Pre-Leaving Certificate Examination 2024

Computer Science

Sections A & B

Ordinary Level

Time: 1 hour, 30 minutes

123 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	45 marks
Section B	Long Questions	Attempt any two questions All questions carry equal marks	78 marks
Section C	Programming	Answer all question parts	87 marks

Calculators may **not** be used during this section.

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.
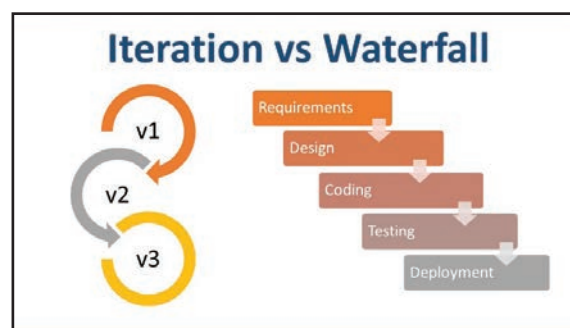
Answer any **nine** questions.

Question 1

Name and briefly describe any **two** important developments in computer science over the past 100 years.

Development 1.
Development 2.

Question 2

Originally, the staged (or waterfall) development process was used, but over recent years, developers moved to the iterative development process. Identify **one** reason why developers might prefer the iterative development process.

Question 3

Integers and Floats are two types of variables used in many programming languages such as Python.

(a) Provide an example of an integer value, and say where in a programming problem that you have completed that you needed to use an integer.

Example:
Where:

(b) Provide an example of a Float value, and say where in a programming problem that you have completed that you needed to use a float.

Example:
Where:

Question 4

The below program takes in a person's age and stores it in the variable age, it then prints out A, B or C, depending on the value entered for the person's age.

```
1   age = int(input("Please enter your age:"))
2   if age > 16:
3       print("A")
4   elif age < 16:
5       print("B")
6   else:
7       print("C")
```

Given 5 inputs, write into the corresponding box the value that the program will print (that is, A, B or C).

Value entered for age	Output (A, B, or C)
18	
-1	
100	
16	
3	

Question 5

Computational thinking often uses pattern recognition. Pattern recognition is the ability to recognise common previously used code or patterns within problems you are trying to solve. When you break down (decompose) a problem into smaller subproblems, you may be able to spot previously used code/patterns that will help you to solve the problem (adapted from Isaac Computer Science).

You need to find something behind one of the locked doors, so you need to develop an algorithm to do so (to search), but you can only open one door at a time as all of the keys are on a single bunch of keys that cannot be split.

Figure 1

(a) Name a searching algorithm that could be used for this problem.

| |
| |

(b) Name **one** piece of code and **one** variable that you may need for your algorithm, and explain your choice for each.
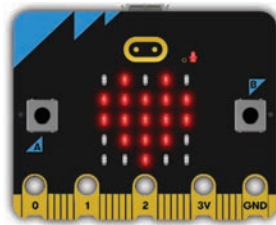
| |
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Question 6

Figure 2

The diagram above is of an embedded system. This is a Micro:bit, but there are also others such as the Raspberry Pi or the Arduino.

(a) Briefly describe where you have used an embedded system before, mentioning the problem that you were solving with it.

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(b) The user wants to develop a system to take in input from a user via a keyboard. Would the embedded system from part **(a)** be suitable for this problem and why?

