**1. Understanding Asymptotic Notation**

**✅ Big O Notation:**

* Big O notation describes the **upper bound** of an algorithm's time or space complexity as the input size increases.
* It helps in evaluating the **scalability and performance** of algorithms without focusing on hardware specifics.

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

For **search operations**:

* **Linear Search**:
  + Best: O(1) → if the element is at the beginning.
  + Average: O(n)
  + Worst: O(n)
* **Binary Search** (on sorted data):
  + Best: O(1) → if the element is at the middle.
  + Average & Worst: O(log n)