**ANSWER**

**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 is a mathematical notation used to describe the complexity of an algorithm, that is,  the time or space required by the algorithm relative to the size of the input. It focuses on the worst  case scenario to provide an upper bound and helps in understanding how the algorithm scales as the  input size increases.

O(1): Uniform time complexity;    
O(n): Linear time complexity;    
O(log n): Logarithmic time complexity;    
O(n^2): Quadratic time complexity;

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

🡪Best case: The scenario where the search takes the shortest amount of time (e.g. the target is at  the beginning of the array).  
Average: A condition representing the time required for each access point.  
Worst case scenario: The scenario where the search takes the longest amount of time (e.g. the target is at the end of the array or does not exist).

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

🡪 **Linear Search**:

* Best Case: O(1) (if the target element is at the beginning of the array)
* Average Case: O(n) (on average, half the elements will be checked)
* Worst Case: O(n) (if the target element is at the end or not present)

**Binary Search**:

* Best Case: O(1) (if the target element is at the middle of the array)
* Average Case: O(log n) (the search space is halved in each step)
* Worst Case: O(log n) (if the target element is at the extreme end)
  + **Discuss which algorithm is more suitable for your platform and why.**

🡪 For ecommerce businesses with large products, binary search is more suitable due to its efficiency in processing large data. However, it requires control of the index in the analysis, which can be  controlled by the analysis process or data structure, such as parallel trees or indexed data into  dynamic data.