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Question 7

Researchers at MIT (Massachusetts Institute of Technology) fooled Artificial Intelligence (AI) into thinking that an image of guns was in fact an image of a helicopter. This fooling of AI is often called AI hacking.
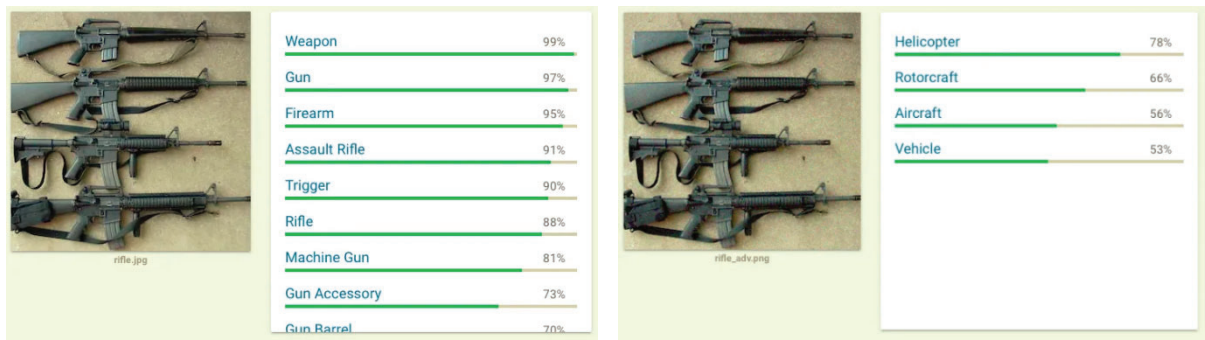
Original image – labelled correctly   *MIT after hacking the AI system*

Figure 3

(a)   Given that AI can be hacked, describe **one** risk for an airport looking to use this AI as the **only security** to identify anyone bringing guns into the airport.

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| |

(b)   Describe **one** additional action that you would suggest to the airport to address this risk.

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Question 8

ChatGPT is called generative AI; this is an AI tool that can produce text, maths, programming code and much more. Even Snapchat has generative AI built in now (using ChatGPT), called MyAI, that can answer questions and have conversations.
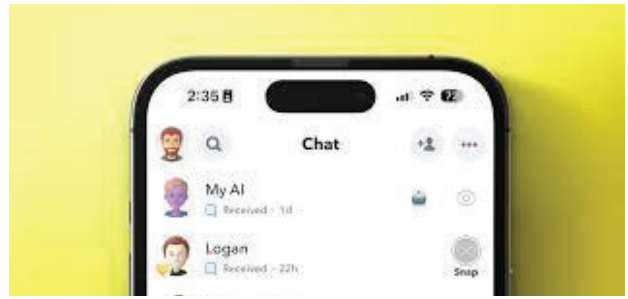

Figure 4

(a) Suggest **one** issue with the use of ChatGPT, My AI, or a generative AI.

(b) Suggest **one** positive use/application for the use of ChatGPT, My AI or a generative AI.

Question 9

Operating systems are typically designed using layers. This can include mobile phones and tablets (like Android and IOS) and PCs or laptops (MacOS and Windows).
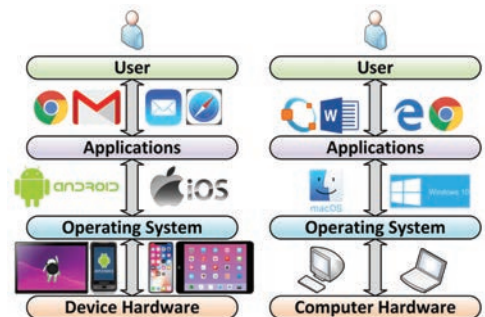

Figure 5

(a) Suggest **one** reason why operating systems are designed like this.

(b) Give **one** example of a hardware device in a computer **and** give its function.

Question 10

Below shows an image of some Python code. Study the code carefully and answer the questions that follow.

```python
1  myList = [11, 13, 3, 9, 6, 1]
2
3  key = 7
4  found = False
5
6  #Part A start
7  for element in myList:
8      if element == key:
9          found = True
10 #Part A end
11
12 #Part B start
13 if found:
14     print("X")
15 else:
16     print("Y")
```

(a) Studying all of the code in Part A carefully, explain specifically what the code in lines 7-9 does.

