CSE 30: Midterm

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CSE-30 (lab 06L)

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Question 1: Getting random elements from arrays of different sizes.

Getting any element from the array of any size at the given index always takes constant time (about 0 ms).

Regardless of how big the array is, 'get' function will only address the memory location of the provided index. $f(n) = 0$.

Here is the most useful table ever:

Number of Elements	*Access Time (ms)*
424321	0
252174	0
9992471	0
4196	0
21110342	0

Question 2: Getting a value at a given position from a linked list.

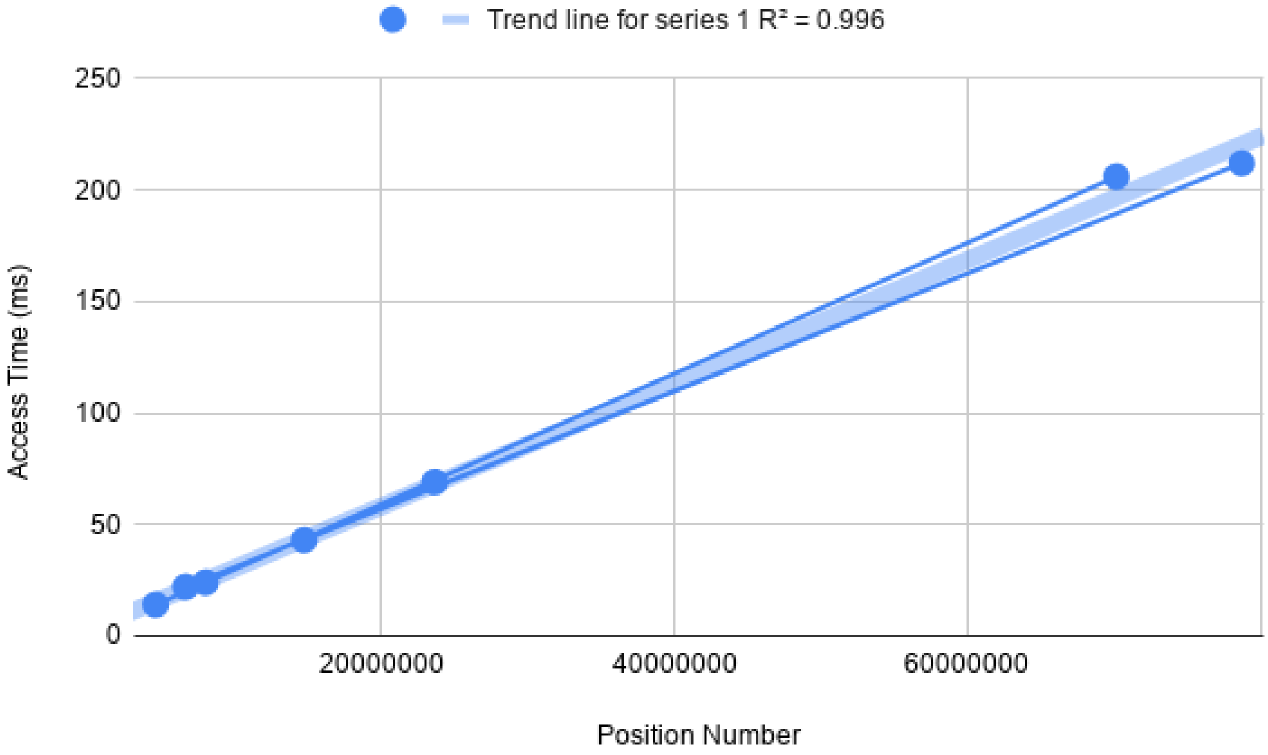
For any value, other than the first and the last ones, the loop has to iterate the amount of times given by the position. The size of the linked list won't matter because the amount of iterations in 'get' function will only depend on the given position.

In the following table we will be reading from a **constant** position from lists of different sizes to show that the access time does not depend on the size.

Number of Elements	*Access Time (ms)*
500001	2
4385080	2
7892791	1
6044371	1
79218739	1
70799205	2

$f(n) = c$, where c is the given position (in example above $c = 500000$). In other words, there is no dependency on the size of the list.

In contrast, in the following chart we will be reading from a **random** position, to show that access time depends on the position number proportionally ($f(c) = c$).



Concluding, the relationship between the size and the access time is $f(n) = c$ meaning that there is no dependency on the size of the list.

