

CSE 1141 - COMPUTER PROGRAMMING I
Programming Assignment # 3
DUE DATE: 24/11/2017 - 23:59 (No extension)

In this assignment, you will write the following programs by using loops.

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: 1
The number of bits: 1
```

```
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. A special sequence of numbers is defined as follows. The first two numbers in the sequence are 0 and 1, and each subsequent number is 4 times the previous number minus the one before that. In other words, let A_x be the x -th number in sequence. Then, $A_x = (4 \times A_{x-1}) - A_{x-2}$

The sequence is: 0, 1, 4, 15, 56, 209, 780, 2911...

Write a program that calculates the x -th number in the sequence. The program asks the user for the value of x and prints it out to the screen.

Example:

```
Please enter an integer number:
```

```
8
```

```
In position 8, the value is 2911.
```

3. Write a program that takes a string as input and prints the following pattern. Please consider the necessary controls to print the first and the last characters of the string only a single time! You have to use loops in your implementation, otherwise you cannot get any points!

1st Sample run:

```
Enter an input string: COMPUTER
```

```
COMPUTERETUPMOCOMPUTERETUPMOC
COMPUTE ETUPMOCOMPUTE ETUPMOC
COMPUT TUPMOCOMPUT TUPMOC
COMPU UPMOCOMPU UPMOC
COMP PMOCOMP PMOC
COM MOCOM MOC
CO OCO OC
C C C
```

2nd Sample run:

```
Enter an input string: MARMARA
```

```
MARMARARAMARMARARAMRAM
MARMAR RAMRAMARMAR RAMRAM
MARMA AMRAMARMA AMRAM
MARM MRAMARM MRAM
MAR RAMAR RAM
MA AMA AM
M M M
```

3rd Sample run:

Enter an input string: 12345678

```
12345678765432123456787654321
1234567 7654321234567 7654321
123456   65432123456   654321
12345    543212345    54321
1234     4321234     4321
123      32123      321
12       212       21
1        1        1
```

Submission Instructions

Please zip and submit your files using filename YourNumberHW3.zip (ex: 150713852HW3.zip) to Canvas system (under Assignments tab).

Your zip file should contain the following 6 files:

1. Java source code for Q1 (Pro3_1_150713852.java)
2. Java class file for Q1 (Pro3_1_150713852.class)
3. Java source code for Q2 (Pro3_2_150713852.java)
4. Java class file for Q2 (Pro3_2_150713852.class)
5. Java source code for Q3 (Pro3_3_150713852.java)
6. Java class file for Q3 (Pro3_3_150713852.class)

Your program *must include necessary comments with your own words to explain your actions!*

Notes:

1. Write a comment at the beginning of each program to explain the purpose of the program.
2. Write your name and student ID as a comment.
3. Include necessary comments to explain your actions.
4. Select meaningful names for your variables and class names.
5. You are allowed to use the materials that you have learned in lectures & labs.
6. Do not use things that you did not learn in the course.
7. In case of any form of **copying and cheating** on solutions, all parts will get **ZERO** grade. You should submit your own work. In case of any forms of cheating or copying, both giver and receiver are equally culpable and suffer equal penalties.
All types of plagiarism will result in zero grade from the homework.
8. No late submission will be accepted.

Grading:

Question 1 → 20 points

- Correct execution for test inputs (10 points)
- Negative input control (3 points)
- Check if termination condition is satisfied (4 points)
- Comments are necessary (3 points)

Question 2 → 20 points

- Correct execution for test inputs (10 points)
- Negative input control (5 points)
- Comments are necessary (5 points)

Question 3 → 50 points

- Correct execution for test inputs (15 points)
- Correct # of rows (10 points)
- Correct # of columns (10 points)
- Output format - M shape (10 points)
- Comments are necessary (5 points)

Submission Format → 10 points

- 3 java files + 3 class files
- Make sure that your class files can be executed on another computer.
- Make sure that the input/output of your program must be the same with the examples above (all informative strings & spaces). Otherwise, auto-grader cannot grade your code!!!