

CSE 1321L: Programming and Problem Solving I Lab

Lab 4

Flow Control (Part 1)

What students will learn:

- o Logic using selection structures (IF/ELSE and match statements)
- o Review of I/O (input and output)
- o Review reading input from the user and storing it into variables.
- o Review doing basic calculations with variables to generate a solution.

Content

- o Overview
- o Lab4A: What is my grade?
- o Lab4B: Creating a menu
- o Lab4C: Triangle Types

Overview

During this week we have learned different ways to make our program follow different paths based on conditions. In this lab you will work with **IF**, **ELIF**, and **ELSE** statements to make your code responsive to different conditions. This lab is all about logic, so you will need to think through the problem.

As with previous weeks, all labs should have the appropriate file names:

- o Lab4A.py
- o Lab4B.py
- o Lab4C.py

Lastly, make sure you review the sample output and make sure the output of your program follows the exact same format including the input statements, print statement, etc. As always, user input is shown in **red** and **bold**.

Lab4A: What is my grade?

First, we are going to start with a very simple question to understand the use-case of conditional statements. **For this reason, your solution for this lab must exclusively use IF/ELIF/ELSE statements.**

Imagine someone just got an exam grade back and was wondering what letter grade they would get. To figure this out, we are going to build a program that can determine the letter grade based on a numeric grade.

For this lab:

- o Write a program that prompts the user to input the number grade they received on an exam.
- o Then, the program should determine the letter grade based on this table:

Letter Grade	Range
A+	(97, 100]
A	(94, 97]
A-	(91, 94]
B+	(88, 91]
B	(85, 88]
B-	(82, 85]
C+	(79, 82]
C	(76, 79]
C-	(73, 76]
D+	(70, 73]
D	(67, 70]
D-	(64, 67]
F	[0, 64]

- o Lastly, output the corresponding letter grade.

Note:

- o Take into consideration that the user should be able to take in fractional numeric values, so make sure your program is able to handle this.
- o Remember that the ranges shown in the table specify what ranges are inclusive (**()**) and exclusive (**[]**). This means that a grade of **94.0** is considered an **A-**, but a grade of **94.1** is considered an **A**.

Sample Output #1:

Enter your grade: **97**
Letter grade is: A

Sample Output #2:

Enter your grade: **97.2**
Letter grade is: A+

Sample Output #3:

Enter your grade: **43.4**
Letter grade is: F

Lab4B: Creating a menu

For this lab exercise, you are going to create a basic program which will allow the user to select an option from a menu; selecting a different option from the menu should result in a different outcome. **For this lab, your solution for this lab must exclusively use a *MATCH statement*.**

For this lab:

- o Welcome the user by printing “Welcome!”.
- o Prompt the user to enter a number and read it. This input value will be the number that the program will perform the calculation.
 - The user output can contain decimal values.
- o Next, print the menu options as shown in the sample output.
- o Read the menu option for the users select. If the user enters option 4, the program should just terminate and output “Thank you, goodbye!”.
- o If the user chooses options 0 through 3, perform the appropriate calculation.
 - If the user enters a number other than 0 to 4, output “Invalid option!”.
- o Output the results with the corresponding message as shown in the sample output.
 - If a calculation cannot be performed, output the corresponding message as shown in the sample output.
 - Round your output to 3 decimal places.

Note:

- o Additive inverse of 5 is -5, remember to use the corresponding math operation to do so. Concatenating a dash (-) with the user’s input is not a valid operation. Find a way to calculate the additive inverse mathematically.
- o The reciprocal of 3 is 1/3.

Sample Output #1:

```
Welcome!  
Please input a number: 100
```

```
What would you like to do with this number:
```

- 0) Get the additive inverse of the number
- 1) Get the reciprocal of the number
- 2) Square the number
- 3) Cube the number
- 4) Exit the program

```
0
```

```
The additive inverse of 100.0 is -100.0
```

Sample Output #2:

```
Welcome!  
Please input a number: 50.4
```

```
What would you like to do with this number:
```

- 0) Get the additive inverse of the number

- 1) Get the reciprocal of the number
- 2) Square the number
- 3) Cube the number
- 4) Exit the program

1

The reciprocal of 50.4 is 0.02

Sample Output #3:

Welcome!

