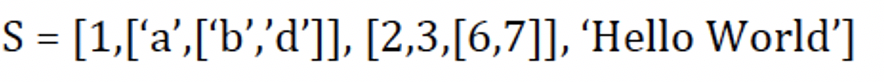
Total points: 24pts+4pts bonus.

Topics: List, List methods, List comprehension, String.

You can discuss it with your classmates, TA and me. **Please DO NOT copy solutions from the Internet.**

**Question 0 (5Pts)**



Please write down the result the following statement without using Python:

What is the outcome?

S[1][1] -> [‘b’, ‘d’]

S[:2] -> [1, [‘a’, [‘b’, ‘d’]]]

S[3:] -> [‘Hello World’]

S[2][2][0] -> 6

What is the output after each line?

len(S[2]) -> 3

len(S[3]) -> 11

len(S) -> 4

S.index(‘Hello World’) -> 3

S[0] = 2 -> Nothing, but the ‘1’ in index 0 is replaced with 2

S.remove(2) -> Nothing, but removes the number 2 in index 0

C = S.pop(3) -> Nothing, but takes ‘Hello World’ string in index 3

(CORRECTION: Range Error because index 1 becomes index 0, since original value at 0 was removed. Index 3 no longer exists.)

print(C) -> ‘Hello World’

(CORRECTION: Undefined error because pop function did not execute, and nothing was assigned to C)

What is the index of 7 in S? = 1 (or doesn’t exist, when checking S.index(7) in console, because it’s not a lone value in the index, but it is part of index 1)

Check your answers with a Python interpreter (Console in PyCharm)?

**Question 1 (4pts)**

Write a function according to specification below without altering the list.

*def lesser\_than(thelist, value):*

*“”” This function returns: number of elements in the list strictly less than the value.”””*

Example: lesser\_than([5,6,7,9],7) evaluates to 2

Preconditions: the list is a list of integers.”””””

**Question 2 (4pts)**

Write a function that counts the number of unique elements in a list of integers.

*def unique(thelist):*

*“””Returns: the number of unique elements in a list”””*

Example: *unique*([5,6,7,9,9,9]) evaluates to 4

**Question 3 (4pts)**

Write a function that takes a list of words, scramble the order of the words and then return the scrambled words.

Hint: import random

*def scramble(thelist):*

*“””This function scrambles the input word”””*

Example: *scramble*(‘hello’) produces lelho. You might expect different results because the scramble was random.

**You shouldn’t use the function shuffle.**

This wiki page is useful:

<https://en.wikipedia.org/wiki/Fisher%E2%80%93Yates_shuffle>

**Question 4 (4pts)**

Write a function called has\_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

**Question 5 (4pts)**

Given two lists sorted in increasing order, create and return a merged list of all the elements in sorted order. You may modify the passed in lists. Ideally, the solution should work on linear time, making a single pass of both lists.

*def merge\_lists(list1,list2):*

*“””This function sorted numbers of the merged list in ascending order”””*

Example: merge\_list([1,3,5],[2,7,8]) -> [1,2,3,5,7,8]

Reading about “linear time” here.

<https://en.wikipedia.org/wiki/Time_complexity>

An algorithm is said to take **linear time**, or *O*(*n*) time, if its time complexity is *O*(*n*). Informally, this means that the running time increases at most linearly with the size of the input. More precisely, this means that there is a constant *c* such that the running time is at most *cn* for every input of size *n*. For example, a procedure that adds up all elements of a list requires time proportional to the length of the list, if the adding time is constant, or, at least, bounded by a constant.

Question 6 (4pts) Search Insert Position.

Given a sorted array of distinct integers and a target value, return the index if the target is found. If not, return the index where it would be if it were inserted in order.

**Input:** nums = [1,3,5,6], target = 5

**Output:** 2

**Input: nums = [1,3,5,7], target = 6**

**Output: 3**

Question 7 (Bonus 4pts)

Given a list of integers of length n, and an integer target, find three integers in the list such that

The sum is closest to the target. Return the sum of the three integers.

For example:

TheList = [-1,2,1,-4], target = 1

Output: 2

The sum of the 3 numbers that is closest to the target is 2.

-1+2+1 = 2