(b) Currently, the print statements in line 14 and line 16 are not very informative.
Give a meaningful message for the print statements in line 14 and line 16:

14 X:
16 Y:

9

Question 11

Websites are often not suitable for people with additional needs, such as vision impairment. On February the 2nd 2006, Facebook looked like the below:
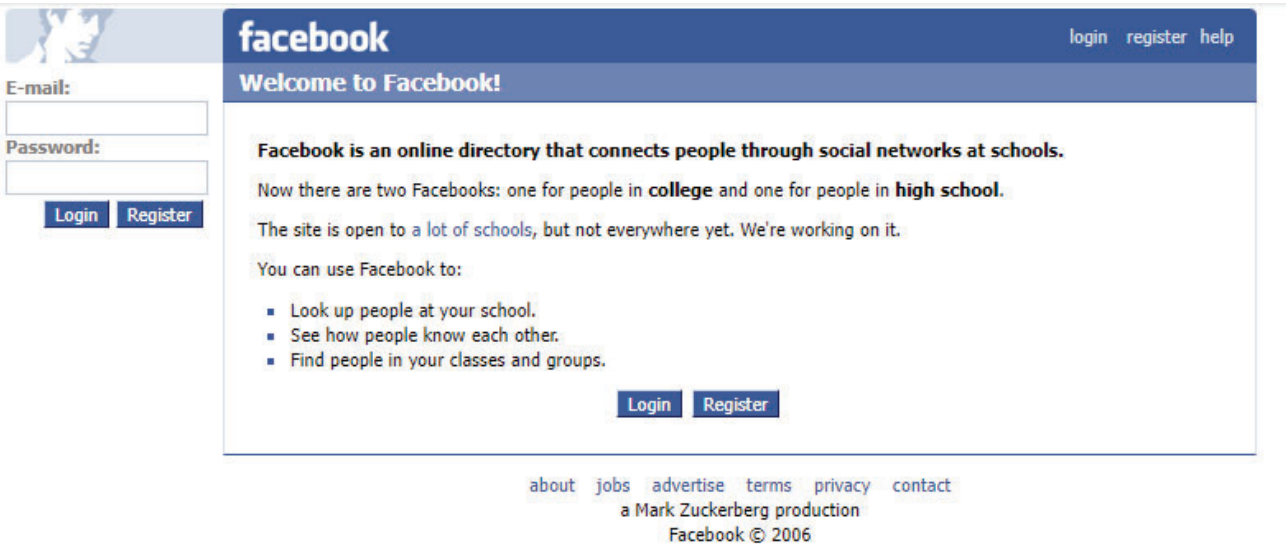

Figure 6

(a) Suggest a way to change this website to improve accessibility for people with vision impairments.

(b) Identify **one** other addition or change that you would make to the site for accessibility.

Question 12

A school wants to develop an online interactive software system to take in and store students' exam results. The following stakeholders will interact with the system:

- Teachers can enter the results and review them.
- Parents and guardians can see the results.
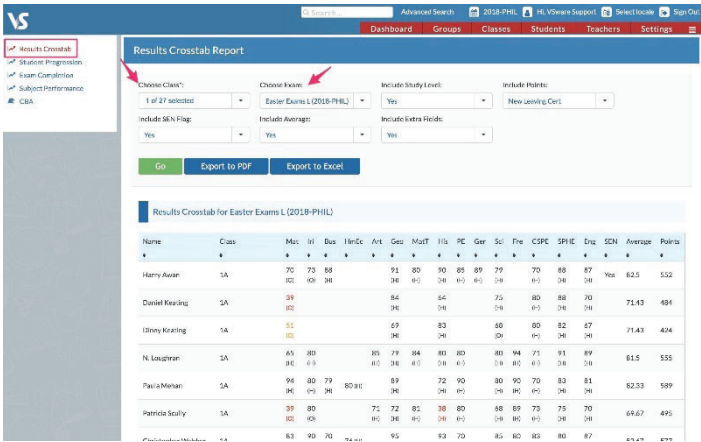- School management can see the results for winter and summer reports.

