your reasoning for **each** aspect you have chosen.

Aspect 1:
Reasoning for Aspect 1:
Aspect 2:
Reasoning for Aspect 2:

This question continues on the next page.



(b) One of the stories of 2021 was the rise, fall and rise of Dogecoin.

This is a form of crypto currency that was heavily influenced by social media and a number of high-profile individuals.

Describe **two** positive impacts and **two** negative impacts of social media on culture and society in the 21st century.



Figure 7

Positive impact 1:
Positive impact 2:
Negative impact 1:
Negative impact 2:

This question continues on the next page.



- (c) Leaving Certificate Computer Science places special emphasis on the iterative design process.

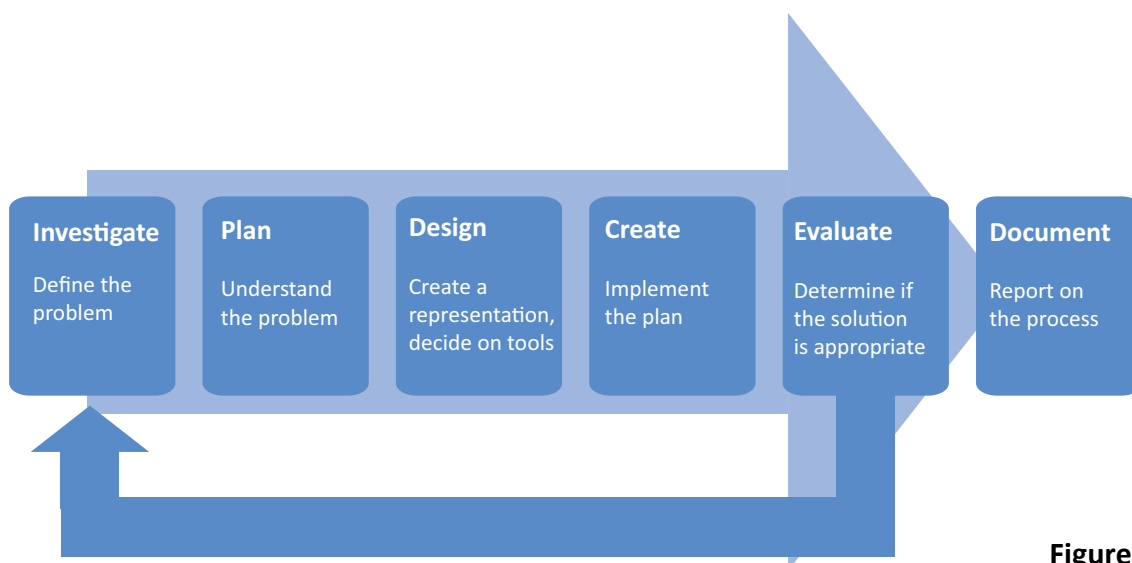


Figure 8

- (i) Give **one** example of where you have used the iterative design process in one of your Applied Learning Tasks (ALTs).

- (ii) Explain how the iterative design process helped you achieve your goal.



- (d) The age of digital consent is the minimum age a user must be before a social media or other online service can collect, process and store their data. In 2018, the European Union set the default age of digital consent at 16 years.

Give **two** reasons for lowering the age of digital consent and **two** reasons for maintaining the age of digital consent at 16 years.

Lowering the age of digital consent 1:
Lowering the age of digital consent 2:
Maintaining the age of digital consent 1:
Maintaining the age of digital consent 2:



Question 15

(a) As part of your Leaving Certificate Computer Science course you used an embedded system in Applied Learning Task 4 (ALT4).

(i) What is an embedded system?

(ii) Name **three** analogue sensors that may be attached to an embedded system.

1.
2.
3.

(b) Lisa and Max have decided to buy a gaming computer.

The specifications of the computer they decided to buy are:

- Intel Core i9-101850K CPU
- ASUS ROG Strix Z590-F Gaming WiFi
- 32GB Corsair Vengeance 3000MHz RAM
- 6GB GeForce RTX 2060 GPU
- 1TB Seagate BarraCuda HDD
- Windows 10 Home



Figure 9

(i) They have opted for 32GB of RAM. What is RAM?



- (ii) Explain why Lisa and Max opted for the additional 6GB GPU, instead of just the i9 CPU.

- (iii) The i9 CPU has 8 cores. Name **two** components of a CPU core.
Give the function of **one** of the components you have named.

Component 1:
Component 2:
Function of one component:

This question continues on the next page.



(c) Describe, using examples, the difference between a digital signal and an analogue signal.



