

CS 1110

Prelim 1

March 10, 2015

(Print Last Name)

(Print First Name)

(Net ID)

Circle Your Lab:

ACCEL: Tue 12:20 Tue 1:25 Tue 2:30 Tue 3:35

ACCEL : Wed 10:10 Wed 11:15 Wed 12:20 Wed 1:25 Wed 2:30 Wed 3:35

PHILLIPS : Tue 12:20 Tue 1:25 Wed 12:20

Write your name and NetID on every page.

Check that your exam has (11) pages counting this one.

In cases where you write code, you will lose points for ambiguous indentation.

Academic Integrity

It is a violation of the Academic Integrity Code to look at any exam other than your own, to look at any other reference material, or to otherwise give or receive unauthorized help. We also ask that you not discuss this exam with students who are scheduled to take a later makeup. Academic Integrity is expected of all students of Cornell University at all times, whether in the presence or absence of members of the faculty. Understanding this, I declare I shall not give, use or receive unauthorized aid in this examination.

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Problem 1	15 points	
Problem 2	20 points	
Problem 3	20 points	
Problem 4	15 points	
Problem 5	20 points	
Problem 6	10 points	

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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.  
    """
```

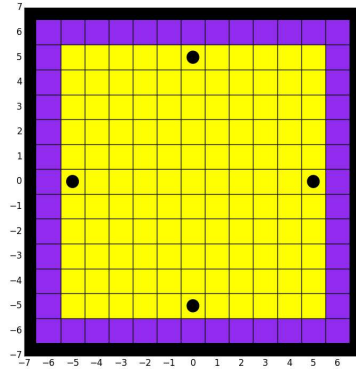
(b) Imagine playing around with this script:

```
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.

2 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 robot's journey from (0,0) to a purple boundary tile. Here is a display of an $n = 5$ playpen 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 playpen. 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: 'EWN~~N~~W~~W~~N'. 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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(c) Assume that

- `s` is initialized and contains a travel string.
- `xf` is initialized and contains the x -coordinate of the robot's final location.
- `yf` is initialized and contains the y -coordinate of the robot's final location.

Write Python code that assigns to variables `x` and `y` the x -coordinate and y -coordinate of the last yellow tile on the robot's journey. Points will be deducted for solutions that involve a loop.

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'
```

4 Testing

In the “You Are Late” problem in assignment A1 you essentially implemented the following function:

```
def YouAreLate(s):
    """ Returns a time string that specifies a time that is
    90 minutes earlier than the time specified by s.

    A time string has these properties:

    (a) its length is 5
    (b) its middle character is ':'
    (c) its first two characters are '01', '02', ..., '09', '10', '11', or '12'
    (d) its last two characters are '00', '01', ..., '58', or '59'

    Precondition: s is a time string
    """
```

In assignment A2 you assembled 10 “representative” test cases that could be used to help affirm the correctness of your WindChill implementation. This problem is about applying the representative test idea to the function `YouAreLate`. In particular, complete the following table so that it specifies a collection of six representative test cases that could be used to check the correctness of a `YouAreLate` implementation.

Test Case	Expected Output	What it Checks
01:15	11:45	

Points will be deducted for test cases that do not contribute any new information about correctness when compared to the other test cases. Test cases that check for valid input will not add to your score on this problem. To enforce brevity, we will not consider anything written outside of the table.

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5 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.

6 A Graphics Procedure

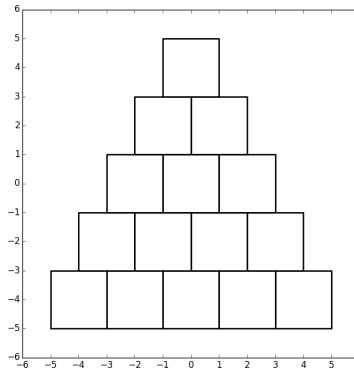
Assume the availability of the following procedure:

```
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:



Function Information

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