Your Name: _____ Your TA's Name: _____

CS 1301 CS1 with Robots Fall 2008 – Exam 2

1. Vocabulary Matching: (15 points)

Write the number from the correct definition in the blank next to each term on the left:

_15__compound data type _1__slice _7__traverse _3__mutable _10__increment _11__decrement _12__element _6__aliases _8__sequence _9__nested list _14__clone _13__immutable type _2__dictionary _4__recursion __5_iteration	1. A part of a string specified by a range of indices. 2. A collection of key-value pairs that maps from keys to values. 3. A compound data type whose elements can be assigned new values. 4. The process of calling the function that is currently executing. 5. Repeated execution of a set of statements using either a recursive function call or a loop. 6. Multiple variables that contain references to the same object. 7. To iterate through the elements of a set, performing a similar operation on each. 8. Any of the data types that consist of an ordered set of elements, with each element identified by an index. 9. A list that is an element of another list. 10. To increase the value of a variable by one. 11. To decrease the value of a variable by one. 12. One of the values in a list (or other sequence). The bracket operator selects an _____ of a list. 13. A type in which the elements cannot be modified. Assignments to elements or slices of these types cause an error. 14. To create a new object that has the same value as an existing object. 15. A data type in which the values are made up of components, or elements, that are themselves values.

2. Write Code (15 points)

Write a function **return_smallest** that accepts 3 parameters (x,y,z) and returns the smallest of the three. For example, **return_smallest**(7, -34, 23.8) should return -34. Make sure that your function works for test cases such as return_smallest(5,5,4).

```
def return_smallest(x,y,z):
    if(x <= y and x <= z):
        return(x)
    if(y <= x and y <= z):
        return(y)
    if(z <= y and z <= x):
        return(z)
```

```
grading: 5 points – Correct def statement, has one or more
return statements.
        5 points – works correctly for differing values
e.g. (5,6,7) or (-1,10,11)
        5 points – works correctly for same values, eg:
(5,5,7) and (5,5,5)
```

-1 point for minor syntax errors.

3. Program Comprehension (3 points)

```
def n_lines(n):
        print "Line!"
        if n >= 0:
            n_lines(n-1)
```

How many times will the string “Line!” be printed when n_lines is called with n=4?
Number_____6_____

4. Write Code (2 points)

Write a function with infinite recursion named **run_forever**. Your function should have no parameters, and it should run forever when called (on an ideal computer, in a real computer it would eventually run out of memory.) You may add a print statement if you wish.

```
def run_forever():
    run_forever()
```

5. Robot Directions (10 points)

The following code makes the robot drive the trajectory drawn in the box to the right.

```
def turn90degrees():
    turnRight(1, 1)

def nudge(x):
    forward(1, x)

nudge(1)
turn90degrees()
nudge(1)
nudge(2)
```

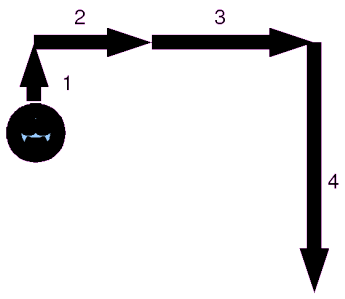
Draw the robot's trajectory when the following code is executed. Start the robot in the middle of the box and use arrow heads (as above) to indicate each movement.

```
def turn90degrees():
    turnRight(1, 1)

def nudge(x):
    forward(1, x)

nudge = [ 1,2,3,4]

for I in nums:
   if (I % 2 == 0) :
       turn90degrees()
   nudge(I)
```



Grading: -2 for each incorrect turn, -1 point for each incorrect line segment.

6. Fill in the blank (2 points)

In python, the = operator performs ____Assignment_____ while the == operator performs __Comparison / Equality Check_____.

7. Python Expression Evaluation (20 points)

For this question, assume the following statements have already been entered and interpreted:

```
a = [ True, 7, ["Cherry", "Apple","Plum"], 56, [4, 5, 6], 84 ]
b = a
c = a[0:4]
d = a[2]
d[2] = "Peach"
```

Pretend that you are the Python Interpreter (IDLE window). What do you print or return when each of the following statements are entered?

