Search Test Lab Report

Names:
Zhuocai Li

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

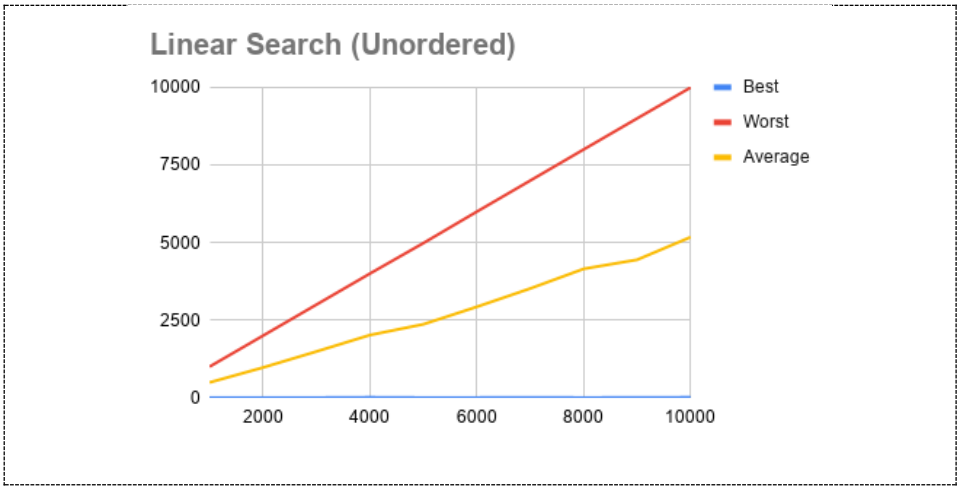
A. Run experiments with an increasing value of N (from 1000 to 10,000). Does increasing N affect how many trials you have to run to get accurate results? Explain.

The number of trial only helps to increase the accuracy of the final results, and can lead our results much closer to the ideal stage.

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

Number of Trials
1000

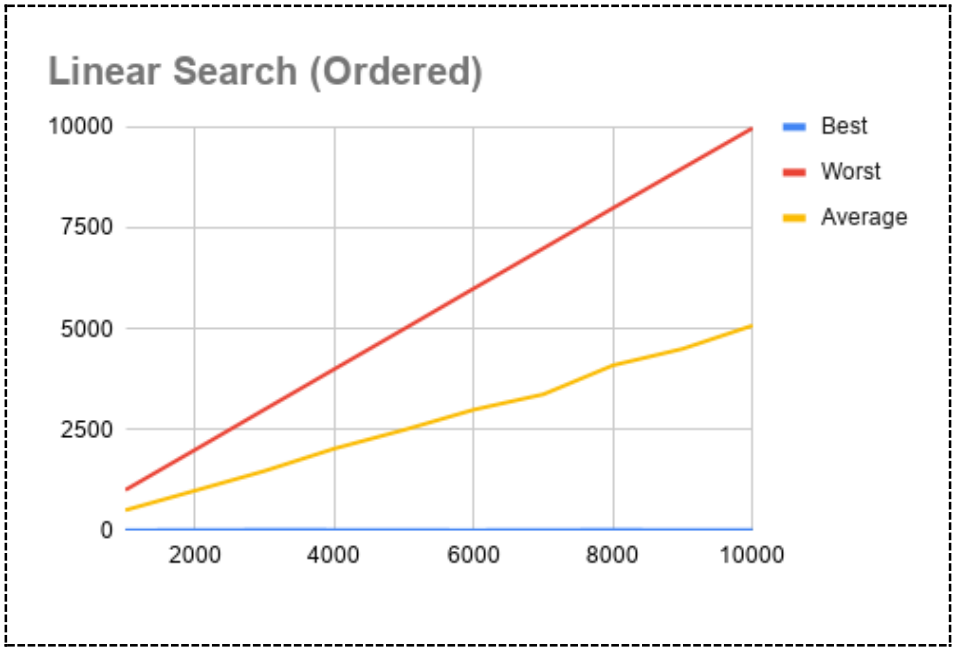
Q2: Linear Search Time Complexity Plot (Unordered List)



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 Time Complexity Plot (Ordered List)



