

Search Test Lab Report

Names:

1. Linear Search

We know from class that the theoretical time complexity of linear search over unordered lists is:

Best Case	Worst Case	Average Case
1	N	$N/2$

Q1: Increasing the number of trials and the value of N

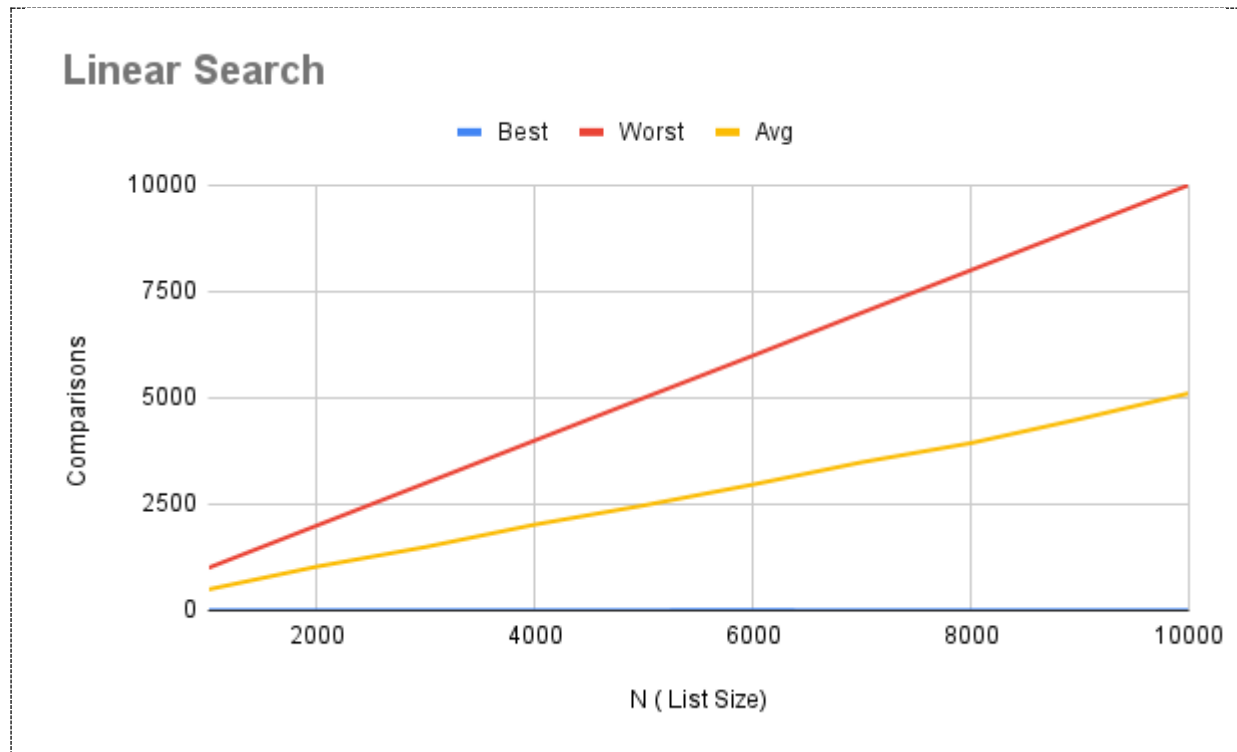
- A. Run experiments with an increasing value of N (from 1000 to 10,000). Does increasing N affect how many trials you have to run to get accurate results? Explain.

Yes, it does affect the accuracy of the result. When N increases, both the best, worst, and the average search cases increases in a linear way. Therefore, it is important to increase the number of trials so that we can minimize the errors occur.

- B. Write down the number of trials that seem to have worked well for $N=10,000$.

