**E-commerce Platform Search Function**

**Understand Asymptotic Notation:**

**Q1. Explain Big O notation and how it helps in analyzing algorithms.**

**ANS.** Big-O is a way to express the upper bound of an algorithm’s time or space complexity.

It describes the asymptotic behaviour of a function, not its exact value. It provides an upper limit on the time taken by an algorithm in terms of the size of the input. We mainly consider the worst case scenario of the algorithm to find its time complexity in terms of Big O.

Helps in analyzing algorithms in the following ways:

1. Performance Comparison
2. Predictive Capability
3. Resource Management

**Q2. Describe the best, average, and worst-case scenarios for search operations.**

**ANS. BEST-CASE:** The optimal scenario where the target element is found with minimal operations.

**Linear Search:** Target element is the first element in the array.

**Time Complexity:** O(1)

**Binary Search:** Target element is the middle element in the array.

**Time Complexity:** O(1)

**AVERAGE-CASE:**  Expected performance when elements are randomly distributed.

**Linear Search:** Target element is near the middle of array.

**Time Complexity:** O(n/2)

**Binary Search:** Requires logarithmic time to locate element.

**Time Complexity**: O(log n)

**WORST-CASE:** Maximum operations required when elements are in the least favorable position.

**Linear Search:** Target element is last one or not present at all.

**Time Complexity:** O(n)

**Binary Search:** Target is at the end of sub array or not at all.

**Time Complexity:** O(log n)

**ANALYSIS:**

**Q1. Compare the time complexity of linear and binary search algorithms.**

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| **TIME COMPLEXITY** | **BEST-CASE** | **AVERAGE-CASE** | **WORST-CASE** |
| **LINEAR SEARCH** | O(1) | O(n/2) or O(n) | O(n) |
| **BINARY SEARCH** | O(1) | O(log n) | O(log n) |

**Q2. Discuss which algorithm is more suitable for your platform and why.**

Binary Search is more suitable for E-commerce platform since it sorts products based on ProductID and performs well on large datasets operations which helps with scalability of the platform. Linear search only fits good when performing complementary functions on smaller and unsorted dataset.