2. E-Commerce Platform Search Function

Understanding Asymptotic Notation

Big O Notation:

- Big O notation is a mathematical concept used to describe the upper bound of an algorithm's runtime in terms of the input size n. It provides a way to describe the worst-case scenario for the growth rate of an algorithm's running time as the input size increases.
- It helps in comparing the efficiency of different algorithms and understanding their scalability.

Best, Average, and Worst-Case Scenarios:

- **Best Case**: The scenario where the algorithm performs the minimum number of steps. For example, in a search operation, the best case is when the desired element is the first one in the list.
- **Average Case**: The scenario where the algorithm performs an average number of steps over all possible inputs.
- **Worst Case**: The scenario where the algorithm performs the maximum number of steps. For example, in a search operation, the worst case is when the desired element is the last one or not present at all.

Analysis

1. Linear Search:

- **Pros**: Simple to implement, works on unsorted data.
- **Cons**: Inefficient for large datasets due to linear time complexity.

2. Binary Search:

- **Pros**: Much faster for large datasets due to logarithmic time complexity.
- **Cons**: Requires the data to be sorted, more complex to implement.