Lab 3: Decisions and Loops

Due Date: 20 December 2024

Submission Instructions:
You are not allowed to submit a soft copy of the lab report. The lab report should include the following sections: Background/Theory, Implementation, Output(s), Conclusion, and Discussion. The Conclusion and Discussion sections must contain a minimum of 40 words each.

Note: This lab work will contribute **10%** towards the final internal marks in the `internal practical` category for the course.

Questions

1. Write a Python program to multiply two matrices. Ensure that the number of columns in the first matrix is equal to the number of rows in the second matrix. Use nested loops for matrix multiplication.

2. Write a Python program to generate all subsets (the power set) of a given set of numbers. The subsets should be represented as lists.

   ```
   Input:  [1, 2, 3]
   Output:  [[], [1], [2], [3], [1, 2], [1, 3], [2, 3], [1, 2, 3]]
   ```

3. Write a program to print the following pattern:

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

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

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

123454321
1234321
12321
121
1

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

4. Write a program to print a Pascal Triangle.

5. Write a Python program to print a zig-zag number pattern. The numbers should alternate in direction (left-right or right-left) in each row.

```
Input:  A positive integer n.
Output:  A zig-zag pattern with numbers.
Example:
1 2 3 4 5
10 9 8 7 6
11 12 13 14 15
20 19 18 17 16
21 22 23 24 25
```