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Assignment D2

Binary Search and Building an Index for CS4DS

**Assignment Code:** After implementing all the assignment I pushed my code on my [Github](https://github.com/AhmedDiderRahat/csfb-wise2122/tree/main/assignment_5) link.

**Answer to the question no. 1**

After running the code and observng the documentation I have made the following decisions:-

**Case a:** list.sort() method only sort the exsiting list and return None. So, while assiginng and sorting a list in a same statement, the original list is sorted but the second list is assigning only the None from list.sort() method.

**Case b:** In this case, the list is first assigned to another list. As list assignment just assign the reference of one list to other, so list.sort() function sort both of the list.

**Case c:** In this case, sorted(list) method is used. This method sort the list and return the soterd iiterables instead of sorting the original list.

**Answer to the question no. 2**

I have implement the code using recursion. So, for the recusrssion process I consider the following assumtions.

1. **Base Conditions:** I assum base conditions are:
   1. if lower index is larger than upper then the element is not found.
   2. if the element is found in the middle of the given range.
2. **Recursive call:** If the middle point of the data is larger than the search element, we search the element into the left part otherwise into right part.



**Answer to the question no. 3**

**Time Complexity of binary search:** The binary search algorithm based on divide-and-conquere rule. So, each time its divide the data into two eual parts. So, the time complextiy follow function.

**Best case:** O(1)

**Worst case:** O()

**Average case:** O()

**Answer to the question no. 4**

For searching 1000 elements the average and worstcase complexities are given bellow:

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|  | **Average case** | **Worstcase** |
| **Linear search** | 0(n/2) = 500 | 0(n) = 1000 |
| **Binary Search** | O() = 10 | O() = 10 |

**Answer to the question no. 5**

In python, there is a build-in data strucutre name dictionary which store the data as key-value pair. So, for storing the name as index and original index as value, I use the dictionary.

**Answer to the question no. 6**

In question-5, I used dictionary. And the space complexity of dictionary is O(n).

**Answer to the question no. 7**

I implement the code in Question\_D2\_7.py file.

**Answer to the question no. 8**

The screen shot of output is given bellow:



**Answer to the question no. 8**

Yes, python dictionary is an alternative for binary search. Python dictionary used hashmap implementation internally. So, access any key of a dictionary is approximately 0(1).