# 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') > 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 effetive 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

Consider the random walk simulation in Assignment 4. Recall that the simulation produces a travel string comprised of the characters N, S, E, and W. The travel string encodes the hop directions associated with the robots journey from (0,0) to a purple boundary tile. Here is a display of an $n = 5$ playpen:
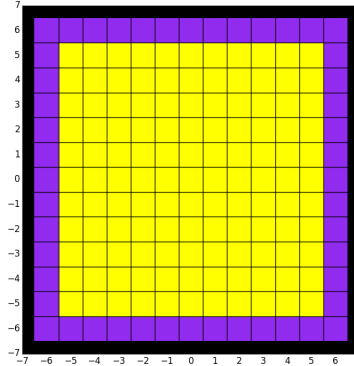


**(a)** Suppose `t` is a length-4 string that encodes the robot's next four hop directions. If after these four hops the robot ends up where it started, then we say that `t` is a "cycle" string. Here are some examples: 'NESW', 'EEWW', 'NSSN'. Complete the following function so that it performs as specified:

```
def isCycle(s):
    """ Returns True if s is a cycle string and False otherwise.
    PreCondition: s is a length-4 string made up of the characters N, E, S, and W.
    """
```

**(b)** Complete the following function so that it performs as specified.

```
def nLoops(s):
    """ Returns the number of cycle strings in s[:(len(s)-1)]
    PreCondition: s 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)
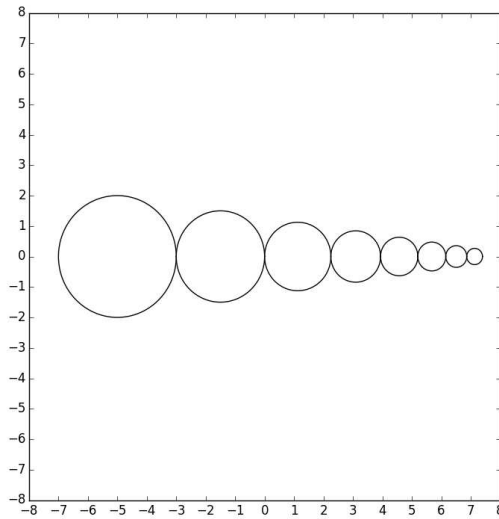
# 6 Leading Zeros

Complete the following function so that it performs as specified

```python
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. |