Number of Trials
2000

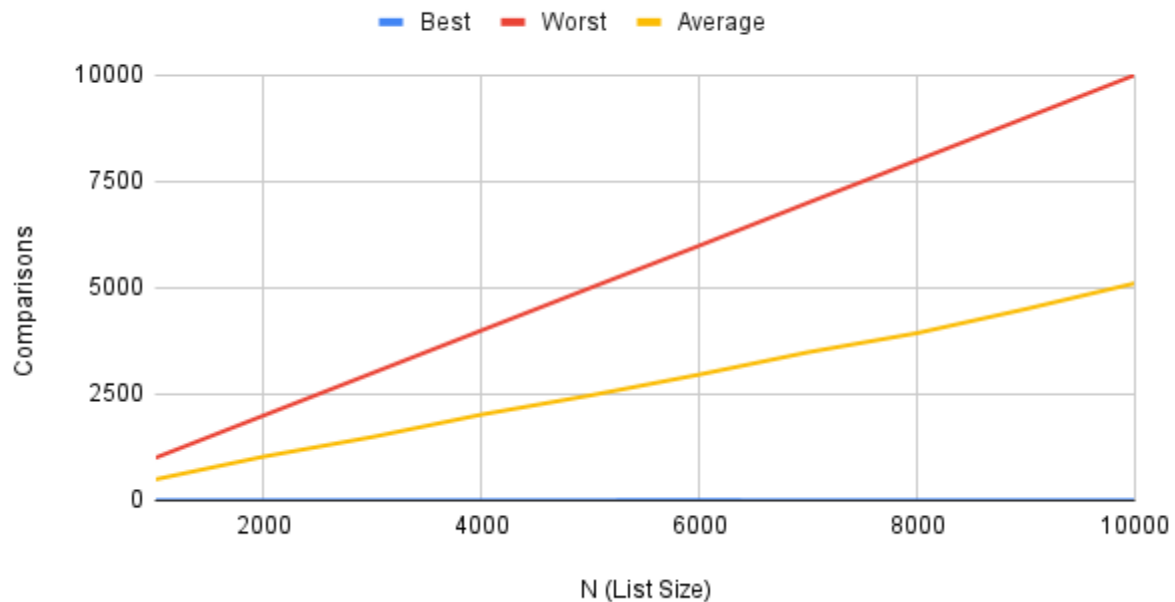
Q2: Linear Search Time Complexity Plot (Unordered List)



Q3: Does the order of the data in the list affect the number of comparisons? In the table below, guess the time complexity of Linear Search on an *Ordered List*.

Best Case	Worst Case	Average Case
1	N	N/2

Linear Search (Sorted List)



Linear Search Time Complexity Plot (Ordered List)

Conclusion:

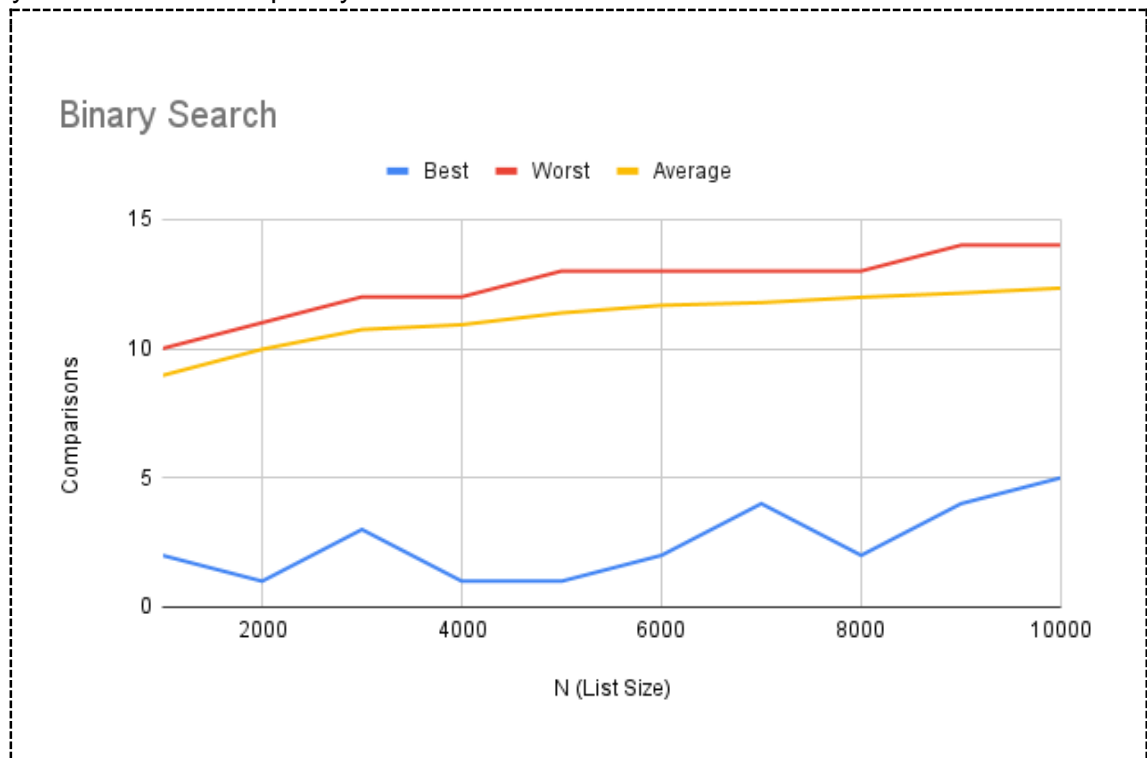
The order of the data in the list doesn't affect the number of comparisons. The worst case for linear search in sorted list is still N , the best case is 1, and the average is $N/2$.

