Full Stack Development with AI

Lab 6.3 – Conditional Control Flow with Python

Lab Overview

In this lab, you will learn how to work with the conditional control flow statements `if` and `match-case` in Python through some basic to intermediate programming exercises.

Exercise 1 – Enhanced Temperature Conversion

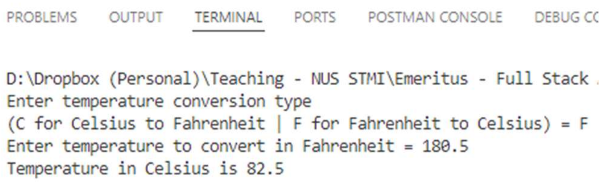
Let's try to enhance the Python program that you have written in Lab 6.2 Exercise 3. Write a new program that asks user for the type of temperature conversion that is required, either Celsius to Fahrenheit or Fahrenheit to Celsius, using a suitable input scheme. For example, you could ask user to input a string ('C' or 'F') or integer (1 or 2).

If the temperature conversion type inputted by user is valid, the program should ask user to input the temperature in the original scale. Finally, the program should convert the input temperature to the required scale before printing out the converted temperature.

Depending on the type of temperature conversion selected by the user, check that the original temperature input by the user is within the boiling point of water and the freezing point of water for the original temperature scale. If the input temperature is valid, continue to perform the temperature conversion and print out the converted temperature. Otherwise, print out an error message.

Hint*: Note that you are likely to use nested `if` statements. Do exercise caution when formatting the indentation of your code as indentation affects the scope of the conditional control flow statements.*

Sample Input	Sample Output
Celsius to Fahrenheit, 0	32.0
Celsius to Fahrenheit, 33.3	91.9
Fahrenheit to Celsius, 212	100.0
Fahrenheit to Celsius, 180.5	82.5



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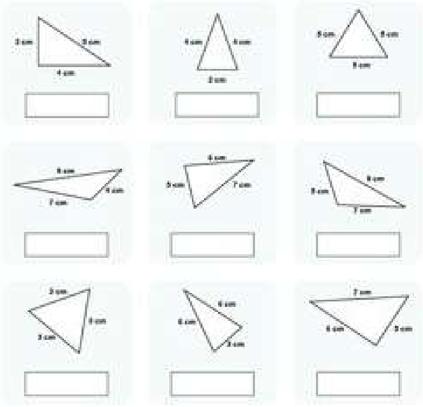
D:\Dropbox (Personal)\Teaching - NUS STMI\Emeritus - Full Stack
Enter temperature conversion type
(C for Celsius to Fahrenheit | F for Fahrenheit to Celsius) = F
Enter temperature to convert in Fahrenheit = 180.5
Temperature in Celsius is 82.5
```

Exercise 2 – The World of Triangles

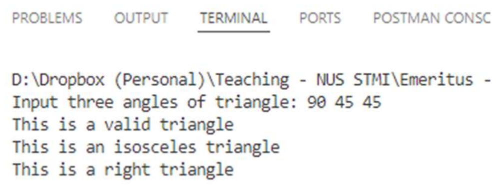
A triangle is a three-sided polygon, which has three vertices. The three sides are connected with each other end to end at a point, which forms the angles of the triangle. Triangles may be classified into different types by side and by angle.



Write a program that asks the user to input the three angles. You may assume that the inputs are valid integer numbers, and no input data validation is required. Based only on the three angles inputted by the user, print out i) whether the three angles constitute a valid triangle; and ii) all applicable type(s) that the triangle may be classified as.

Search on the Internet and find out more about the mathematical properties of triangles in particular how they may be classified by side and by angle. This would help you to formulate the correct algorithm using appropriate conditional control flow statements.

No sample input and output is provided for this question but refer to the screenshot for a sample run of the program.



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Input three angles of triangle: 90 45 45
This is a valid triangle
This is an isosceles triangle
This is a right triangle
```

Exercise 3 – Identity Card Number

The National Registration Identity Card (NRIC) is the compulsory identity document issued to citizens and permanent residents of Singapore. The unique identifier associated with the document is commonly known as the “identity card number” or simply “NRIC number”.

