Full Stack Development with AI
Lab 6.4 – Iterative Control Flow with Python

Lab Overview

In this lab, you will learn how to work with the iterative control flow statements `for` and `while` in Python through some basic to intermediate programming exercises.

Exercise 1 – Multiplication Table

Write a program that asks user to input a positive integer. Thereafter, the program should print out the multiplication table of the integer from 1 to 10.

Use the `while` statement and `for` statement to write two different versions of the program.

Sample Input	Sample Output
2	2, 4, 6, 8, 10, 12, 14, 16, 18, 20
13	13, 26, 39, 52, 65, 78, 91, 104, 117, 130

***Post Exercise Thoughts*:** Briefly explain which statement is more suitable for solving this problem. Observe that certain computational problems lend themselves naturally to the use of the `for` loop. But recall that the `while` loop is the most generic iterative control flow in any programming language.

Exercise 2 – Find Any Digit

Write a program to print out the n^{th} digit, starting from the left, of any positive integer input by the user. If the requested n^{th} digit inputted by the user is invalid, the program should print out an appropriate error message.

You are **NOT** allowed to treat the input as string.

Sample Input	Sample Output
2345, 0	Error: Digit position must be greater than 0
2345, 1	2
2345, 2	3
2345, 3	4
2345, 4	5
2345, 5	Error: Digit position is more than the number of digits.
56789543257899, 4	8

Exercise 3 – The World of Triangles

Write a program to draw a triangle with asterisks on the screen. The program should:

1. Prompt the user to input the base in units.

2. Compute the height of the triangle using the formula $(base + 1)/2$ and output the height to user.

3. Draw a triangle of the respective base and height on the screen using asterisks.

4. For example, if user input a base of 9 units, the program should compute the height as 5 units and then draw this triangle using asterisks. See the sample output below.

Sample Program Run:

```
PROBLEMS   OUTPUT   TERMINAL   PORTS   POSTMAN CONSOLE   DEBUG CONSOLE

D:\Dropbox (Personal)\Teaching - NUS STMI\Emeritus - Full Stack AI\Mo
Enter Base of Triangle (Odd Number Integer, Minimum is 3 units) = 9
You have requested a triangle with a base of 9 units :)
This triangle has a computed height of 5 units :)
Here is your triangle...

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

Exercise 4 – Prime Factorisation

Prime factors of a positive integer greater than 1 are the prime numbers that divide that integer exactly, without leaving a remainder. The process of finding these prime numbers is called prime factorisation. A prime number itself is defined as a positive integer greater than 1 that has no positive divisors other than 1 and itself.

Write a program to generate the prime factors of any positive integer greater than 1.

Sample Input	Sample Output
2	2
48	2 x 2 x 2 x 2 x 3
255	3 x 5 x 17
9001	9001
67786531	17 x 443 x 9001

-- End of Lab --