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Task 1

Function	Test case	Data/code	Does my code handle it?/Time Complexity
sublist(list A, list pos_list)	Index out of bounds	A: 10 ->10 ->40 ->20 pos_list: (**-7**) -> 3 or pos_list: 3 -> **80000** -> 3 result: fct returns NULL	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A is NULL	list A = NULL; result: fct returns NULL	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A is empty	list A = newList(); result: fct returns NULL	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	pos_list is empty	list pos_list = NULL; result: fct returns NULL	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	pos_list is NULL	list pos_list = newList(); result: fct returns NULL	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A is not modified by sublist(…) ….	A: 15 -> 100 -> 7 -> 5 -> 100 pos_list: 3 -> 0 ->2 result: A will still be :	Yes O(N) It traverses the

		15 -> 100 -> 7 -> 5 -> 100	entire list
	Normal data (as in hw writeup)	A: 15 -> 100 -> 7 -> 5 -> 100 -> 7 -> 30 pos_list: 3 -> 0 -> 6 -> 4	5->15->30->100 O(N) It traverses the entire list
	Repeated position	A: 5 pos_list: 0 -> 0 -> 0 result: returns: 5-> 5-> 5	Yes O(N) It traverses the entire list
deleteOccurrences (list A, int V)	Normal data, V is in A (as in hw write-up)	A: 15 -> 100 -> 7 -> 5 -> 100 -> 7 -> 30 V is 7, Result: A will become: 15-> 100-> 5 -> 100 -> 30	Yes O(N) It traverses the entire list
	V does not occur in A	A: 15 -> 100 -> 7 -> 5 V is 9, Result: A does not change: 15-> 100-> 7-> 5	Yes O(N) It traverses the entire list
	Repeated consecutive occurrences	A: 15 -> 7 -> 7 -> 5 V is 7, Result: A becomes: 15 -> 5	Yes O(N) It traverses the entire list
	A has one item and that is V	A: 7 V is 7 Result: A becomes Empty	Yes O(N) or O(1) It traverses the entire list
	A has only items with value V in it	A: 7->7-> 7 V is 7 Result: A becomes empty	Yes O(N) It traverses the entire list
	A is NULL	A = NULL Result: A is not changed	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A is empty	A = newList() Result: A is not changed	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list

swapFirstThird (list A)	A is NULL	A = NULL Result: A is not changed	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A is empty	A = newList() Result: A is not changed	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A has one item	A: 7 Result: A does not change	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A has two items	A: 7->10 Result: A becomes: 10->7	Yes O(1) Because the list is smaller than three elements, it's going to be a constant time
	A has three or more items	A: 15 -> 100 -> 7 -> 5 -> 100 -> 7 -> 30 Result: A becomes: 7->100->15->5->100->7->30	Yes O(1) Since we have to traverse only till the third element each time and change the pointers. N does not matter as we do not have to traverse through the entire list
moveAllMaxAtEnd (list A)	A is NULL	A = NULL Result: A is not changed	Yes O(1) It runs in constant time. It doesn't depend on N. It

			doesn't traverse the list
	A is empty	A = newList() Result: A is not changed	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	Normal data (as in hw write-up)	A: 15 -> 100 -> 5 -> 100 -> 30 Result: A will become: 15 -> 5 -> 30 -> 100 -> 100	Yes O(N) It traverses the entire list
	A has one item	A: 7 Result: A does not change	Yes O(1) It runs in constant time. It doesn't depend on N. It doesn't traverse the list
	A has only items of the same value in it (all items are MAX).	A: 7-> 7 ->7 Result: A does not change (the order of the nodes does not change either)	Yes O(N) It traverses the entire list
	MAX is on first position	A: 100-> 7->20 Result: A: 7->20->100	Yes O(N) It traverses the entire list
	MAX is on last position	A: 10-> 7->200 Result: A: 10->7->200	Yes O(N) It traverses the entire list

CODE & DRAWING for swapFirstThird (list A) (This is a reminder of what needs to be done. Do not squeeze the answer in here. Use an additional page.)