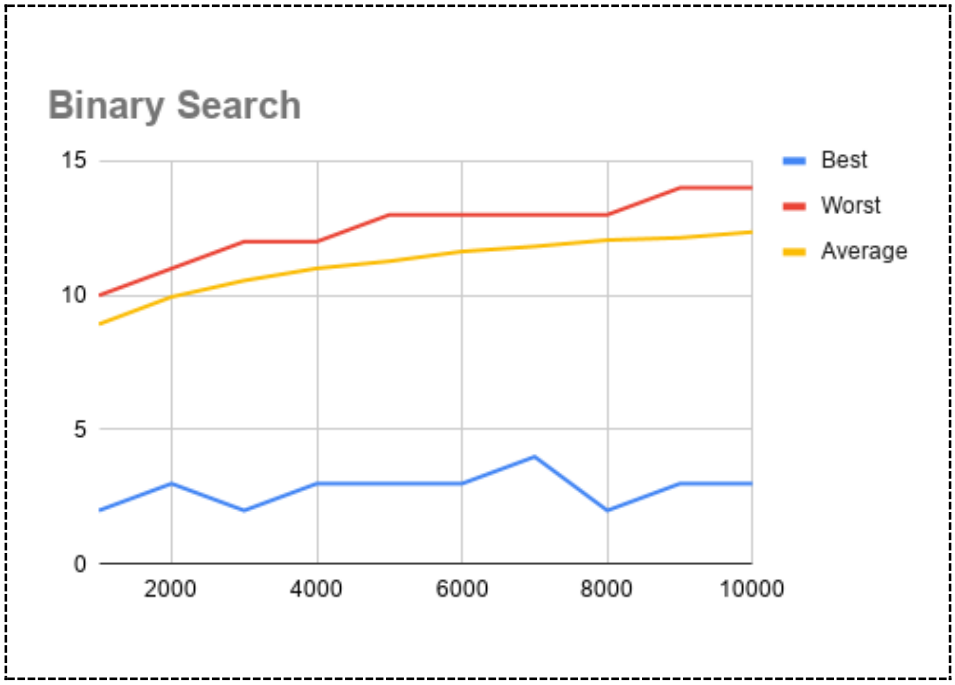
Conclusion:
No matter in an ordered list or an unordered list, the time complexity for linear search is the same, with 1 for the best case, N for the worse case, and N/2 for the average case.

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)*

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 is almost the same as the worst case, which is 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*

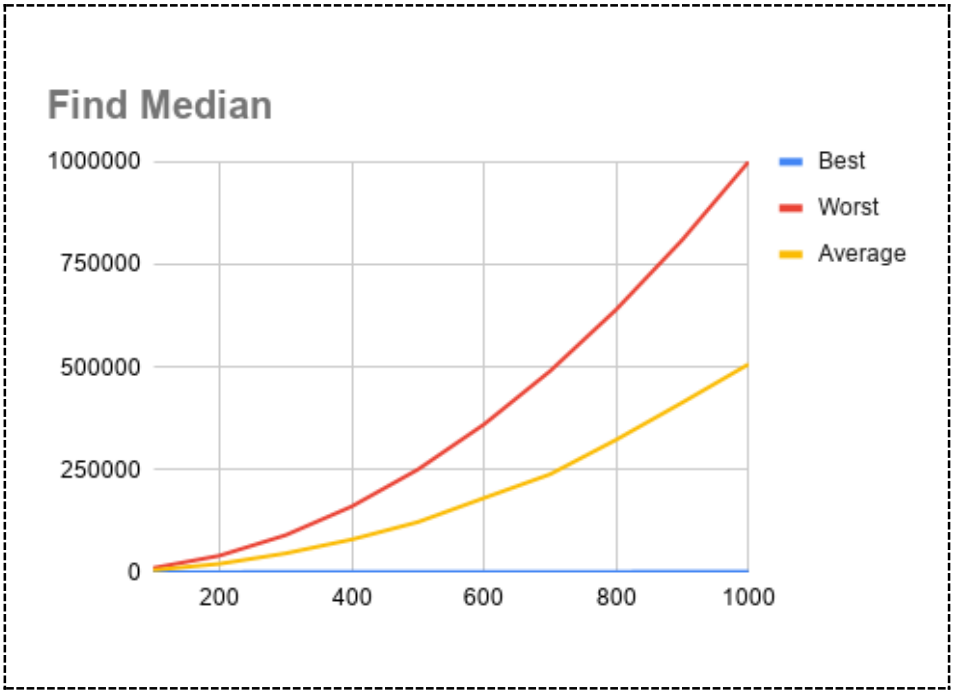
Justification:

A. Best case scenario:
Happens when...
In the first loop, when i == 1, and it finds out the median number.

B. Best case scenario:
Happens when...
In the last loop, when i == N, and it finds out the median number.

C. Average case scenario:
The average case will be the total amount of comparisons divided the total amount of trials.

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 best case will be N, the worse case will be N^2, while the average case will be N^2/2