NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCES
ISLAMABAD CAMPUS
INTRODUCTION TO COMPUTING (CS101) - FALL 2016
ASSIGNMENT # 2 – Part II

Due Date: October 30, 2016 (10:00pm)
Instructions

1. Write the Python programs.
2. Solution to all the problems should be written in a separate (.py) file.
3. Submit the source code (i.e. python code in .py file) via slate. Submissions via email will not be accepted.
4. Moreover, you must submit your notebook file (.ipynb) as well with all the codes and their outputs in different cells.
5. Use proper naming convention to name the file containing source code.

   For example, the file containing the source code for first question of the first assignment should be named as **i16xxxx_assignment_2_part2_q1.py**, replace i16xxxx with your student number.

   Similarly, the third question of the second assignment should be named as **i16xxxx_assignment_2_part2_q3.py**, etc.

3. Please write your name and roll number at the beginning of the each program using comments.

Plagiarism: Plagiarism is not allowed. If found doing plagiarism you will be awarded zero marks in the assignment.

Note:

- **Follow the given instructions to the letter, failing to do to so will result in a zero.**
- **For Repetitive Patterns, Please use Functions.**
- **One way to draw patterns would be to write separate print statement that prints each line of the pattern. However, this solution would not receive any marks.**

1. Write a program that produces as output the lyrics of the song, "There Was An Old Lady." Use functions (functions) for each verse and the refrain. Here are the song's complete lyrics:

```
There was an old lady who swallowed a fly.
I don't know why she swallowed that fly,
Perhaps she'll die.

There was an old lady who swallowed a spider,
That wriggled and iggled and jiggled inside her.
She swallowed the spider to catch the fly,
I don't know why she swallowed that fly,
Perhaps she'll die.


There was an old lady who swallowed a bird,
How absurd to swallow a bird.
She swallowed the bird to catch the spider,
She swallowed the spider to catch the fly,
I don't know why she swallowed that fly,
Perhaps she'll die.

There was an old lady who swallowed a cat,
Imagine that to swallow a cat.
She swallowed the cat to catch the bird,
She swallowed the bird to catch the spider,
She swallowed the spider to catch the fly,
I don't know why she swallowed that fly,
Perhaps she'll die.

There was an old lady who swallowed a dog,
What a hog to swallow a dog.
She swallowed the dog to catch the cat,
She swallowed the cat to catch the bird,
She swallowed the bird to catch the spider,
She swallowed the spider to catch the fly,
I don't know why she swallowed that fly,
Perhaps she'll die.

There was an old lady who swallowed a horse,
She died of course.
```

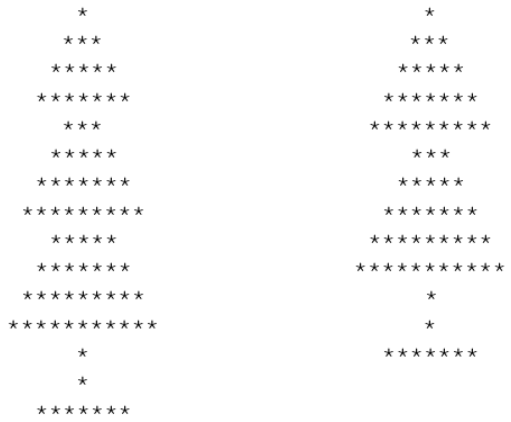
You goal will be to identify a repetitive verses and refrains and write functions corresponding to them

2. Write a function named vertical that accepts a string as its parameter and prints each letter of the string on separate lines. For example, a call of vertical("hey now") should produce the following output:

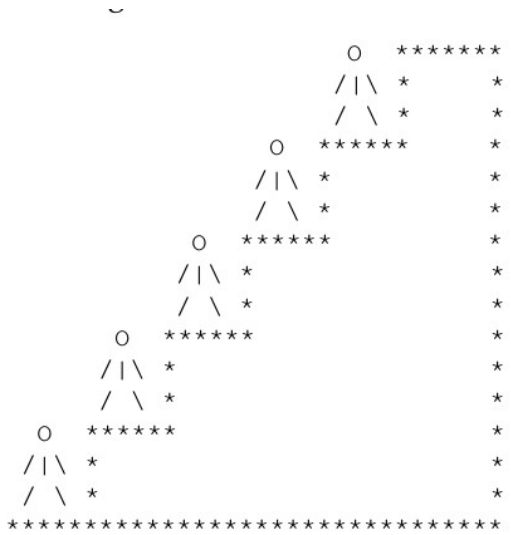
```
h
e
y

n
o
w
```

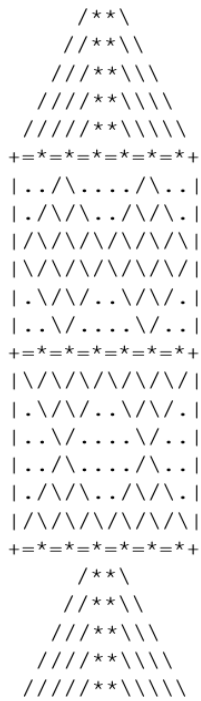
3. Write a program that produces Christmas trees as output. It should have a function with two parameters: one for the number of segments in the tree and one for the height of each segment. For example, the following tree on the left has 3 segments of height 4 and the one on the right has 2 segments of height 5.



