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15-112 Fall 2023 Quiz 8

Up to 20+5 minutes (finish within 20 minutes for 1-point proficiency bonus) No calculators, no notes, no books, no computers. Show your work! Do not use try/except on this quiz

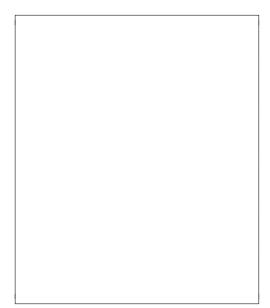
1. (3 points) **Short Answer**: Consider the following code:

```
def f(a):
    t = 0
    if '42' in a:
        for e in a:
            if e*2 in a:
            t = t + 1
    return t
```

Indicate for each case below the big-O of the function in terms of N = len(a).

- (a) a is a list ______.
- (b) a is a set _____
- (c) a is a string _____
- 2. (5 points) **Code Tracing**: Indicate what the following program prints. Place your answer (and nothing else) in the box next to the code. Ensure lists are enclosed with brackets.

```
def ct(L):
    d = dict()
    for i in range(len(L)):
        d[sum(L[i])] = L[i]
    print("a:",d)
    for item in d:
        if item not in d[item]:
            d[item].append(item)
    print("b:",d)
    L = []
    for k in d:
        L.extend(d[k])
    return set(L)
L = [[3,4],[1,2],[2,5]]
print(ct(L))
print("L:",L)
```



3. (4 points) Reasoning Over Code: Find an argument, d, for the following function to cause it to return True. Place your answer (and nothing else) in the box below the code. Make sure strings are enclosed with quotes and lists with brackets.

```
def roc(d):
    assert(isinstance(d, dict) and len(d) == 3)
    s = set()
    for k in d:
        if not len(d[k]) - len(k) == 1:
            return False
        s.add(k)
        s.add(d[k])
    return s == {"a", "bc", "def", 'gh'}
```

4. (8 points) Free Response: getSets

Write the function getSets(L) that takes a **list of lists** L and returns a list containing the set representations of all the lists in L. The order of the sets in the result is **not** important. For example, for L = [[1,2,2], [3], [3,1], [2,1,1,2]], the function should return a list containing the sets $\{1,2\}, \{3\}, \{1,3\}$, in any order, and without duplicates. Note that, in this case, the lists [1,2,2] and [2,1,1,2] have the same set representation $\{1,2\}$, therefore the set $\{1,2\}$ appears only once.

For full credit, the function should be $\mathcal{O}(N \log N)$ or better, where N is the size of the input list L. Slower solutions will receive partial credit. You can assume that the length of each sub-list in L is less than 100. Here are more test cases:

- getSets([[4, 2, 1], [3, 5], [2, 4, 1]]) should return a list containing {1,2,4} and {3,5}.
- getSets([[1, 2, 3, 3], [3, 2, 1], [2, 3, 1, 1, 2]]) should return [{1, 2, 3}].
- getSets([[], [], []]) should return [set()].
- getSets([[1, 2], [3, 4, 3], [5, 6, 6], [7, 8]]) should return a list containing {1, 2}, {3, 4}, {5, 6}, and {7, 8}.

After you write your solution, indicate in the box below the efficiency of your algorithm using Big-O notation in terms of N.

Additional Space for Answer to Question 4