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

**1.What is Big O Notation?**

* **Big O notation** describes the **upper bound** of an algorithm’s runtime as input size grows.
* It helps you understand **how fast** your algorithm will perform on large datasets.
* Example:
  + O(1) → Constant time
  + O(n) → Linear time
  + O(log n) → Logarithmic time
  + O(n log n), O(n²), etc.

**2.Best, Average, and Worst Case for Search:**

* **Best Case:** The item is found at the very beginning (fastest possible match).
* **Average Case**: The item is found somewhere in the middle after checking some elements.
* **Worst Case:** The item is at the end or not present at all (maximum comparisons needed).

| **Scenario** | **Linear Search** | **Binary Search** |
| --- | --- | --- |
| **Best Case** | O(1) | O(1) |
| **Average Case** | O(n/2) ≈ O(n) | O(log n) |
| **Worst Case** | O(n) | O(log n) |

**3.Analysis:**

| **Algorithm** | **Time Complexity** | **Sorted Required** | **Suitable for Large Data?** |
| --- | --- | --- | --- |
| **Linear Search** | O(n) | No | No (slow for large data),suitable for the small data and unsorted ones |
| **Binary Search** | O(log n) | Yes | Yes (very fast) |