

fullName:_____andrewID:_____

recitationLetter:_____

15-112 N22

Quiz4 [30 min.]

You **MUST** stop writing and hand in this **entire** quiz when instructed in lecture.

- You may not unstaple any pages.
- You may not use your own scrap paper. If you must use additional scrap paper, raise your hand and we will provide some. You must hand this in with your paper quiz, and we will not grade it.
- Failure to hand in an intact quiz will be considered cheating. Discussing the quiz with anyone in any way, even briefly, is cheating. (You may discuss it only once the quiz has been posted to the course website.)
- You may not use any concepts (including builtin functions) we have not covered in the notes this semester.
- You may not use recursion.
- We may test your code using additional test cases. Do not hardcode.
- We do not deduct points for bad style on quizzes
- Assume `almostEqual(x, y)` and `roundHalfUp(n)` are both supplied for you. You must write all other helper functions you wish to use.

CT1: Code Tracing [9pts]

Indicate what the following code prints. Place your answers (and nothing else) in the box below.

#Hint: Draw a box and arrow diagram!

Note: this prints 3 lines

```
import copy
def ct1(L, A, n):
    A[-1][0] += n
    A[n%2] += [10*n]
    L.append(n)
    print(A)
```

```
L = [[3], [4]]
C = copy.copy(L)
D = copy.deepcopy(L)
ct1(L, C, 1)
ct1(L, D, 2)
print(L)
```

CT2: Code Tracing [9pts]

Indicate what the following code prints. Place your answers (and nothing else) in the box below.

#Hint: Draw a box and arrow diagram!

Note: this prints 3 lines

```
def ct2(L):
    A = [set()]
    for item in L:
        if item in A[0]:
            print(A[0])
            A.insert(0, {item})
        else:
            A[0].add(item)
    return A

print(ct2([1, 2, 2, 4, 3, 4, 5]))
```

Free Response 1: makeTable(n) [32 points]

Write the function `makeTable(n)` that takes a positive integer `n` and returns a multiplication table in the form of a 2D list with `n` rows and `n` columns. Each cell should be the product of the integer at the beginning of its row and the top of its column. Look at the test cases to identify this pattern.

```
def testMakeTable():
    print("Testing makeTable(n)...", end="")
    assert(makeTable(1) == [[1]])

    assert(makeTable(2) == [[1, 2],
                             [2, 4]])

    assert(makeTable(3) == [[1, 2, 3],
                             [2, 4, 6],
                             [3, 6, 9]])

    assert(makeTable(4) == [[1, 2, 3, 4],
                             [2, 4, 6, 8],
                             [3, 6, 9, 12],
                             [4, 8, 12, 16]])

    assert(makeTable(5) == [[1, 2, 3, 4, 5],
                             [2, 4, 6, 8, 10],
                             [3, 6, 9, 12, 15],
                             [4, 8, 12, 16, 20],
                             [5, 10, 15, 20, 25]])

    print('Passed!')
```

You may continue your FR1 answer here, if you wish

Free Response 2: makeAuthorDict(books) [32pts]

Write the function `makeAuthorDict(books)` which takes a dictionary that maps book titles to their authors, and returns a new dictionary mapping each author to a set of their books, like so:

```
books = {"The Farthest Shore" : "Ursula K. Le Guin",
        "Uzumaki" : "Junji Ito",
        "I, Robot" : "Isaac Asimov",
        "Gyo" : "Junji Ito",
        "A Wizard of Earthsea" : "Ursula K. Le Guin"}

assert(makeAuthorDict(books) == {"Ursula K. Le Guin" : {"The Farthest Shore",
                                                         "A Wizard of Earthsea"},
                                "Junji Ito" : {"Uzumaki",
                                                "Gyo"},
                                "Isaac Asimov" : {"I, Robot"} })
```

You may assume each book only has one author.

You may continue your FR2 answer here, if you wish

True or False [2pts ea]

Write only the whole word "True" or "False" (and not just T or F).

Also, assume we are always talking about very large values of n , and we are not trying to trick you.

_____ **TF1:** The Big-O of merge sort is $O(n \cdot \log n)$

_____ **TF2:** The Big-O of selection sort is $O(n \cdot \log n)$

_____ **TF3:** Selection sort is generally faster than merge sort

_____ **TF4:** Sets cannot contain duplicate values

_____ **TF5:** Sets cannot contain immutable values

_____ **TF6:** Dictionary keys must be immutable

_____ **TF7:** Dictionary values must be immutable

_____ **TF8:** Binary search can only be used when a list is known to be sorted

_____ **TF9:** $O(100N)$ is faster than $O(N^{**100})$

bonusCT: Code Tracing [2pts]

This question is optional. Indicate what the following code prints. Place your answers (and nothing else) in the box below.

```
def bonusCt(L, s):  
    L = [chr(ord('a')+L[i]+i) for i in range(len(L))]  
    s = sorted(set(s) - set(L)) * len(set(s))**len(L)  
    return ''.join(s).count('rb')  
print(bonusCt([2, -1], 'abracadabra'))
```

a