2. Binary Search

We know from class that the theoretical time complexity of binary search over *ordered lists* are:

Best Case	Worst Case	Average Case
1	$\log_2(N)$	$\log_2(N/2)$

Q4: Binary Search Time Complexity Plot



Conclusion: What do your results tell you about the average-case complexity of Binary Search? The average-case complexity of Binary Search is almost the same as the worst-case complexity. Therefore, $\log_2(N/2)$ can be approximated as $\log_2(N)$.

3. Median

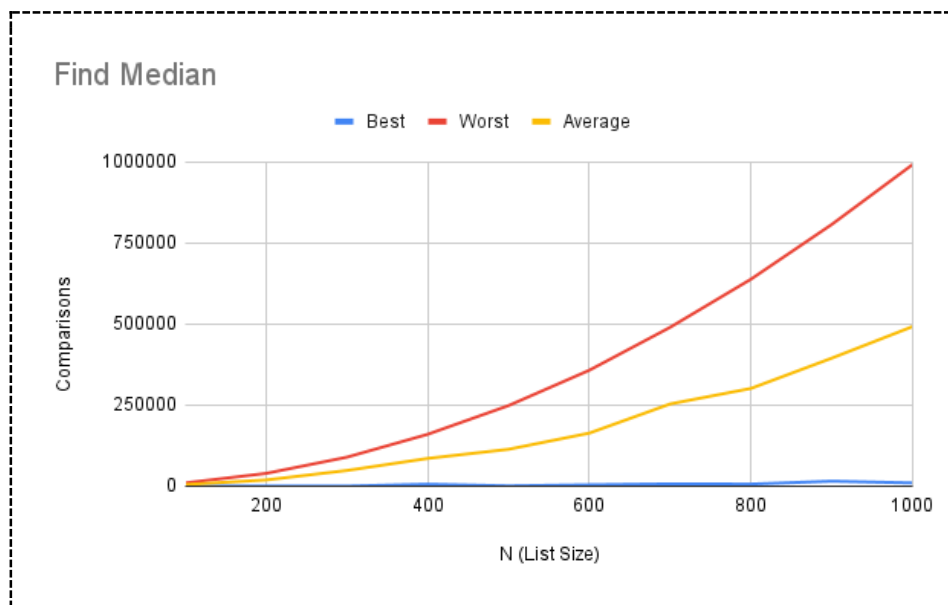
Q5: We hypothesize that the time complexity of find_median is:

Best Case	Worst Case	Average Case
N	N^2	$(N^2) / 2$

Justification:

- A. Best case scenario:
Happens when median comes at the first position of the list.
- B. Best case scenario:
Happens when median comes at the last position of the list.
- C. Average case scenario:
Happens when median comes at the middle of the list.

Find_median Time Complexity Plot



Conclusion: Did your results support your hypothesis? If not, why not, and how does it change your original hypothesis?

Yes. The tail behavior of the graph will show that with the list size increases, both the worst case and the average case are increasing exponentially.