Task 2 :

The time complexity for the functions written has been specifies in the tabular column already present above. Θ is represented as O since I had issues while converting word document to pdf

Task 3 (10 points) Given:

`typedef struct node_struct * link;`	`typedef struct list_struct * list;`

```
struct node_struct  {
   int item;
   link next;
};
```

```
struct list_struct {
   link first;
   int length;
};
```

A new node structure (intended to be used to create a list of lists) is defined as follows:

```
typedef struct coll_node_struct * coll_link;
struct coll_node_struct  {

   list L;

   coll_link next;

};
```

In your drawings, **show all the data as done in class** (including the list nodes, of type `node_struct`). Use boxes for all member variables and write their value inside the box and their name outside the box.

Please find the drawing in the following pages

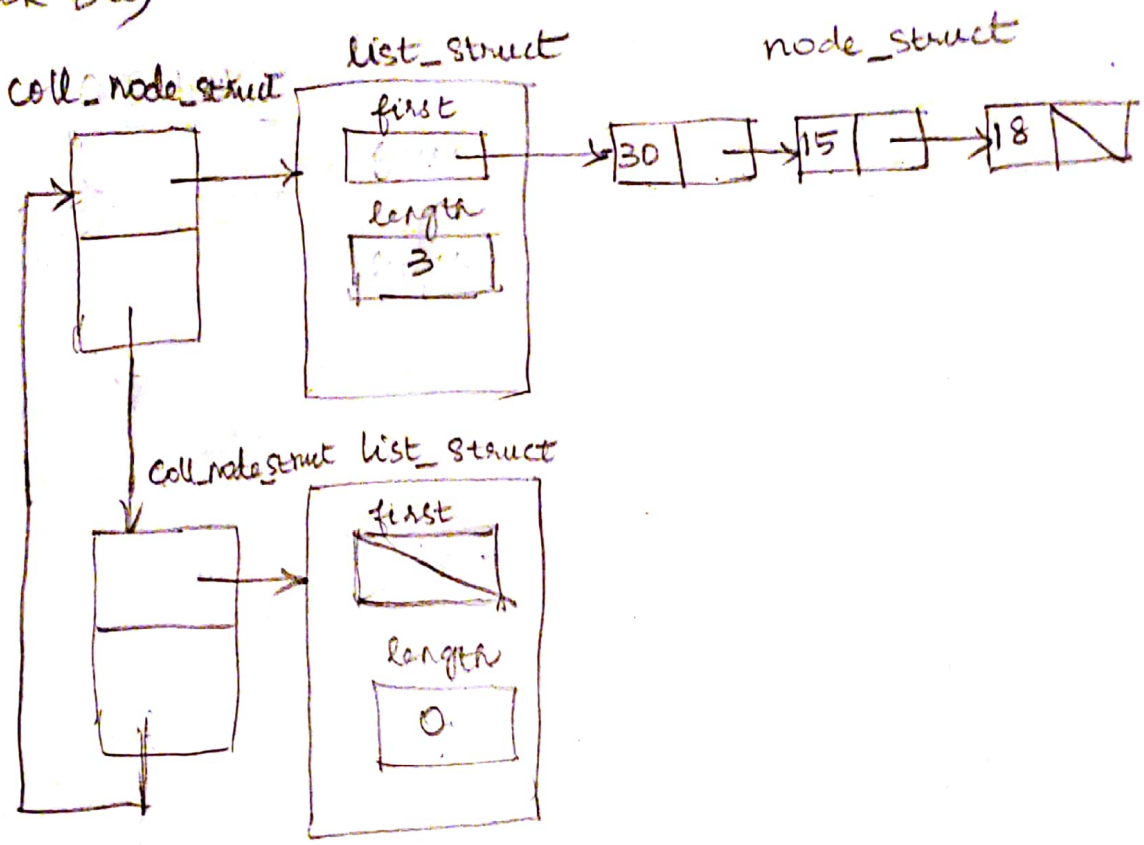
a) (7 points) Draw two nodes (of type `coll_node_struct`**)** that point to each other. For one of them L should be empty and for the other one L should be: 30->15->18 .

