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

**Scenario:**

You are working on the search functionality of an e-commerce platform. The search needs to be optimized for fast performance.

**Steps:**

1. **Understand Asymptotic Notation:**
   * Explain Big O notation and how it helps in analyzing algorithms.
   * Describe the best, average, and worst-case scenarios for search operations.
2. **Setup:**
   * Create a class **Product** with attributes for searching, such as **productId, productName**, and **category**.
3. **Implementation:**
   * Implement linear search and binary search algorithms.
   * Store products in an array for linear search and a sorted array for binary search.
4. **Analysis:**
   * Compare the time complexity of linear and binary search algorithms.
   * Discuss which algorithm is more suitable for your platform and why.

**Algorithm Analysis**

* **Time Complexity**:
  + **Linear Search**: O(n) in worst/average cases. Checks each element sequentially.
  + **Binary Search**: O(log n) in worst/average cases. Halves search space each iteration.
* **Suitability for E-commerce Platform**:
  + In an e-commerce platform, Binary Search is more suitable for product lookup, as it can locate an item among one million in about 20 steps, compared to up to a million with Linear Search. However, **it requires the product list to be sorted,** which is feasible during data updates using O(n log n) sorting algorithms. This one-time cost is amortized, making Binary Search optimal for scalable, high-performance search operations in large product catalogs.