Please input a number: 500

What would you like to do with this number:

- 0) Get the additive inverse of the number
- 1) Get the reciprocal of the number
- 2) Square the number
- 3) Cube the number
- 4) Exit the program

2

The square of 500.0 is 250000.0

Sample Output #4:

Welcome!

Please input a number: 9

What would you like to do with this number:

- 0) Get the additive inverse of the number
- 1) Get the reciprocal of the number
- 2) Square the number
- 3) Cube the number
- 4) Exit the program

3

The cube of 9.0 is 729.0

Sample Output #5:

Welcome!

Please input a number: 98234

What would you like to do with this number:

- 0) Get the additive inverse of the number
- 1) Get the reciprocal of the number
- 2) Square the number
- 3) Cube the number
- 4) Exit the program

4

Thank you, goodbye!

Sample Output #6:

Welcome!

Please input a number: 130.4

What would you like to do with this number:

- 0) Get the additive inverse of the number
- 1) Get the reciprocal of the number
- 2) Square the number
- 3) Cube the number
- 4) Exit the program

5

Invalid option!

Sample Output #7:

Welcome!

Please input a number: 0

What would you like to do with this number:

- 0) Get the additive inverse of the number
- 1) Get the reciprocal of the number
- 2) Square the number
- 3) Cube the number
- 4) Exit the program

1

Cannot divide by 0!

Lab4C: Triangle Types

In this lab, you are going to be implementing **Nested IF**, **ELIF**, and **ELSE** statements.

You may recall from geometry that we have three types of triangles: Equilateral, Isosceles, and Scalene. These classifications are based on the lengths of a triangle's sides:

Type of Triangle	Description
Equilateral	All three sides are the same length.
Isosceles	Only two sides have equal length.
Scalene	None of the sides have equal length.

In this lab, you are going to create a program that prompts the user for the three sides of a triangle and then determines what type of triangle the user has.

Moreover, your solution should verify that the lengths input forms a valid triangle. To validate the lengths, your program should check that:

1. All sides must be greater than 0.
2. The sum of any two sides of a triangle is greater than the third side.

Requirements:

- o Except for the user input portion, your solution should be contained within a **single IF-ELSE** statement.
 - The top-level structure of the program should consist of only one IF statement block and one ELSE statement block.
 - Any additional decisions should be implemented nested inside these blocks.
 - No ELIF statement should be added to the top-level IF-ELSE statement.
- o Your solution must verify that the user's input forms a valid triangle with the points specified:
 - All sides must be greater than 0. Else, your program should print:
 - "Invalid input. All sides must be greater than 0."
 - The sum of any two sides of a triangle must be greater than the third side. Else, your program should print:
 - "The sides do not form a valid triangle."
- o The user should only be able to input integer numbers.
- o Make sure to review the Sample Output as guidelines for the prompts and print statements. Your output **must** match the Sample Output provided.

Sample Output #1:

```
Enter the first side of the triangle: 5
Enter the second side of the triangle: 5
Enter the third side of the triangle: 5
The triangle is an equilateral triangle.
```

Sample Output #2:

```
Enter the first side of the triangle: 10
```

Enter the second side of the triangle: 15
Enter the third side of the triangle: 15
The triangle is an isosceles triangle.

Sample Output #3:

Enter the first side of the triangle: 10
Enter the second side of the triangle: 8
Enter the third side of the triangle: 3
The triangle is a scalene triangle.

Sample Output #4:

Enter the first side of the triangle: 6
Enter the second side of the triangle: 9
Enter the third side of the triangle: 15
The sides do not form a valid triangle.

Sample Output #5:

Enter the first side of the triangle: 10
Enter the second side of the triangle: 15
Enter the third side of the triangle: 0
Invalid input. All sides must be greater than 0.

Submission Instructions:

- o Programs must follow the output format provided. This includes each blank line, colons (:), and other symbols.
- o Programs must be working correctly.
- o Programs must be written in Python.
- o Programs must be submitted with the correct **.py** format.
- o Programs must be saved in files with the correct file name:
 - Lab4A.py
 - Lab4B.py
 - Lab4C.py
- o Programs (source code files) must be uploaded to Gradescope by the due date.