Figure 7

Assign **two** roles **and** responsibilities within a software development team to tackle this computing task.

Role 1:
Responsibility 1:
Role 2:
Responsibility 2:

Answer any **two** questions.

Question 13

(a) The below jumbled lines of code are meant to ask a user for their name, and print to the screen whether the name is valid or not. It will later be entered into a database, so it is important to ensure the name is valid. To be valid, a name must:
  • Have three or more characters
  • Not have a space in it.

Write into the table on the right the order of the code blocks to create the program.
Please note you can ignore indentation and there is one additional block that is not needed.
The first row has been filled in for you.

Correct order:

```
1   if len(name) > 2 and " " not in name:

2   print("Name Valid")

3   print("Name not valid")

4   else:

5   name = input("What is your name?")

6   if len(name) > 2 and " " in name:
```

Correct order:
5

(b) For the one line of code that was **not** included for the solution for part **(a)**, what would have happened if it replaced the correct line of code that is similar to it?

| |
| |
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(c) For the overall algorithm to work as intended, a name must:
  • Have three or more characters
  • Not have a space in it.

This algorithm is not optimal as it may not work for all names. Can you think of a name or description of a name where the code might not work as intended and how you might fix it?

Question 14

Modelling is often used to build representations of real-world scenarios. In the below example, we have a model to tell us how far away lightning is by counting the time between seeing the lightning flash and hearing the thunder. The model is presented below.
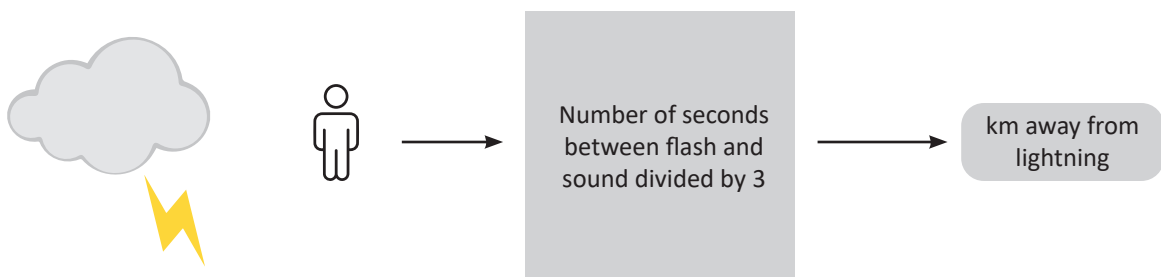
Figure 8

(a) Use the model to take the number of seconds between flash and thunder sound to determine how far the lightning is away in km.

Seconds between flash and thunder	How far away in km
3	
6	
9	
1	

(b) The below Python program is missing **one** line of code for the model:

```python
seconds = int(input("How many seconds between flash and thunder sound?"))

# Missing line of code

print("Distance:", distance, "KM")
```

What is the missing line of code? Is it **a)**, **b)** or **c)**?

```python
a) distance = seconds * 3

b) distance = seconds / 3

c) distance = seconds // 3
```

Answer:

(c) Give **two** reasons why this model may be useful for people to use.

1.

2.

(d) Models can sometimes be incorrect. Describe **one** problem that could occur if an incorrect answer was provided by the model.

Question 15

Below is a histogram of all the English-language Netflix films in the US in 2020 (they currently own the rights to over 4000 series and films).

