

Instructions:

- Please write clearly. What I cannot read, I will not grade.
- Show all your work in detail. I give partial credit.
- This exam has 8 pages including the title page. Please check to make sure all pages are included.
- This exam is closed book, closed notes, no calculators.
- Don't get bogged down on any one question. You will have 50 minutes to complete this exam.

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community.

Signature: _____

Question	Points	Score
1. Vocabulary	21	
2. Fill in the Blanks	4	
3. Python Expressions	22	
4. Robot Drawing	9	
5. Find the Error	3	
6. Leaky Pipes	6	
7. countUpBy	8	
8. Average a List	8	
9. Save Light Values	10	
Bonus Questions	0	
Total:	91	

Vocabulary Questions

1. For each of the following vocabulary terms, write a concise 1-2 sentence definition. Be brief, and to the point.

(a) (3 points) block

(b) (3 points) dictionary

(c) (3 points) flow of execution

(d) (3 points) function

(e) (3 points) recursion

(f) (3 points) slice

(g) (3 points) traverse

2. (4 points) Fill in the blanks:

Python has several compound data types that we have learned about. A _____ can be used to store a sequence of characters, while a _____ can store a sequence of any type of data (but is immutable). A _____ can also store any type of data, and allows you to change elements within it. A _____ associates keys to values.

Code Understanding Questions

3. Python Expressions - For this question, assume the following statements have already been entered and interpreted:

```
a = [ 10, 32, 42, True, ["Ivy", "Oak", "Fern"], 3.14159, [ 10, 11, 12], 4]
b = a
c = a[0:4]
d = a[4]
d[2] = "Palm"
```

Act like the python interpreter and evaluate the following expressions, writing the value they evaluate to:

- (a) (2 points) `a[0]`
- (b) (2 points) `3+2`
- (c) (2 points) `len(a)`
- (d) (2 points) `a[6][10]`
- (e) (2 points) `d`
- (f) (2 points) `c`
- (g) (2 points) `a[4][2]`
- (h) (2 points) `b[:2]`
- (i) (2 points) `b[-2]`
- (j) (2 points) `c[-2]`
- (k) (2 points) `a[4] + [1,3,5]`

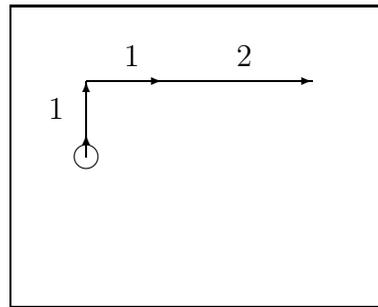
4. (9 points) Robot Drawing - Assume `turn90degrees()` has been defined as below so the robot turns right 90° and `nudge(x)` has been defined to move the robot forward x units.

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

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

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

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



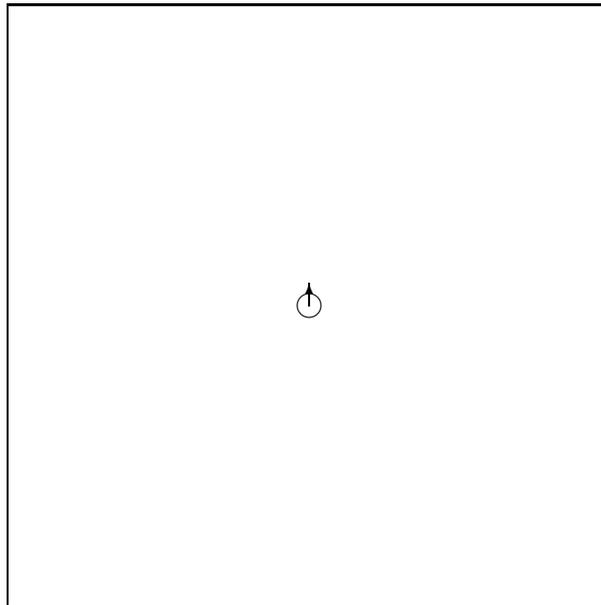
Draw the robot's trajectory when the following code is executed. Label the length of each move (nudge) using numbers as in the example above.

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

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

turns = [2, 6]

for idx in [2,2,6,2,1]:
    if idx in turns:
        turn90degrees()
    nudge(idx + 1)
```



5. (3 points) Find the Error: The following code contains a statement that will cause a runtime error. Circle the line and explain what's wrong.

```
e = "2.718"  
pi = 3.14  
pie = str(pi) + e  
print int(e)  
print int(pi)  
print pie
```

6. (6 points) Leaky Pipes - What is printed by the following function if it is called with an input of 12?

```
>>> leakyPipes( 12 )  
  
def leakyPipes(n):  
    if (n > 0):  
        if (n % 4 == 0):  
            print "drip %d" % n  
            leakyPipes(n-3)  
        if (n % 3 == 0):  
            print "drop %d" % n
```

Code Writing Questions

7. (8 points) Write a function called `countUpBy` that accepts a single integer parameter and uses a while loop to print out a count from that number up to twenty (inclusive) by that number. You may assume that your input will be between one and 20 (inclusive).

```
Examples: >>> countUpBy(5)
          5
          10
          15
          20

          >>> countUpBy(7)
          7
          14
```

8. (8 points) Average a List - Write a function called `average` that accepts a list of numbers (they may be ints or floats). It should **return** the average (mean) value of all the numbers in the list. If the list is empty, it must return `None`.

For example:

```
>>> result = average( [10, 5, 5] )
>>> print result
6.6666666
```

9. (10 points) Write a function named `saveLightValues` that accepts the name of a file to open as a string parameter. The function should open the file for writing, and save ten light values from calling the `getLight("center")` function, one per line. Between calls to the `getLight()` function to get light samples, the robot should turn left a small amount (you choose the speed and duration).

10. (2 points (bonus)) Bonus Questions:

(a) What did you name your robot?

(b) What has been the most difficult topic or concept in this class for you to understand (what should we spend more time on)?