CS 1110   Practice Prelim 1

1   String Methods

(a) Implement the following function so that it performs as specified:

```
def Q1(s):
    """ Returns True if the first half of s is exactly  same as the
    second half of s.

    PreCondition: s is a non-empty string with even length.
    """
```

(b) What can you say about a string `s` if the boolean expression `s.count(s[0]) == len(s)-1` is True? Assume that `s` has length 2 or greater.

(c) Give an example of a string `s` for which the boolean expression `s.find('xx') > s.find('x') >= 0` is True.

2   Loops

(a) Consider the following script:

```
N = input('Enter a positive integer: ')
s1=0
s2=0
for k in range(1,N+1):
    if k%2==0:
        s1 = s1+k
    else:
        s2 = s2+k
print s2-s1
```

What is the output if the value of `N` is 4? What is the output if the value of `N` is 99?

(b) Consider the following script:

```
k = 0
while k<=100:
    print k
    k=k+5
```

Write an equivalent script that makes effective use of a for-loop.

(c) Describe in English what the following function returns:

```
def F(s):
    """ PreCondition: s is a non empty string
    """
    t = ''  # Empty string
    for c in s:
        if s.count(c)==1:
            t = t+c
    return t
```

3 Random Walk

A *travel string* for a robot journey is made up of the characters N, E, S, and W. If T is a travel string then T[k] specifies the direction of travel at step k . (Indexing steps from zero.) Assume that 'N' means that the y-value of the robot's location is increased by 1. Assume that 'E' means that the x-value of the robot's location is increased by 1. Assume that 'S' means that the y-value of the robot's location is decreases by 1. Assume that 'W' means that the y-value of the robot's location is decreased by 1. We assume that the robot starts at (0,0).

(a) Complete the following function so that it performs as specified:

```
def FarAway(T,r,k):
""" Returns true if and only if the robot's distance to (0,0)
    is greater than r just after it takes step k.
PreC: T is a travel string, k is an int that satisfies 0<=k<len(T), r is a positive float.
```

(b) We say a step is *good* if after it is completed the robot's distance to the origin is greater than r. Complete the following function so that it performs as specified. Make effective use of FarAway.

```
def NotFarAway(T,r):
""" Returns an int that is the total number of good steps.
PreC: T is a travel string.
```

4 Short Answer

(a) Assign a value to `x` so that the following code prints ``''A''``:

```
x = _____

if  x == x-(x/d)*d+7:
    print 'A'
```

(b) Assume that `x`, `y`, and `z` are initialized integers. Can the Boolean expression `(x*y)/z != x*(y/z)` ever be `True`? Explain.

(c) Indicate the output if the following application script is run:

```
def F(x,y):
    u = x+2*y
    print x,y,u
    return x

if __name__ == '__main__':
    x = 1
    y = 10
    u = 0
    print x,y,u
    y = F(y,x)+F(2*x,y)
    print x,y,u
```

(d) A function can have local variables and parameters. Explain using as an example the function `F` in part (c).

5   A Graphics Computation

By adding code in between the two comments, produce a script that draws the figure below

```
x = -5
y = 0
r = 2
alfa = .75
DrawDisk(x,y,r)

for k in range(7):
    #################################################



    #################################################
    DrawDisk(x,y,r)
```

Assume (a) all the circles have their centers on the x-axis, (b) the radius of a given circle is .75 times the radius of the circle to its left, (c) the circles are tangent to each other, and (d) the leftmost circle has radius 2 and center (-5,0)
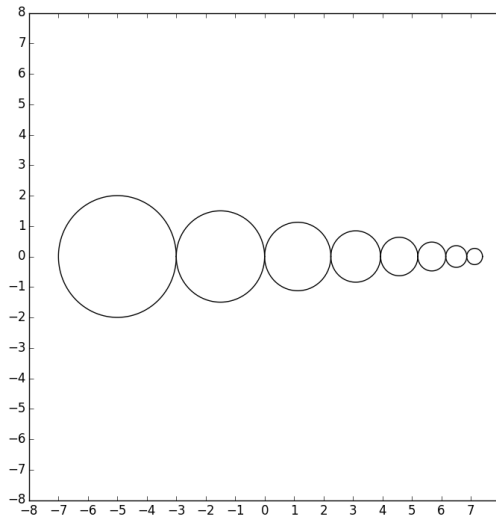
6 Leading Zeros

Complete the following function so that it performs as specified

```
def ThreeDigit(n):
    """Returns a length-three string that encodes the integer n.

    Leading zeros are included if necessary, e.g., '000', '001', '012'.

    Precondition: n is an integer that satisfies 0<=n<=999.

    """
```

Function	What It Does
`len(s)`	returns an `int` that is the length of string `s`
`s.count(t)`	returns an `int` that is the number of occurrences of string `t` in string `s`
`s.find(t)`	returns an `int` that is the index of the first occurrence of string `t` in the string `s`. Returns -1 if no occurrence.
`s.replace(t1,t2)`	returns a string that is obtained from `s` by replacing all occurrences of `t1` with `t2`.
`floor(x)`	returns a float whose value is the largest integer less than or equal to the value of `x`.
`ceil(x)`	returns a float whose value is the smallest integer greater than or equal to the value of `x`
`int(x)`	If `x` has type `float`, converts its value into an `int`. If `x` is a string like '-123', converts it into an `int` like -123
`float(x)`	If `x` has type `int`, converts its value into a `float`. If `x` is a string like '1.23', converts it into a `float` like 1.23.
`str(x)`	Converts the value of `x` into a string.
`DrawRect(x,y,L,W)`	Draws a rectangle with center (x, y), horizontal dimension L, and vertical dimension W.
`DrawDisk(x,y,r)`	Draws a circle with center (x, y) and radius r.
`DrawStar(x,y,r)`	Draws a star with center (x, y) and radius r.
`DrawLineSeg(x,y,L,d)`	Draws a length L line segment that starts at (x, y) and makes counterclockwise angle of d degrees with the positive x-axis.