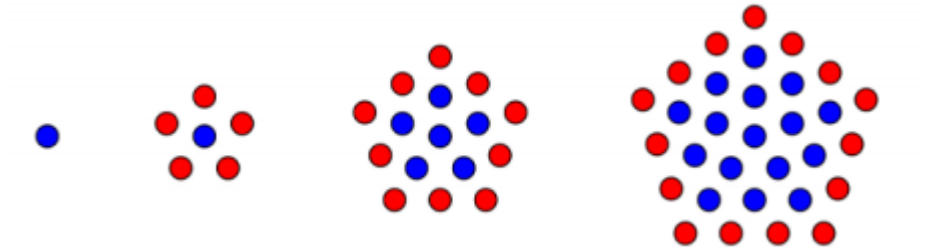
CSE 4256 - Homework 8: Due on Tuesday, June 29

Often when you apply for a programming job, you will need to complete what is called a coding interview, where you are asked to come up with a solution to a coding problem. For this class, you will complete four coding-interview type questions.

1) **Pentagonal Number**

Write a function named pentagonal_number(num) that takes a positive integer as an argument and returns the number of dots that exist in a pentagonal shape around a center dot on the Nth iteration. For example, in the image below you can see that on the first iteration there is only a single dot, on the second iteration there are 6 dots, on the third there are 16 dots, and on the fourth there are 31 dots.

Hint: Use recursion.



2) **Pentagonal Number**

Run-length encoding is a fast and simple method of encoding strings. The basic idea is to represent repeated successive characters as a single count and character. For example, the string "AAAABBBCCDAA" would be encoded as "4A3B2C1D2A".

2a) Write a method encode(s) that takes a string of characters and returns a string that is s encoded.

2b) Write a method called decode(s) that takes a string representing an encoded string and returns a string representing s decoded. For example, decode("4A3B2C1D2A")should return "AAAABBBCCDAA". You can assume that any digit in the string to decode will be less that or equal to 9.

3) **Balanced String**

Given a string of round, curly, and square open and closing brackets, write a method called is_balanced(s) that return whether the brackets are balanced (well-formed).

For example, given the string "([])[]()", you should return True. Given the strings "([)]", "((()" or "", you should return False. Hint: You should use a deque to implement a stack for this method.

4) **Monte Carlo Method**

Recall from Software 1 that a Monte Carlo method uses random numbers to estimate result. The area of a circle is defined as πr^2. Estimate π using a Monte Carlo method. Your method should not use in it.

See http://web.cse.ohio-state.edu/software/2221/web-sw1/extras/slides/05a.Monte-Carlo.pdf for more information.

Hints: The basic equation of a circle is $x^2 + y^2 = r^2$. Also, import the random class and use random.random().