**Exercise 2: E-commerce Platform Search Function**

**1. Understand Asymptotic Notation**

**Big O Notation:**

* Big O notation describes the upper bound of an algorithm’s running time or space requirement in terms of input size (n).
* It helps analyse the scalability and efficiency of algorithms.
* Focuses on the growth rate rather than exact execution time.

**Search Operation Scenarios:**

| **Case** | **Linear Search (Unsorted Data)** | **Binary Search (Sorted Data)** |
| --- | --- | --- |
| Best Case | O(1) (first item matches) | O(1) (middle item matches) |
| Average Case | O(n/2) ≈ O(n) | O(log n) |
| Worst Case | O(n) | O(log n) |

**2. Analysis**

**Time Complexity Comparison:**

| **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) |

**Suitability for Platform:**

* **Binary Search** is ideal for:
  + Large datasets
  + Static or infrequently updated product lists
  + Scenarios where fast response is critical
* **Linear Search** is suitable for:
  + Small datasets
  + Frequently updated or unsorted data
  + Simple search needs with minimal setup

**Conclusion**

* Big O notation is essential to compare and select the right search algorithm.
* Binary search offers superior performance for large, sorted datasets typical in e-commerce platforms.
* Linear search can still be useful in flexible or small-scale scenarios.