CSE 1142 - COMPUTER PROGRAMMING II
Programming Assignment # 3
DUE DATE: 01/05/2019 - 23:59 (No extension)

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

1. We have bunnies standing in a line, numbered 1, 2, ... The odd bunnies (1, 3, ..) have the normal 2 ears. The even bunnies (2, 4, ..) have 3 ears, because they each have a raised foot. Recursively return the number of "ears" in the bunny line 1, 2, ... n (without loops or multiplication).

Example:

```
Please enter the number of lines (n=): 2
bunnyEars2(0) → 0
bunnyEars2(1) → 2
bunnyEars2(2) → 5
```

2. In this question, you will write a program to find super digit of a number ***X*** using the following rules:

- If ***X*** has only 1 digit, then its super digit is ***X.***
- If ***X*** has more than 1 digit, then its super digit is equal to the super digit of the digit-sum of ***X.***

For example,

```
super_digit(1245) = super_digit(1+2+4+5)
                  = super_digit(12)
                  = super_digit(1+2)
                  = super_digit(3)
                  = 3.
```

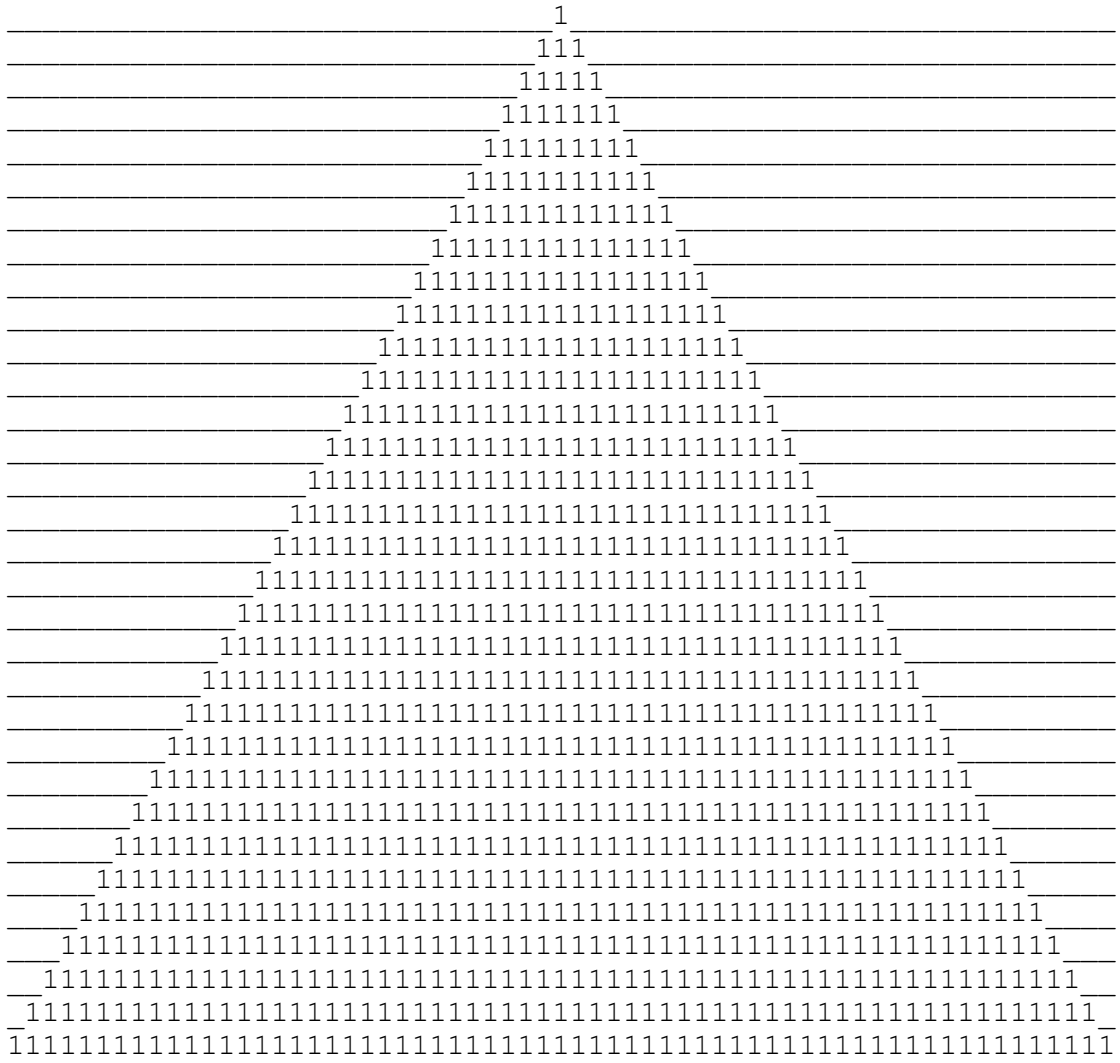
The number ***X*** will be given to your program with two numbers (***n*** and ***k***) and you will construct the number ***X*** as the number ***n*** concatenated ***k*** times.