Beside the histogram is the average minimum and maximum length of films on Netflix.
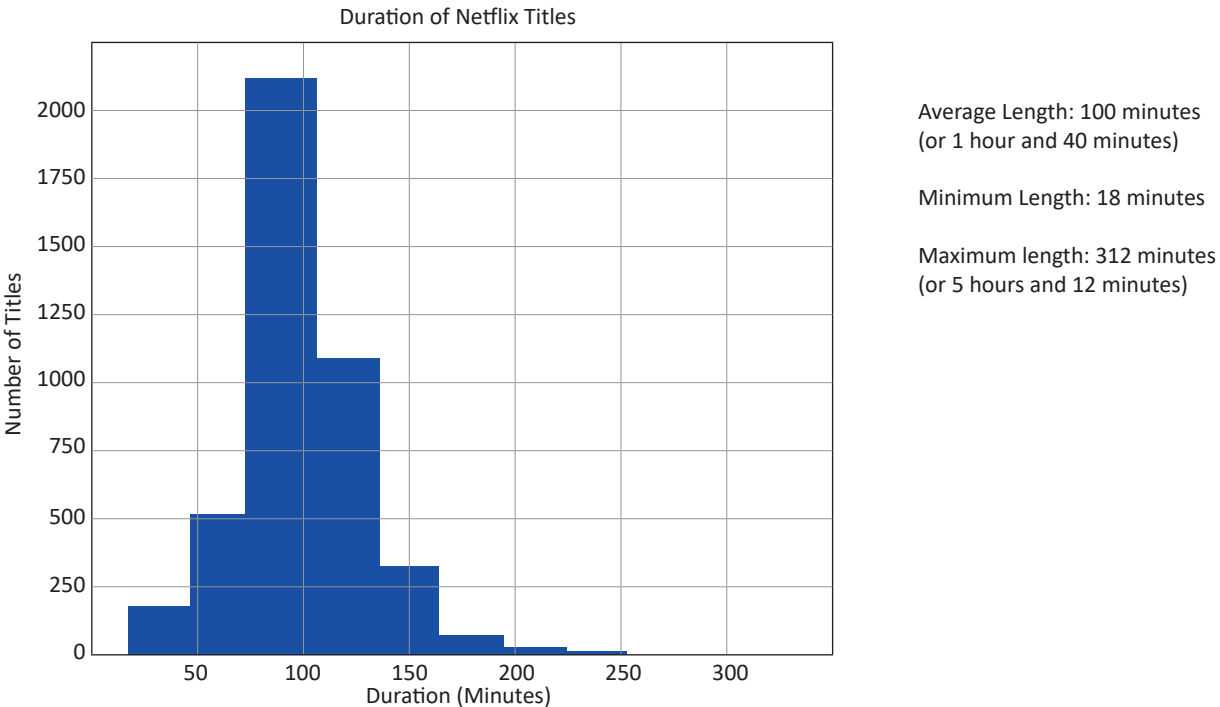

Duration of Netflix Titles

Average Length: 100 minutes
(or 1 hour and 40 minutes)

Minimum Length: 18 minutes

Maximum length: 312 minutes
(or 5 hours and 12 minutes)

Figure 9

(a) The longest English-language film on Netflix is *The Irishman*, running at 209 minutes (3 hours and 29 minutes). Can you spot any data ranges present in the histogram that may be incorrect? Why would you think this?

What data is incorrect?
How did you come to this conclusion?

(b)   Below is a dataset for US household income in 2016, presented as a histogram (number of households on the Y-axis and the amount of money the household brings in each year on the X-axis).

Figure 3-i. U.S. Household Income Distribution in 2016

Number of households (in thousands)

