CSE 1241/1141 - COMPUTER PROGRAMMING I
Programming Assignment # 2
DUE DATE: 17/11/2023 - 23:59 (No extension)

1. Write a program that takes an integer argument `N` at each iteration and uses a `while` loop to compute the number of times you need to divide `N` by 2 until it is strictly less than 1. Print out the error message "`Illegal input`" if `N` is negative. Whenever the user enters the value of 0, your program should end.

   This program simply computes the number of bits in the binary representation of N.

   Example:

```
Enter an integer number: 2
The number of bits: 2

Enter an integer number: 4
The number of bits: 3

Enter an integer number: 8
The number of bits: 4

Enter an integer number: 16
The number of bits: 5

Enter an integer number: 1000
The number of bits: 10

Enter an integer number: -25
The number of bits: Illegal input

Enter an integer number: 0
Program ends. Bye
```

2. Write a program that computes a number series which starts with 0, 1, and 2, and each successive number is the summation of the sine, cosine, and tangent values of previous three numbers. For example the 4th number in the series should be calculated as sin(0) + cos (1) + tan(2). In general, each number should be calculated based on the following formula:

$$A_x = sin(A_{x-3}) + cos(A_{x-2}) + tan(A_{x-1})$$

   Your program should first request the length of the series' and then generate and display the number series using a loop.

Example:

```
Enter the length of the series: 10

0.0 1.0 2.0 -1.64 13.92 5.48 -1.83 5.42 -2.14 1.24
```

3. In this question, you will write a program that prints the following pattern by using a mix of numbers and characters. First, your program should request the number of rows from the user and then you should print the pattern.

Example:

```
Welcome to the Num-Char printer program:
===================================
Enter the size: -3
Invalid size. Enter the size again: -4
Invalid size. Enter the size again: 5

            1
         1  2  A
      1  2  3  B  A
   1  2  3  4  C  B  A
1  2  3  4  5  D  C  B  A
   1  2  3  4  C  B  A
      1  2  3  B  A
         1  2  A
            1

Would you like to continue? (Y or N): Y
Enter the size: 8

                     1
                  1  2  A
               1  2  3  B  A
            1  2  3  4  C  B  A
         1  2  3  4  5  D  C  B  A
      1  2  3  4  5  6  E  D  C  B  A
   1  2  3  4  5  6  7  F  E  D  C  B  A
1  2  3  4  5  6  7  8  G  F  E  D  C  B  A
   1  2  3  4  5  6  7  F  E  D  C  B  A
      1  2  3  4  5  6  E  D  C  B  A
         1  2  3  4  5  D  C  B  A
            1  2  3  4  C  B  A
               1  2  3  B  A
                  1  2  A
                     1
```

```
Would you like to continue? (Y or N): N
Program ends. Bye :)
```

Important Notes:

- ***You should print the values with two digits after the decimal point.***
- ***Your programs should execute correctly for different test cases.***
- ***Selected parts of your submissions will be graded! If you only submit the implementation of a single question, you might get a grade of 0!***

Submission Instructions:

Please zip and submit all your files using filename YourNumberHW2.zip (ex: 150713852HW2.zip) to Canvas system (under Assignments tab).
Your zip file should contain the followings:

1. Java source code for Problem 1 (Pro1_150713852.java)
2. Java class file for Problem 1 (Pro1_150713852.class)
3. Java source code for Problem 2 (Pro2_150713852.java)
4. Java class file for Problem 2 (Pro2_150713852.class)
5. Java source code for Problem 3 (Pro3_150713852.java)
6. Java class file for Problem 3 (Pro3_150713852.class)

Please use the *default package in Eclipse IDE* for the assignments. Otherwise, the submitted code may not be compiled on another computer.

Notes:

1. Write a comment at the beginning of each program to explain the purpose of the program. Write your name and student ID as a comment. Include necessary comments to explain your actions.
2. Select meaningful names for your variables.
3. You are allowed to use the materials that you have learned in lectures & labs.
4. Do not use the things that you did not learn in the course.
5. Each student should submit his/her own homework. You can discuss with your peers about the homework but you are not allowed to exchange code or pseudocode. This also applies to material found on the web. Should some submitted homework assignments be identical or suspected to be identical, all involved parties will get a grade of **ZERO** from all homework assignments. In case of any forms of cheating or copying, both giver and receiver are equally culpable and suffer equal penalties.
6. No late submission will be accepted.