For example:

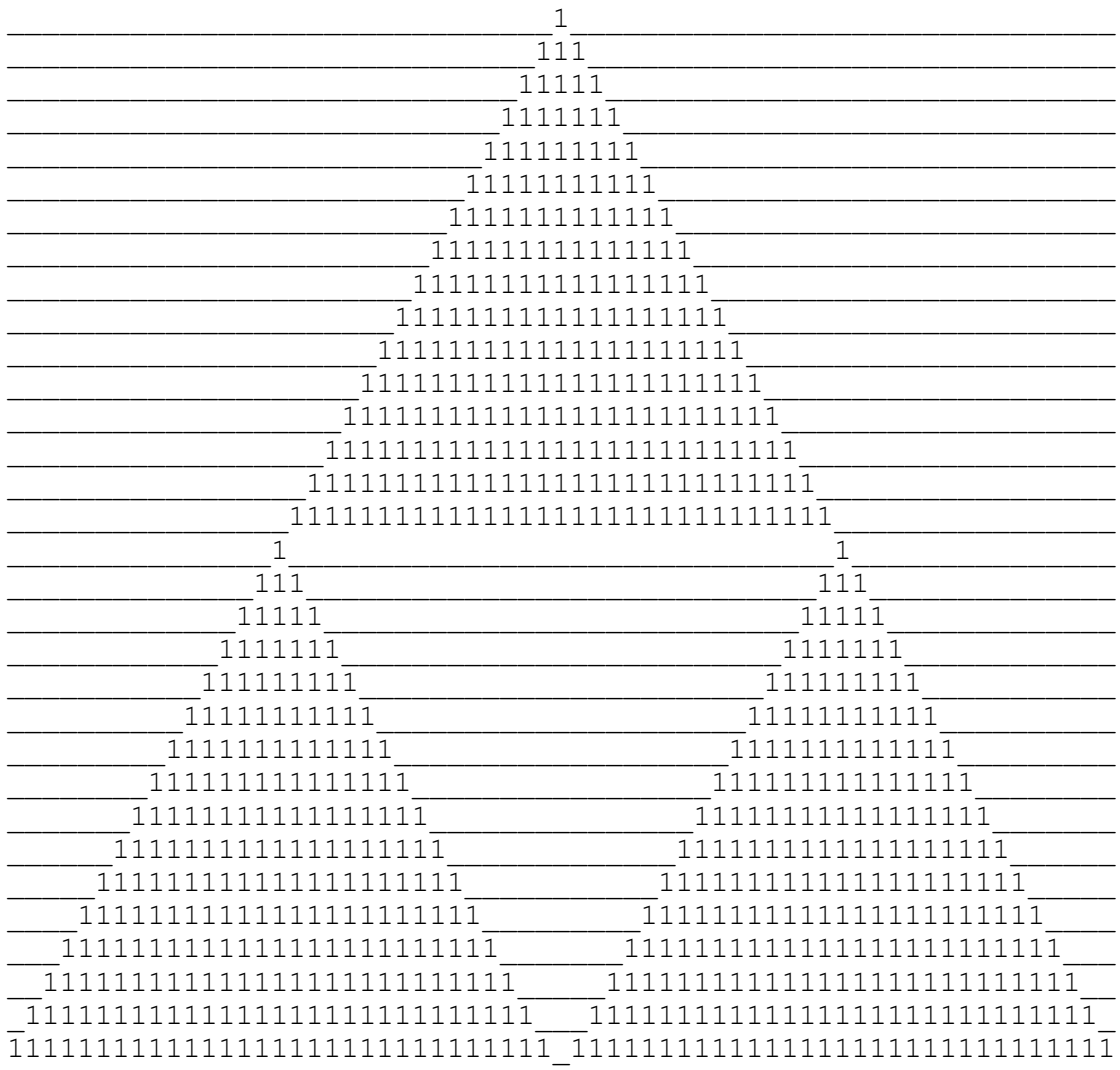
```
Please enter a number (n=) : 123
Please enter repetition factor (k=): 3
Super digit of number 123123123 is 9.
```

3. In this question, you will print identical triangles nested each other recursively. You will construct the triangles by using two digits **'_'(underscore)** and **'1'**. There will be number of iterations given as an input to your program.