Median: $59,039   Mean: $83,143

Income range (thousands of dollars)
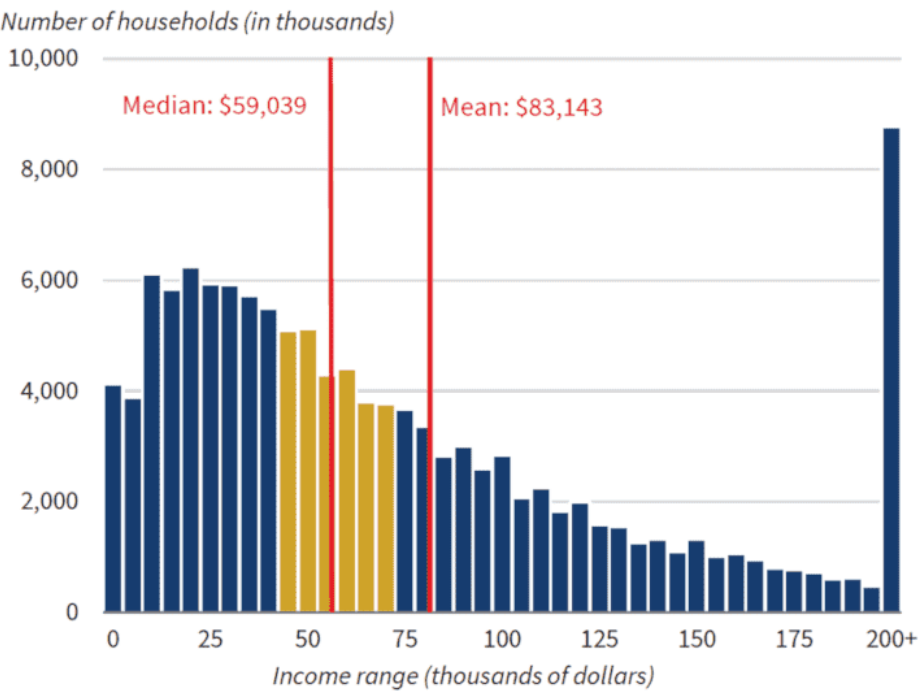
Source: U.S. Census Bureau.
Note: Middle quintile range (shaded yellow) is an estimate. Data are right-censored at $200,000.

Figure 10

The figure reports two items, the mean and the median. What do these two values tell you about the household income in the US in 2016? (you can also refer to other parts of the graph if you would like, but it is not essential).

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.

B 5 1

Pre-Leaving Certificate Examination 2024

Computer Science

Section C

Ordinary Level

Time: 1 hour

87 marks

Instructions

There is one section in this paper.

Section C	Programming	One question	87 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 Table*s 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.
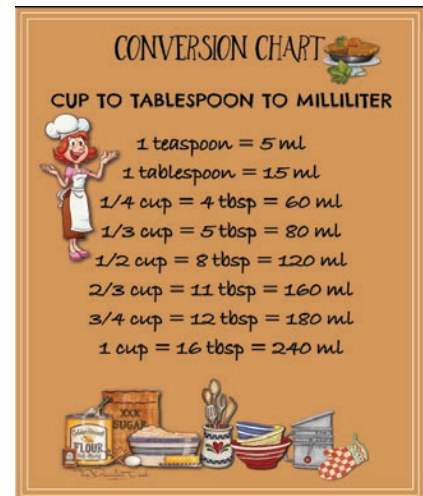
Answer all question parts.

Question 16

(a) Computer programs can be used to make simple tools.
One such tool is a converter for recipes, as many recipes
change between spoons and cups and ml (millilitres).

Open the program called **Question16_A.py** from your
device.

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

CONVERSION CHART

CUP TO TABLESPOON TO MILLILITER

1 teaspoon = 5 ml
1 tablespoon = 15 ml
1/4 cup = 4 tbsp = 60 ml
1/3 cup = 5 tbsp = 80 ml
1/2 cup = 8 tbsp = 120 ml
2/3 cup = 11 tbsp = 160 ml
3/4 cup = 12 tbsp = 180 ml
1 cup = 16 tbsp = 240 ml

www.pinterest.ie

```python
# Please enter name:

print("*****************")
print("*  Conversions   *")
print("*****************")
print("1) From teaspoons   to ml")
print("2) From tablespoons to ml")
print("3) From cups        to ml")
print("4) From ml          to teaspoons")
print("5) From ml          to tablespoons")
print("6) From ml          to cups")

conversion = int(input("Please enter the conversion:"))

if conversion == 1:
    teaspoons = int(input("Please enter number of teaspoons:"))
    ml = teaspoons * 5
    print("The ml is:", ml)
elif conversion == 2:
    tablespoons = int(input("Please enter number of tablespoons:"))
    ml = tablespoons * 15
    print("The ml is:", ml)
```

