**Name: Sukisivam Balakrishnan  
Superset ID:  6412333  
Exercise 2: Ecommerce Platform Search Function**

**Objective:**

To develop an efficient product search mechanism for an e-commerce platform using Data Structures and Algorithms (DSA). The focus is on analyzing and comparing linear and binary search techniques to ensure fast and accurate product retrieval.

**1. Understanding Asymptotic Notation**

* **Big O Notation (O)** helps measure the performance of an algorithm as input size grows.
  + **Best-case**: Minimum time taken for an algorithm (e.g., item found at first index).
  + **Average-case**: Expected time for typical inputs.
  + **Worst-case**: Maximum time taken (e.g., item not found or at the end).

Example:

* **Linear Search**:
  + Best: O(1)
  + Average: O(n)
  + Worst: O(n)
* **Binary Search** (on sorted data):
  + Best: O(1)
  + Average: O(log n)
  + Worst: O(log n)
* **4. Analysis**

| **Criteria** | **Linear Search** | **Binary Search** |
| --- | --- | --- |
| Time Complexity | O(n) | O(log n) |
| Data Requirement | Unsorted Array | Sorted Array |
| Performance (Large) | Slower | Much Faster |
| Ease of Use | Very Simple | Needs sorting |

* **Recommendation:**
* For **small datasets**, linear search is sufficient.  
  For **large datasets (hundreds to millions of products)**, **binary search** is more efficient due to logarithmic time complexity.

**Output:**