4. Write a function that produces the following output. Use a function parameter to make it possible to change the number of stairs in the figure. You can use write other helper functions as well.



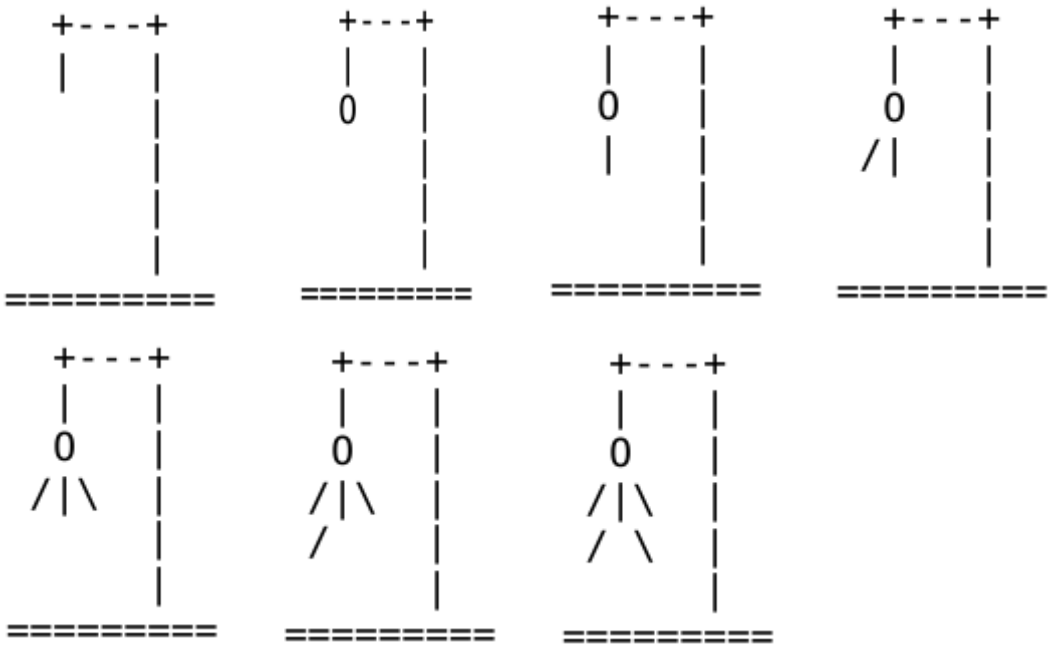
5. Write a function that produces the following rocket ship figure as its output. Use a function parameter to make it possible to change the size of the rocket (the following output uses a size of 2). You can use write other helper functions as well.



6. HangMan or HangWoman: In this question you are going to write code for hangman. To write your program you will need a list of words, you can create your own list of words. For instance, you can initially use following list of words and then extend it by adding more words to the list

```
listOfWords = ["Fast", "programming", "Student", "are", "lazy", "hangmen"]
```

You can display following seven types of hangmen at each level of your game.



You should display the number of possible letters in the word as underscores on the screen and if user enters one of the correct letter you should then replace the underscore with the users entered letter. You will need to use random function to randomly select one of the word from the given list of words.

Q6. We consider the following piecewise constant function

$$f(t) = \begin{cases} 1, & 0 < t < T/2, \\ 0, & t = T/2, \\ -1, & T/2 < t < T \end{cases}$$

Sketch this function on a piece of paper. One can approximate f(t) by the sum

$$S(t;n) = \frac{4}{\pi} \sum_{i=1}^{n} \frac{1}{2i-1} \sin\left(\frac{2(2i-1)\pi t}{T}\right).$$

It can be shown that $S(t;n) \to f(t)$ as $n \to \infty$.

a. Now Write a Python function S(t, n, T) for returning the value of S(t; n).
b. Write a Python function f(t, T) for computing f (t).
c. Write out tabular information showing how the error=f(t) − S(t; n) varies with “n” and “t” for the cases where n = 1, 3, 5, 10, 30, 100 and t = αT with T = 2π, and α = 0.01, 0.25, 0.49.
d. Find the best values of α and n that gives minimum error.

Q7. Write a function using other functions and loops to produce the following figure. Please use functions for structure and elimination of redundancy.

Hint: In lines that have repeated patterns of characters that vary in number from line to line, represent the lines and character patterns using nested for loops. It may help to write pseudocode and tables to understand the patterns.