# Search Algorithm Analysis: E-commerce Platform

## 1. Understanding Asymptotic Notation (Big O)

Big O notation describes the performance of an algorithm as the input size increases. It helps estimate the worst-case, average-case, and best-case scenarios.

• Best Case: The algorithm completes in the minimum possible time.

• Average Case: The algorithm completes in expected average time over multiple inputs.

• Worst Case: The algorithm takes the maximum possible time.

## 2. Search Algorithms Used

• Linear Search: Scans each element until the target is found.

• Binary Search: Repeatedly divides a sorted array and compares the target with the middle element.

## 3. Time Complexity Comparison

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| --- | --- | --- | --- |
| Algorithm | Best Case | Average Case | Worst Case |
| Linear Search | O(1) | O(n) | O(n) |
| Binary Search | O(1) | O(log n) | O(log n) |

## 4. Analysis and Recommendation

Linear Search is simple and works on unsorted arrays. It is best suited for small datasets or occasional searches where sorting is not required.

Binary Search is significantly faster for large datasets but requires the array to be sorted beforehand. It is best suited for frequent search operations on large, static datasets.

For an e-commerce platform with a large product catalog and frequent searches, Binary Search is the preferred approach assuming the data is sorted.