Example: a[0] *Result:* **True**

Example: a[4:6] *Result:* _ [[4,5,6], 84]_

1. **a[4][0]** *Result:* *4*
2. **d** *Result:* *[“Cherry”, “Apple”, “Peach”]*
3. **c** *Result:* *[True, 7, ['Cherry', 'Apple', 'Peach'], 56]*
4. **a[2][2]** *Result:* *”Peach”* or *'Peach'*
5. **b[:2]** *Result:* *[True, 7]*
6. **b[-2]** *Result:* *[4,5,6]*
7. **c[-2]** *Result:* *[“Cherry”,”Apple”,”Peach”]*
8. **print "Pumpkin %.3f" %3.1459** *Result:* *Pumpkin 3.146*
9. *(5 > 10) or (5 > 3)* *Result:* *True*
10. *34 % 10* *Result:* *4*

Grading: -2 points if wrong. -1 point if missing/adding quotes, or getting 3.145 on question 8. If they mess up the “Peach”/”Plum” bit, take off 2 points the first time, and only 1 point the subsequent times.

8. Write Code (10 points)

Write a function **changeLetter(aString, index, newLetter)** that will replace the letter stored at index in aString with the contents of newLetter and *return* the new string *without modifying the original string!* For example, *changeLetter("Python is great!", 10, "G")* will return the string "Python is Great!"

```
def changeLetter(aString, index, newLetter):
    return( aString[:index] + newLetter + aString[index+1:] )
```

grading: 5 points for having a correct def line w/ parameters, and a return statement. -1 point for missing the colon.

5 points for working (even if off by one). -2 point for being off by a letter.

9. Write Code (5 points)

Write a function **changeValue(aList, index, newValue)** that will replace the element stored at index in aList with the contents of newValue. It should NOT return the list. For example after the following commands:

a = [5, True,"Test",10]

changeValue(a, 3, "Hi!")

The list **a** will be [5, True,"Test","Hi!"]

```
def changeValue(aList, index, newValue):
    aList[index] = newValue
```

grading: 2 points for correct def line, -1 for missing the colon.

3 points for working. -2 for returning anything other than a blank or None.

10. Write Code! (20 points)

Write a function called **roboFlute** that takes no parameters. The roboFlute function will watch each of the robot's 3 light sensors (values obtained using the getLight("loc") function and specifying a location out of the set ("left" / "right" / "center")) and play a beep that is ½ second long if a light sensor is covered. You know a light sensor is covered when the value it returns is larger than 1000. Each of the three sensors should play a different note, as follows: "left" = 800Hz, "center" = 440Hz, "right" = 220Hz. The robotFlute function should perform the above actions for 25 seconds and then return.

API Hints: beep(time_in_seconds, frequency_in_Hz), value = getLight("location")

```
def roboFlute():
    while( timeRemaining(25) ):
        if (getLight("left") > 1000 ):
            beep(0.5, 800)
        if ( getLight("center") > 1000 ):
            beep(0.5, 440)
        if ( getLight("right") > 1000 ):
            beep(0.5, 220)
```

1 free point if they attempted to answer.

1 points for getting the def line right and not returning anything.

6 points for running for 25 seconds.

4 points (12 total) for each sensor triggering the appropriate beep.

11. Write Code! (15 points)

Write a function **reverseList(aList)** that will return a reversed copy of aList. For example, after the following:
a = [5, 10, True, "Hi!"]

b = reverseList(a)

The list b = ["Hi!", True, 10, 5], while a = [5, 10, True, "Hi!"].

Simple way:

```
def reverseList(aList):
  return ( aList[len(aList):0:-1] )    #or return( aList[::-1] )
```

Another way:

```
def reverseList(aList):
        bList = []
        for x in aList:
                bList = [x] + bList
        return( bList)
```

Grading: 7 points for correct def line w/ parameters and a return statement.

8 points for working.

12. Write Code: (10 Points)

Write a function **findJ(aString)** that uses a **while** loop to find the index of the first occurrence of the letter 'J' in the aString parameter. The function should return the index it found. For example, findJ("This is Jays String") should return the number 8. Note that you should find both UPPERCASE J's and lowercase j's! If you do not find a J or a j you should return -1.

```
def findJ(aString):
  index = 0
  while(index < len(aString) ):
      if (aString[index] == 'j' or aString[index] == 'J'):
          return(index)
      index = index + 1

   return(-1)
```

Grading: 3 points for def, parameter, and return.
3 points for the while loop and index counter.
4 points for working correctly.

Extra Credit (1 point each)

What is the one sensor on the Scribbler that does not detect light of one form or another?

getStall() (or getBattery() although technically the voltage sensor is on the fluke.)

What is the decimal representation of the binary number { 101101}? 45

What is the hexadecimal representation of the decimal number 34? 22

What does CSS stand for? Cascading Style Sheets