Search Test Lab Report

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**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

1. 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.

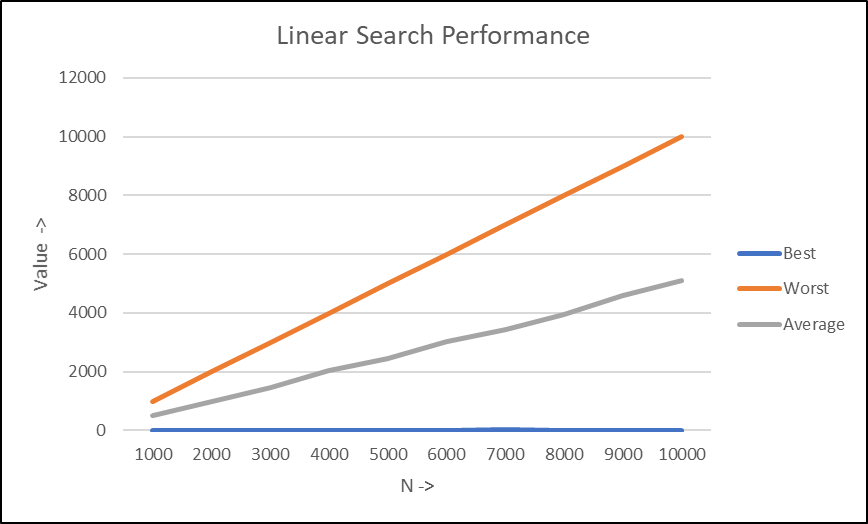
Answer: Increasing N does affect the number of trials needed to run to get accurate results. It is akin to sample size determination. The bigger the population (N) the bigger the sample size (trials) needed to represent the time complexity of the linear search. As the ratio of number of trials to N (list length) approaches 1, the results match closely to the expected behavior (linear) of the linear search algorithm.

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

|  |
| --- |
| **Number of Trials** |
| 1000 |

Number of trials did not really matter after a certain point to improve variance in the best and average performance of the linear search. However the variance in the average, best and worst outcomes does reduce as the number of trials increases.

**Q2:** Linear Search Time Complexity Plot (Unordered List)

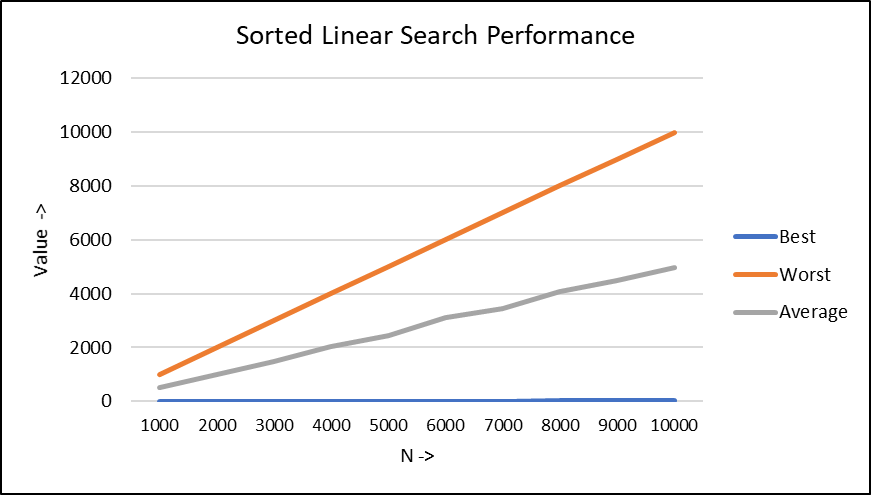


**Q3:** Does the order of the data in the list affect the number of comparisons? In the table below, guess the time complexity of Linear Search on an *Ordered List.*

|  |  |  |
| --- | --- | --- |
| **Best Case** | **Worst Case** | **Average Case** |
| 1 | N | N/2 |

Sorting should not affect the linear search

Linear Search Time Complexity Plot (Ordered List)



**Conclusion:**

**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)* | *???* |

**Q4:** Binary Search Time Complexity Plot

|  |
| --- |
| *Insert plot here* |

**Conclusion:** What do your results tell you about the average-case complexity of Binary Search?

**3. Median**

Q5: We hypothesize that the time complexity of find\_median is:

|  |  |  |
| --- | --- | --- |
| **Best Case** | **Worst Case** | **Average Case** |
|  |  |  |

**Justification:**

1. Best case scenario:

*Happens when...*

1. Best case scenario:

*Happens when...*

1. Average case scenario:

Find\_median Time Complexity Plot

|  |
| --- |
| *Insert plot here* |

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