Name: ______________________________ Andrew Id: ________________

15-112 Spring 2024 Quiz 9

Up to 25 minutes. No calculators, no notes, no books, no computers. Show your work!
Do not use try/except on this quiz.

1. **Code Tracing**: Indicate what the following programs print. Place your answers (and nothing else) in the boxes below the code.

   (a) (6 points) CT1

```
def ct1(s):
    if len(s) == 0:
        return ""
    elif len(s) == 1:
        print(s)
        return s
    else:
        print(s)
        return s[0] + ct1(s[1:][::-1])

print(ct1("chats"))
```

(b) (6 points) CT2

```
def ct2(s):
    if len(s) == 0:
        return ""
    print(s)
    if len(s) == 1:
        return s
    x = len(s) // 2
    return s[x] + ct2(s[:x]) + ct2(s[x + 1 :])

print(ct2("dance"))
```

2. **Free Response**: Digit Count Map

This two-part problem is very similar to the homework, and the concept of a digit count map is the same.

Your solutions to this problem must be entirely recursive. No loops or iterative functions are allowed; their use will result in a zero score for this problem. Using `str()` to convert a multidigit integer to a string is iterative and therefore not allowed.

(a) (4 points) Write the recursive function `addDigitsToMap(countMap, n)` which, given a dictionary `countMap` and a non-negative integer `n`, adds the count of all of the digits in `n` to `countMap`. The function does not return anything. Consider the following examples:

```
d = dict()
addDigitsToMap(d, 155)
assert d == {1: 1, 5: 2}

d = dict()
addDigitsToMap(d, 155)
addDigitsToMap(d, 2045)
assert d == {0: 1, 1: 1, 2: 1, 4: 1, 5: 3}
```

(b) (4 points) Write the recursive function `digitCountMapFromList(L)` that takes a list of non-negative integers, `L`, and returns a map of the counts of all the digits that occur in the numbers in the list.

For example, consider `digitCountMapFromList([12, 10, 9, 11])`. These numbers include one 0, four 1's, one 2, and one 9, so the call would return a dictionary containing: `{ 0:1, 1:4, 2:1, 9:1 }`.

Consider the following additional examples:

```
assert digitCountMapFromList([6, 2, 7, 1, 5, 6]) == {1: 1, 2: 1, 5: 1, 6: 2, 7: 1}
assert digitCountMapFromList([12, 10, 9, 11]) == {0: 1, 1: 4, 2: 1, 9: 1}
assert(digitCountMapFromList([4, 686, 64, 89, 710]) == {0:1, 1:1, 4:2, 6:3, 7:1, 8:2, 9:1})
assert digitCountMapFromList([]) == {}
```

You may assume that you have a working implementation of `addDigitsToMap(countMap, n)`, even if yours does not work.