More Sample Prelim Questions

1 String Manipulation

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

```
def Q1(s):
    """ Returns True if the characters at the start and end of s are the
    same and occur nowhere else in s

    PreCondition: s is a string with length greater than or equal to 3.
    """
```

(b) Imagine playing around with this script:

```
s = raw_input('Enter a string that has length greater than or equal to 2: ')
t = s.replace(s[0],'x')
u = t.replace('x',s[0])
print s,u
```

Sometimes it is the case that the printed values of `s` and `u` are the same and sometimes it is observed that they are different. Give a Boolean expression that is `True` if `u` and `s` have the same value and is `False` otherwise. Hint. Consider some small examples.

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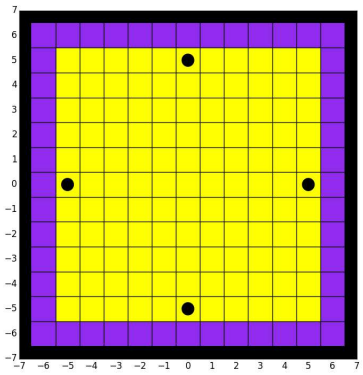
2 Random Walk

A random walk 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 $n = 5$ "hopping arena" highlighting its four *middle edge* tiles:



(a) Assume that `x` and `y` are initialized with the (x, y) coordinates of the robot's location and that the value of `n` is the size of the hopping arena. Give a Boolean expression that is `True` if the robot is on a middle edge tile and `False` otherwise.

`(b)` A hop is "predictable" if it is in the same direction as the previous hop. Here is a travel string that includes 3 predictable hops: `'EWNNNWWN'`. Complete the following function so that it performs as specified.

```
def nPredictable(s):
    """ Returns an int that is the number of predictable hops in s.
    Precondition: s is a travel string.
    """
```

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3 Short Answer

(a) Assign a value to `x` so that the character `'A'` is printed out:

```
x =  ______________________

if x%2==0 and x%3==1:
   print 'A'
```

(b) Assign values to `x` and `y` so that the character `'D'` is printed out:

```
x = ____________________


y = ____________________

if  not ((0<=x<=3) and (0<=y<=3)):
   print 'A'
elif y<=1 or y>=2:
   print 'B'
elif x<=1 or x>=2:
   print 'C'
else:
   print 'D'
```

(c) What would be the output if the following code is executed?

```
x = float(10/4)
print x
```

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(d) Suppose the functions in modules `M1.py` and `M2.py` are to be used by module `M.py`. Briefly explain why it is safer to implement `M.py` with

```
import M1
import M2
```

than with

```
from M1 import *
from M2 import *
```

(e) Indicate what the output would be if the following application script is run:

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

if __name__ == '__main__':
    x = 1
    y = 2
    print x,y
    x = F(y,x)
    print x,y
    if x<y:
        print 'A'
    else:
        print 'B'
```

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4 Loops

(a) Consider the following script

```
t = 'x'
s = raw_input('Enter a string: ')
for c in s:
    t =  t + c + t
```

Assuming that `'ba'` is assigned to `s`, what is the final value of `t`? Show work.

(b) Write a script that is equivalent to the script in part (a) but which uses a while-loop instead of a for-loop.

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5 A Graphics Procedure

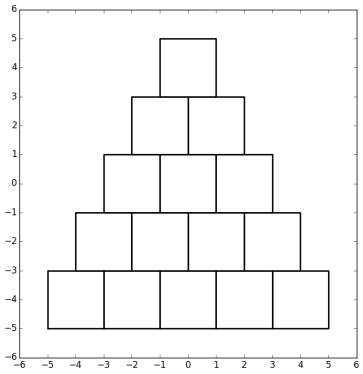
Assume the availability of the following procedure:

```
def DrawRow(x0,y0,s,n):
    """ Draws a horizontal row of n squares that are each s-by-s. The
    center of the leftmost square is (x0,y0).

    Precondition: x0, y0, and s are floats, n is a positive integer"""
```

By making effective use of `DrawRow`, implement the following procedure so that it performs as specified

```
def DrawPyramid(x0,y0,s,n):
    """ Draws a pyramid of s-by-s squares. The bottom row consists
    of n squares and the lower left corner of the leftmost square is at (x0,y0).
    There are n rows of squares and each row has one less square than the row beneath it.
    The centers of each row are vertically aligned.

    Precondition: x0, y0, and s are floats, n is a positive integer"""
```

For your information, the call `DrawPyramid(-5.,-5.,2.,5)` would produce this figure:



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Function Information

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.