Please find the drawing in the following pages.

b) (3 points) Assume that an `int` is stored in 4 Bytes and a memory address is 8 Bytes. How much space will the above two nodes (and the data that they reference) occupy? That is, give the total space needed to store in memory what you drew above. **SHOW YOUR WORK**.

76 Bytes (Shown work in the following pages. Kindly look into it)

Task 3 a)



Task 3 b) Corresponding to the above diagram

Data: 2 × 4 = 8

Address: 4 × 8 = 32

Total 32

Address: 1 × 8 = 8

Total 16

Data: 3 × 4 = 12

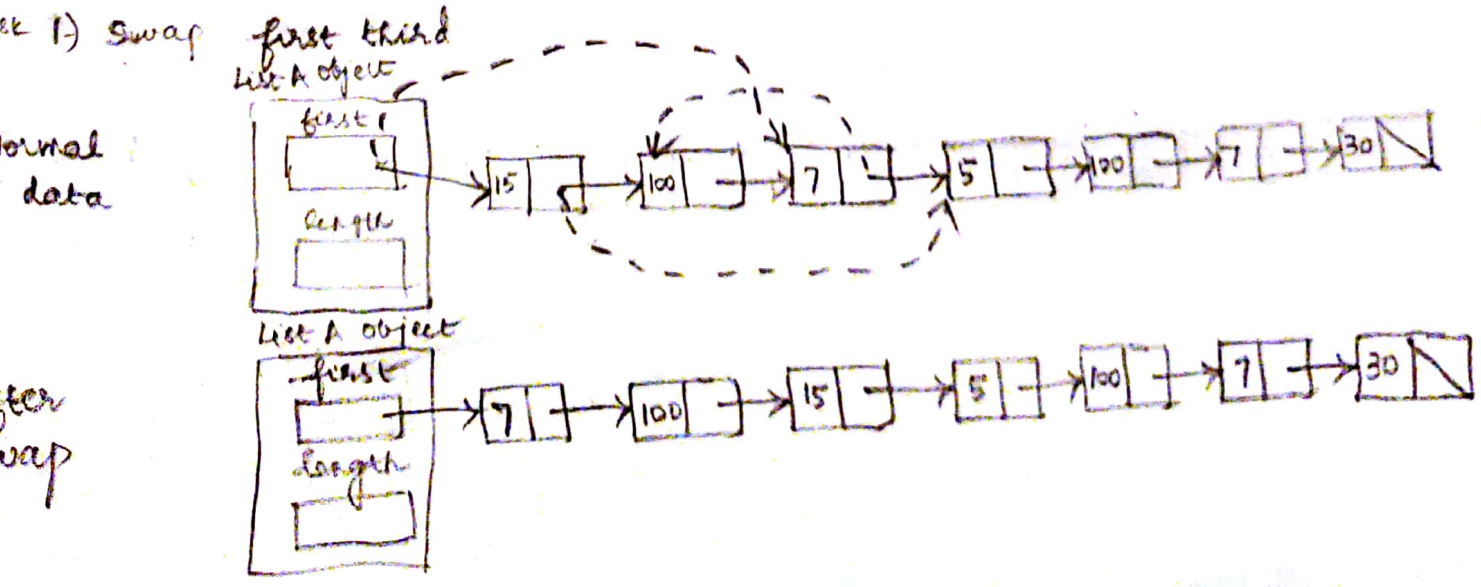
Address: 2 × 8 = 16

Total 28

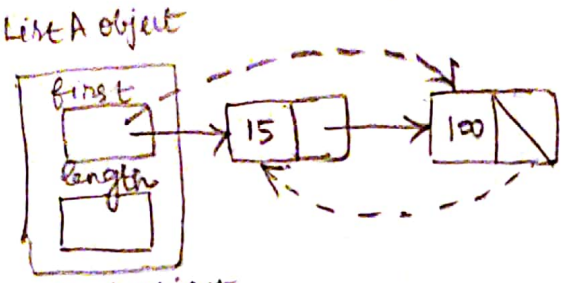
Total space needed = 32 + 16 + 28 = 76 bytes

15 → 100 → 7 → 5 → 100 → 7 → 30

Task 1) Swap first third



If list A has only two items



After swap