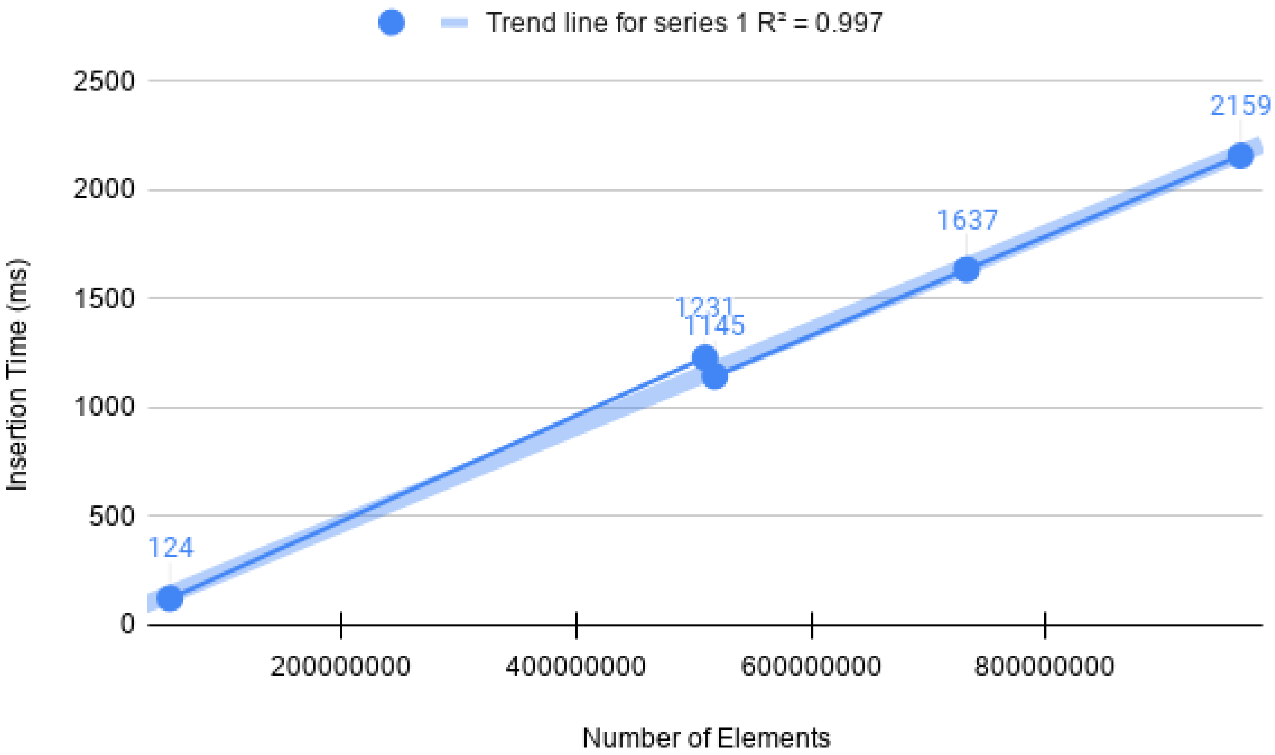
Question 3: Insertion at the end of the array.
When inserting an element at the end of the array, it is equivalent to appending an element. Meaning, there are no repeated operations to perform. The function just inserts the number into the last position (counter). Therefore, it is not dependent on the size of the array because it doesn't have to shift anything or change the values of other elements.
$f(n) = 0$.

Number of Elements	*Insertion Time (ms)*
992696996	0
46894401	0
205009095	0
179150774	0

Question 4: Insertion at the beginning of the array.

When inserting at beginning of the array, what's happening is that all elements of the array will be shifted to the right by index 1. The amount of iterations is straightly dependent on the size of the array. Furthermore, it is equal to the size of the array. The dependency is $f(n) = n$.

The following chart proves the dependency.



Question 5: Insertion at the end of the linked list.

Insertion at the end of the list is an 'append' function. It will have constant execution time, regardless of the size of the list. All it does is taking the last Node and making it's 'next' point to a newly created Node.

$f(n) = 0$. The following table shows that.

Number of Elements	*Insertion Time (ms)*
393559	0
72741810	0
3279602	0
1420676	0

Question 6: Insertion in the beginning of the linked list.

Insertion in the beginning of the linked list is a 'prepend' function. It will also have a constant execution time and all it does is creating a Node with 'next' pointing to 'head', and making 'head' point to a new node.

$f(n) = 0$. The following table shows that.

Number of Elements	*Insertion Time (ms)*
9309873	0
5161950	0
446	0
59744808	0