Exercise-2

1. Understanding Asymptotic Notation

Big O Notation:

- **Big O Notation** describes the upper bound of the time complexity of an algorithm, representing the worst-case scenario for how the algorithm's runtime grows with the size of the input. It helps in analyzing and comparing the efficiency of algorithms.

Search Operations:

- **Best Case:** The best-case scenario for a search algorithm is when the target value is found immediately. For linear search, this is O(1) if the target is the first element. For binary search, this is also O(1) if the target is the middle element of the sorted array.
- **Average Case:** For linear search, this is O(n), where n is the number of elements. For binary search, it is O(log n) because the search space is halved with each step.
- **Worst Case:** The worst-case scenario for linear search is O(n) if the target is not present. For binary search, it is O(log n) when the target is not present or is found after many halving steps.

4. Analysis

Time Complexity:

- **Linear Search:**
    - **Best Case:** O(1)
    - **Average Case:** O(n)
    - **Worst Case:** O(n)
- **Binary Search:**
    - **Best Case:** O(1)
    - **Average Case:** O(log n)
    - **Worst Case:** O(log n)