CS310: Programming Languages and Compliers
Lab 0

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NOTE: This lab is to warm up your basic programming skills and you should complete the following questions using Java. It is highly recommended to compile your java source file(s) in command line. There is no submission requirement for this lab. However, you should code up your solutions in an optimised way and keep your code short and clean.

1 Palindrome

Write a program that checks if a string is palindrome. For example,

$S1$ =“abbba", $S2$ =“dad", $S3$ =“Dad"

Both strings $S1$ and $S2$ are palindromes. However, $S3$ is not a palindrome.

2 Sum Two Integers

Given an array of integers, return indices of the two numbers such that they add up to a specific target (see the following method signature.). You may assume that each input would have exactly one solution, and you may not use the same element twice. The time complexity for your solution should be $\mathcal{O}(n)$.

```
public int[] twoSum(int[] nums, int target)
```

Example:
Given $nums = [2,7,11,15]$, target $= 9$,
Because $nums[0] + nums[1] = 2 + 7 = 9$, return $[0,1]$.

3 Merge Two Lists

Merge two sorted singly linked lists and return it as a new list. The new list should be made by splicing together the nodes of the first two lists. The class definition for the singly-linked list is as follows:

```
public class ListNode {
        int val;
        ListNode next;
        ListNode(int x) { val = x; }
}
```

The method signature for merging two lists is as follows:

```
public ListNode mergeTwoLists(ListNode l1, ListNode l2)
```

4 Merge k Lists

Now try to merge k sorted linked lists and return it as one sorted list (using the same class definition for *ListNode* from Question 3). Analyze and describe time and space complexity of your solution. The method signature is as follows:

```
public ListNode mergeKLists(ListNode[] lists)
```