The identity card number consists of 9 alphanumeric characters in the following format:

- The 1st character identifies the type of residency status, e.g., “S” and “T” are for Singapore citizens and permanent residents, whereas “F” and “G” are for foreigners issued with long-term passes.

- The 2nd to 8th characters “xxxxxxx” is a 7-digit serial number assigned to the document holder.
- The 9th character is a checksum or check alphabet for validating the correctness of the identity card number.

The algorithm to calculate the check alphabet is based on modulo 11. The 7-digit serial number is first summed up using a weighted additive formula. If the identity card number begins with “T” or “G”, 4 is added to the weighted sum. The final weighted sum is then divided by 11 to obtain the remainder, i.e., the modulo 11. The modulo 11 is then mapped to a table of predefined check alphabets to determine the correctness of an identity card number.

The weight mapping is shown in the table below:

Serial Number	**Weight**
2nd	2
3rd	7
4th	6
5th	5
6th	4
7th	3
8th	2

The check alphabet mappings are shown in the table below:

Modulo 11	**“S” or “T”**	**“F” or “G”**
0	J	X
1	Z	W
2	I	U
3	H	T
4	G	R
5	F	Q
6	E	P
7	D	N
8	C	M
9	B	L
10	A	K

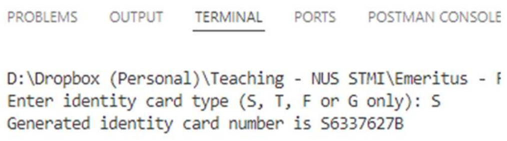
Based on the information given on the algorithm of the identity card number check alphabet, write a program that asks the user to input his/her identity card number and then inform the user whether the inputted identity card number is valid or not valid.

Sample Input	**Sample Output**
S0000001I	Valid
S0000002G	Valid
S0000003E	Valid
S1234567D	Valid
T0830322Z	Valid

Exercise 4 – Identity Card Number Generator

Adapt the algorithm in Exercise 3 to write a program that generates a valid identity card number. Ask the user to input the required type of residency status. If a valid residency status is inputted, generate a corresponding valid identity card number. Otherwise, print out an error message.

No sample input and output is provided for this question but refer to the screenshot for a sample run of the program.



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D:\Dropbox (Personal)\Teaching - NUS STMI\Emeritus - F
Enter identity card type (S, T, F or G only): S
Generated identity card number is S6337627B
```

Exercise 5 – Smart Home System Simulation

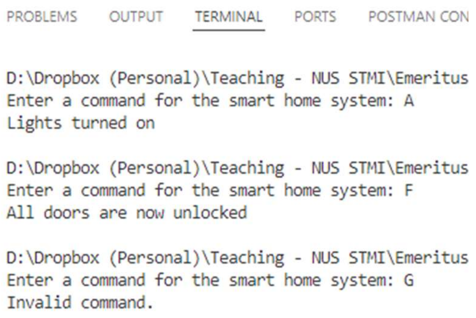
Suppose you are building a simple command interpreter for a smart home system. The user can input a command as a single alphabet. Based on the command, you just need to output the corresponding action message. Use the `match-case` statement in Python to handle the different commands.

The possible commands and their corresponding actions are:

Command	Action Message
A	Lights turned on
B	Lights turned off
C	Alarm has been set
D	Alarm has been disarmed
E	All doors are now locked
F	All doors are now unlocked

If the command is not recognised, output “Invalid command”.

No sample input and output is provided for this question but refer to the screenshot for a sample run of the program.



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D:\Dropbox (Personal)\Teaching - NUS STMI\Emeritus
Enter a command for the smart home system: A
Lights turned on

D:\Dropbox (Personal)\Teaching - NUS STMI\Emeritus
Enter a command for the smart home system: F
All doors are now unlocked

D:\Dropbox (Personal)\Teaching - NUS STMI\Emeritus
Enter a command for the smart home system: G
Invalid command.
```

-- End of Lab --