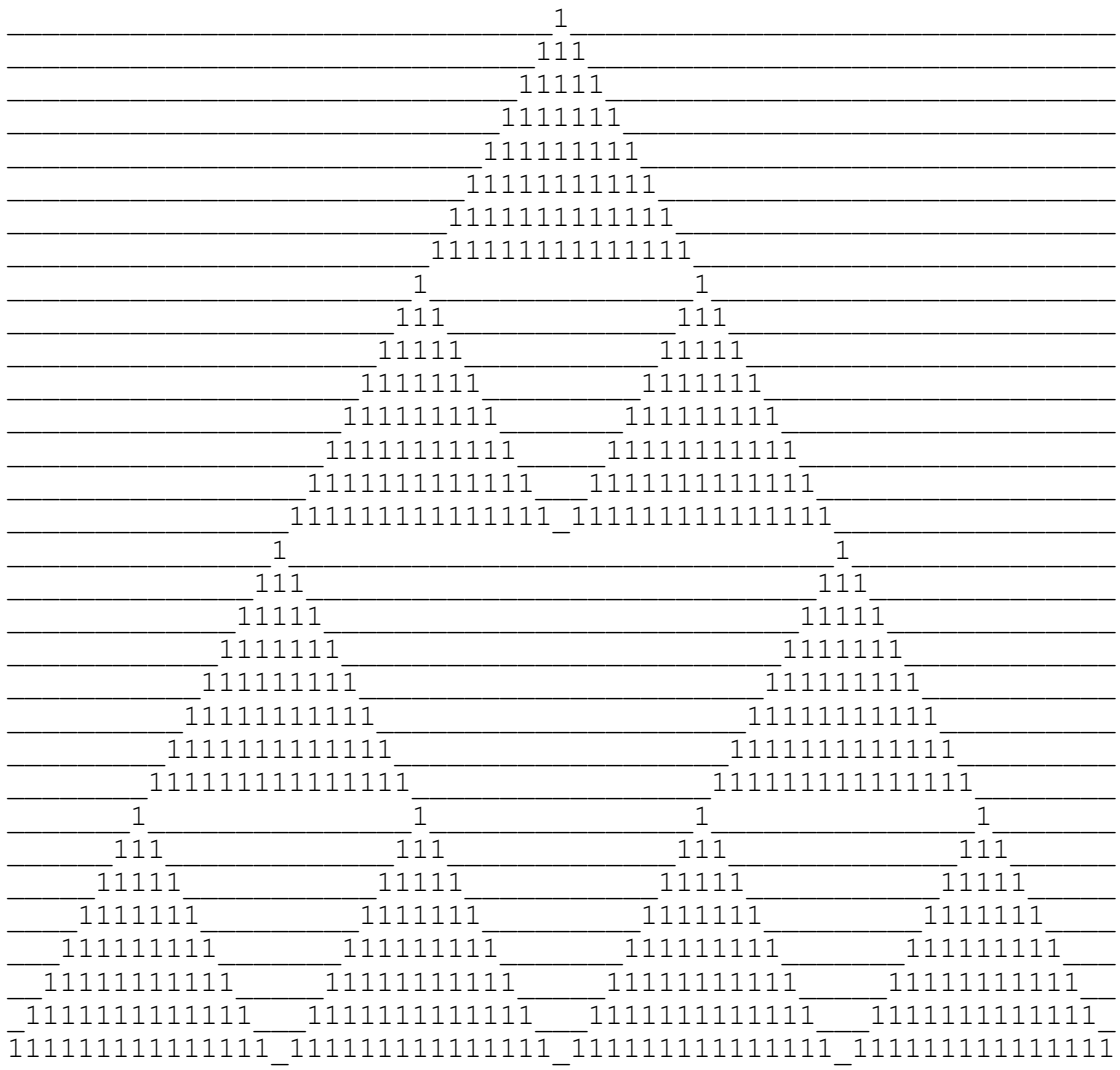
- **If the number of iterations is given as 0**, you will print a simple triangle by using 32 rows and 63 columns in a matrix as the following:



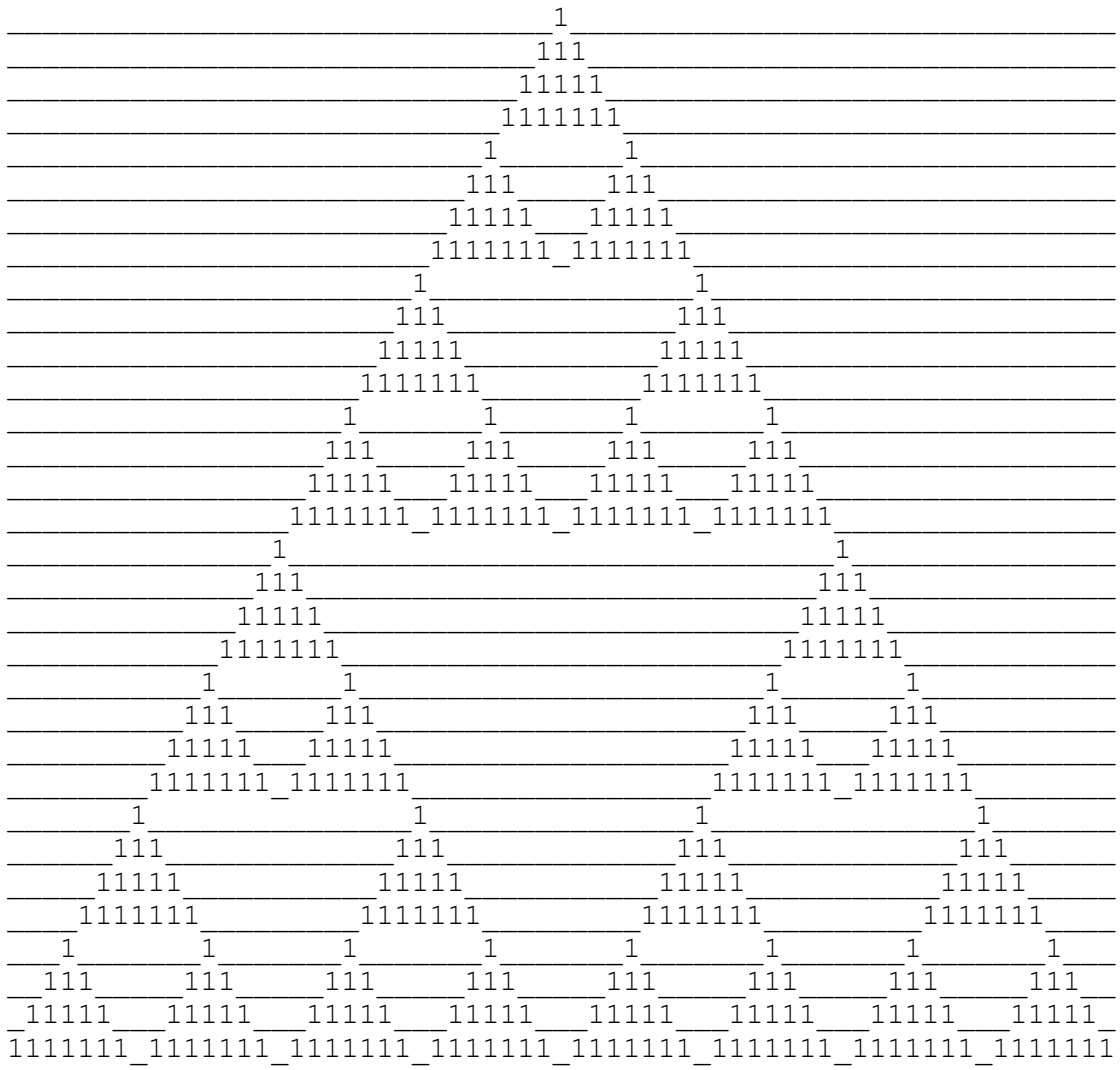
- **If the number of iterations is given as 1**, you will create 3 triangles by calculating their 3 corner points using the original triangle in the previous iteration. It should be noted that the original triangle at iteration 0 will be decomposed three identical triangles as the following:



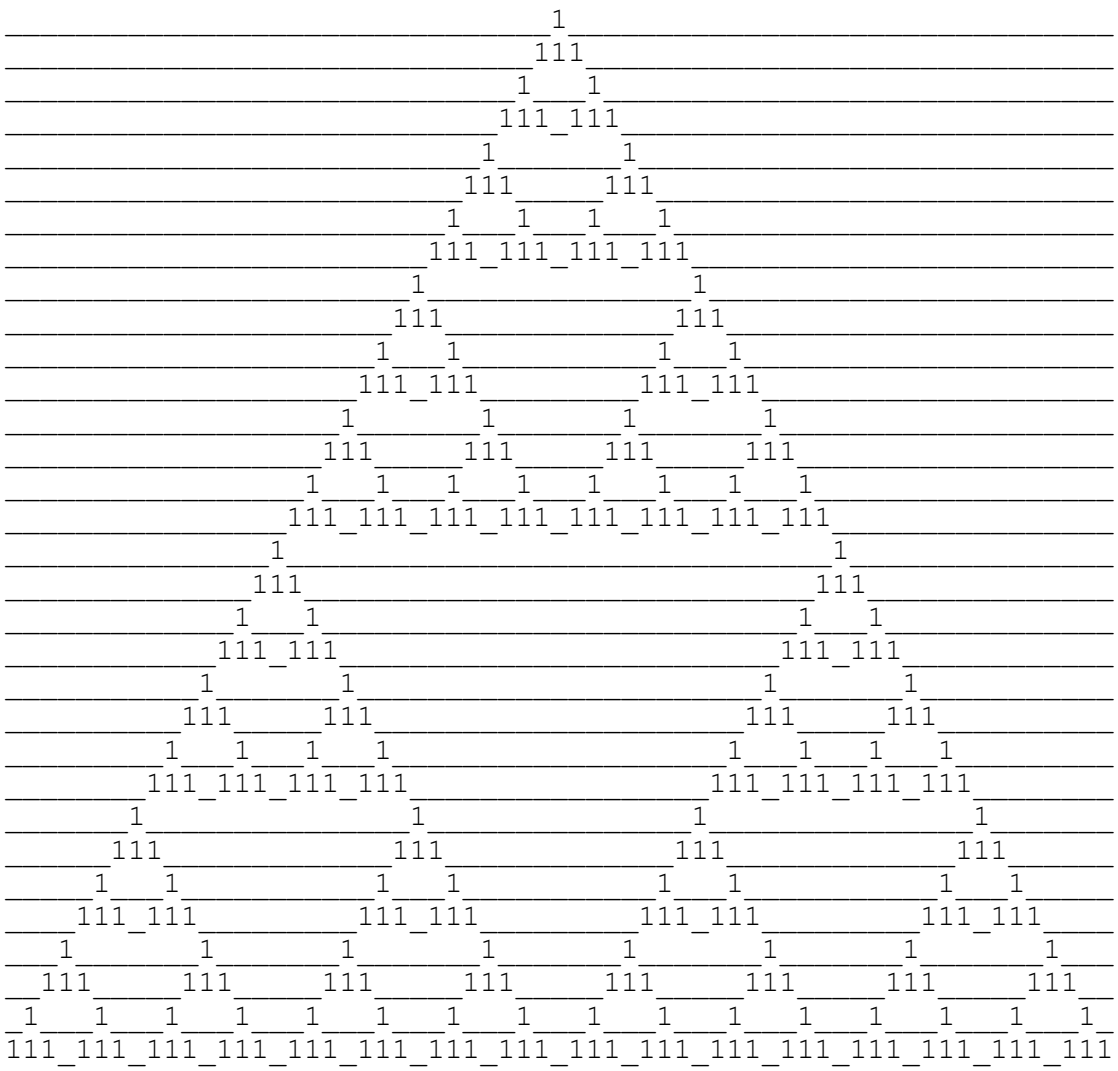
- **If the number of iterations is given as 2**, you will again create 3 triangles for each triangle in the previous iteration by calculating their 3 corner points using the triangles in the previous iteration. It should be noted that each triangle at iteration 1 will be decomposed three identical triangles as the following:



- **If the number of iterations is given as 3**, you will need to print triangles as the following:



- **If the number of iterations is given as 4**, you will need to print triangles as the following:



- The number of iterations given to your program will be less than 5.
- The output will consist of 32 rows and 63 columns, and will be composed of ones (**1**) and underscores as in the triangles above.
- Solutions using iterations will not be graded for ALL questions.
- You have to solve the problems by using RECURSION.
- **It should be noted that <u>selected parts</u> will be graded in your homework.**

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 3 files:

1. C source code for Q1 (Pro3_1_150713852.c)
2. C source code for Q2 (Pro3_2_150713852.c)
3. C source code for Q3 (Pro3_3_150713852.c)

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. **Program submissions** should be done through the Canvas class page, under the assignments tab. Do not send program submissions through e-mail. E-mail attachments will not be accepted as valid submissions.
8. You are responsible for making sure you are turning in the right file, and that it is not corrupted in anyway. We will not allow resubmissions if you turn in the wrong file, even if you can prove that you have not modified the file after the deadline.
9. 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.
10. No late submission will be accepted.