Data Structure and Advanced Programming

Homework #5
Due: 2021/4/6 08:00am (CST)

NOTE: Please upload your C++ source codes (by copy-paste) to PDOGS before the due date and time.

1. (60%) Design and implement a template linked list class that would have a member function `search` that returns the position of a specific value in the linked list. Assume that the list does not have a member `itemCount`. The first node at the list is at position 1, the second at position 2, etc. If the value is not found, the function returns -1. Then extend the linked list class template in the previous problem by including the member function `reverse`, that reveres the order of the data items using three pointers. Test your linked list class template on a list of string objects. The test program should insert some string objects in the list, display the list, search for a particular object in the list, and finally reverse the list and display the reversed list.

   Sample Input / Output
   The first input line indicates the strings that need to be inserted into the list, and the second line means the string we want to search. The first output line displays the list after inserting all strings, the second line shows the search result, and the third line displays the severed list. Please make sure your program can read multiple input data sequentially at once.

`// input`
`Stacks Lists Queues Trees`
`Lists`
 	
`// output`
`Stacks Lists Queues Trees`
`2`
`Trees Queues Lists Stacks`
	`// input`
	`Yellow Red Green Blue Orange`
	`White`
	
	`// output`
	`Yellow Red Green Blue Orange`
	`-1`
	`Orange Blue Green Red Yellow`

2. (40%) Santa Claus allegedly keeps lists of those who are naughty and those who are nice. On the naughty list are the names of those who will get coal in their stockings. On the nice list are those who will receive gifts. Each object in this list contains a name (a string) and a list of that person's gifts (an instance of an ADT list). Design and implement an ADT for the objects in the nice list. Then write a program for Santa that maintains his two lists of those who are naughty and those who are nice.

   Sample Input / Output
   The input is pairs of strings. The former one means the name and the latter one means his/her gift. If the gift is coal, it means the person is a naughty guy. Otherwise, he/she is a nice guy and worthy to have the gift. The first output line displays the pairs in the nice list, and the second line shows the names in the naughty list. Please make sure your program can read multiple input data sequentially at once.

`// input`
`Alice coal, Bob Ball, Robin`
`Beer, Kay coal`
	`// input`
	`Landon Wine, Willow Chair,`
	`Avery coal, Everly coal,`

// output Bob Ball, Robin Beer Alice Kay	Lincoln coal, Lillian Bags // output Landon Wine, Willow Chair, Lillian Bags Avery Everly Lincol