The program asks the user what conversion they want to make, for example, if they select 1, then they will be converting from teaspoons to ml. When the program is run, the output may look as follows:

```
******************

*  Conversions   *

******************

1) From teaspoons   to ml

2) From tablespoons to ml

3) From cups        to ml

4) From ml          to teaspoons

5) From ml          to tablespoons

6) From ml          to cups

Please enter conversion required from the menu, for example 1) to convert

teaspoons to ml:1

Please enter number of teaspoons:1

The ml is: 5.0
```

Modify the program to do the following:

(i) At present, the program can only take in integers. Modify the program so the user will be able to enter floating-point numbers, like in the example output below:

```
******************

*  Conversions   *

******************

1) From teaspoons   to ml

2) From tablespoons to ml

3) From cups        to ml

4) From ml          to teaspoons

5) From ml          to tablespoons

6) From ml          to cups

Please enter conversion required from the menu, for example 1) to convert

teaspoons to ml:1

Please enter number of teaspoons:2.5

The ml is: 12.5
```

(ii) The prompt is not very informative as the program is written currently. Modify the prompt to include an example so the user knows they need to enter a menu option from 1-6 before they can enter a number to be converted. Currently it reads:

```
conversion = int(input("Please enter the conversion:"))
```

(iii) Currently, there are several conversions missing. Create the remaining conversions, that is, from the menu, conversion 3 to 6.

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

(b) Computer programs can also be used to make Chatbots (like ChatGPT or My AI). In this program, the user will enter a prompt and the AI will reply. While some AI is very advanced, some AI is just a series of conditional statements, like in the code below:
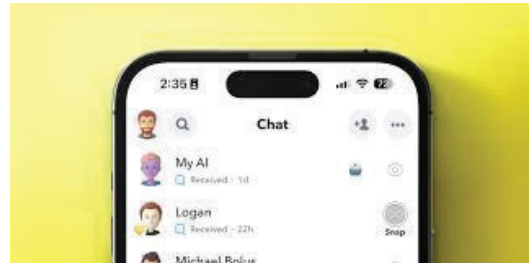
Open the program called **Question16_B.py** from your device.

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

```python
# Please enter name:

from datetime import datetime

prompt = input("Please enter prompt:")

if prompt.__contains__("hello"):
    print("Hi there, how are you?")
elif prompt.__contains__("name"):
    print("My name is ExamBot, how can I help?")
elif prompt.__contains__("time"):
    now = datetime.now()
    current_time = now.strftime("%H:%M:%S")
    print("Current Time =", current_time)
```

The program searches for key words in the sentence to try to understand what you are requesting; for example, if you say hello in the sentence, the output will look like:

```
Please enter prompt: hello
Hi there, how are you?
```

Modify the program to do the following:

(i) Even when dealing with Chatbots of My AI, sometimes the AI does not know the answer. Modify the program so that if we ask it something that is not accounted for, the AI prints out that it does not know. The output may now look as follows:

```
Please enter prompt: how do chatbots work?
I am sorry, I do not know that one?
```

Hint: use an else condition.

(ii) Add a condition that if asked about the weather (where weather is contained in the sentence), it prints out that it is always sunny in Ireland.

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

```
Please enter prompt: what is the weather like?
It is always sunny in Ireland
```

(iii) Currently, all prompts must contain the key word as lowercase. Amend the program so that it does not matter if the key words are in upper or lower case. For example:

```
Please enter prompt: what is the Weather like?
It is always sunny in Ireland
```

Or

```
Please enter prompt: what is the weather like?
It is always sunny in Ireland
```

Space for rough work.

This page will not be reviewed by an examiner.

B 5 2

Space for rough work.

This page will not be reviewed by an examiner.