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]

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 4:	DEB Exams
Images on page 5:	DEB Exams; https://pixabay.com/illustrations/emoji-smilie-whatsapp-emotion-2762568/
Image on page 7:	https://pixabay.com/photos/mother-board-electronic-electronics-5372103/
Image on page 9:	DEB Exams
Image on page 11:	https://pixabay.com/vectors/flat-recognition-facial-face-woman-3252983/
Image on page 13:	https://cryptologos.cc/dogecoin
Image on page 14:	DEB Exams
Image on page 16:	https://pixabay.com/vectors/computer-workstation-server-monitor-158743/

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Pre-Leaving Certificate Examination, 2022 – Ordinary Level

Computer Science – Sections A & B

Time: 1 hour, 30 minutes

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2022-L088-1-EL-24/24

Pre-Leaving Certificate Examination, 2022

Computer Science

Section C

Ordinary Level

Time: 1 hour

80 marks

Instructions

There is one section in this paper.

Section C	Programming	One question Answer all question parts	80 marks
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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 and when you complete each question part.

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 all of your files onto your external media.

<p>Do not hand this paper up</p>

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 **StudentNameQuestion16_A.py**. For example, you would save the file as **MaryMurphyQuestion16_A.py** if your name was Mary Murphy.

Enter your Name and School in the space provided on **line 2** in your Python file.

Vaccines against the SARS-2 (Covid-19) virus have helped to overcome the pandemic. Age was the main factor that determined which type of vaccine a person received during the vaccine rollout.

Vaccine Type	Age Group (years)
MRNA	12 – 49
ADENO	50+

Table 1 shows the types of vaccines available and the age groups they are suitable for.

Table 1

The program below is for a vaccine registration portal. When Jack Saunders enters his name, a message appears saying “Hello, Jack Saunders”.

```

1  # Question 16(a)
2  # Name and School:
3
4  s_name = input("Enter your surname: ")
5  f_name = input("Enter your first name: ")
6  print("Hello", f_name, s_name)

```

Make the following changes to the program:

- (i) Amend the program to allow Jack to enter his age. He is 42 years old.

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

```

Enter your surname:      Saunders
Enter your first name:   Jack
Enter your age:          42
Hello Jack Saunders you are 42 years old

```

- (ii) Amend the program using the information given in **Table 1** so that it tells Jack which vaccine he will receive.

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

```
Enter your surname:      Saunders
Enter your first name:   Jack
Enter your age:          42
Hello Jack Saunders you are 42 years old
Jack, you will receive the MRNA vaccine
```

- (iii) Jack needs to input his Eircode (K78 E625) in order to be assigned to a vaccination centre. Eircodes ending with an odd number are assigned to Northfield and those ending with an even number are assigned to Eastwood.

Amend the program so that Jack is assigned to the correct vaccination centre.

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

```
Enter your surname:      Saunders
Enter your first name:   Jack
Enter your age:          42
Enter your Eircode:      K78 E625
Hello Jack Saunders, you are 42 years old and your
Eircode is K78 E625
You must attend Northfield for your vaccine
Jack, you will receive the MRNA vaccine
```

- (iv) Using a **while** loop or similar, amend the program to give Jack the option to register another person. The code should terminate when you enter the word 'END' or allow you to enter the details for Mary Saunders, 65 years old, Eircode K66 E644.

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

```
Enter your surname:      Saunders
Enter your first name:   Jack
Enter your age:          42
Enter your Eircode:      K78 E625
Hello Jack Saunders, you are 42 years old and your
Eircode is K78 E625.
You must attend Northfield for your vaccine
Jack, you will receive the MRNA vaccine
If you have finished entering people's details type
'END', otherwise press RETURN:
Enter your surname:      Saunders
Enter your first name:   Mary
Enter your age:          65
Enter your Eircode:      K66 E644
Hello, Mary Saunders, you are 65 years old and your
Eircode is K66 E644.
You must attend Eastwood for your vaccine
Mary, you will receive the ADENO vaccine
```

- (v) Jack wants to enrol in a vaccine trial. Amend the program to ask Jack if he agrees to enrol in a vaccine trial and to randomly assign one of the three super vaccines (A, B, C) to him. (Hint: create a list containing A, B, C and use **import random** and **random.choice**).

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

```
Enter your surname:           Saunders
Enter your first name:       Jack
Enter your age:              42
Enter your Eircode:          K78 E625
Do you agree to enrol in a vaccine trial?
Type 'Yes' or 'No'           Yes
Hello Jack Saunders, you are 42 years old and your
Eircode is K78 E625
You must attend Northfield for your vaccine
You are now enrolled in the trial to receive Super
vaccine B
If you have finished entering people's details type
'END', otherwise press RETURN:
```

Save your file using the format **StudentNameQuestion16_A.py**. For example, you would save the file as **MaryMurphyQuestion16_A.py** if your name was Mary Murphy.

- (b) Find the median of the following list of numbers, without using an in-built Python function:

```
List 1 = [4, 5, 9, 8, 10, 17, 99, 77]
```

Save your file using the format **StudentNameQuestion16_B.py**. For example, you would save the file as **MaryMurphyQuestion16_B.py** if your name was Mary Murphy.

Space for rough work.

This page will not be reviewed by an examiner.

Space for rough work.

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Pre-Leaving Certificate Examination, 2022 – Ordinary Level

Computer Science – Section C

Time: 1 hour