**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**

Big O notation describes the upper bound of an algorithm's time complexity, providing a worst-case scenario of how the runtime or space requirements grow as the size of the input increases. It helps in analyzing and comparing the efficiency of different algorithms by focusing on the growth rate rather than specific runtime values..

* + **Describe the best, average, and worst-case scenarios for search operations.**

**Best Case:** The scenario where the algorithm performs the least number of operations. For example, in a linear search, the best case occurs when the desired element is the first in the list (O(1)).

**Average Case:** The expected complexity under typical or random input conditions.

**Worst Case:** The scenario where the algorithm performs the maximum number of operations. For a linear search, this is when the element is either not present or is the last one in the list (O(n)).

1. **Analysis:**
   * **Compare the time complexity of linear and binary search algorithms**.

**Time Complexity Comparison:**

* **Linear Search:** O(n) in the worst case, where n is the number of products. This is because it may need to check every element in the list.
* **Binary Search:** O(log n) in the worst case, as the search space is halved in each step. However, it requires the array to be sorted.
  + **Discuss which algorithm is more suitable for your platform and why**.

Binary search is generally more suitable for large datasets due to its logarithmic time complexity, provided the data is sorted. However, if the dataset is small or unsorted, linear search may be sufficient and simpler to implement.