**Understanding Asymptotic Notation**

**Big O Notation**

Big O notation is a mathematical notation used to describe the performance or complexity of an algorithm in relation to the input size. It provides an upper bound on the growth rate of the running time of an algorithm as the input size increases..

For example,.

Linear Search: Time complexity: O(n) in all cases (best, average, and worst)

Binary Search: Time complexity: O(log n) in average and worst cases, O(1) in best case (when the target is the middle element)

**Best, Average, and Worst-Case Scenarios**

* **Best-case scenario:** It is the most optimal situation for an algorithm. It represents the minimum amount of time or space the algorithm will require to complete its task.
* **Average-case scenario:** The expected performance of an algorithm under typical conditions.
* **Worst-case scenario:** The maximum amount of time or space an algorithm takes to complete its task. This is essential to know whether the selected algorithm is optimal or not.

**Analysis**

For an e-commerce platform with a large product catalog, binary search is generally the preferred choice due to its significantly better average and worst-case time complexity. However, the data must be sorted, which might incur additional time. If the product catalog is relatively small or frequently updated, linear search might be sufficient.