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

**1. Asymptotic Notation:**

Big O Notation describes how the runtime or space requirements of an algorithm grow as the input size increases.

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

• Linear Search:

- Best Case: O(1) (element found at start)  
 - Average Case: O(n/2) ≈ O(n)  
 - Worst Case: O(n) (element not found or last position)

• Binary Search:

- Best Case: O(1) (element found at middle)  
 - Average and Worst Case: O(log n) (input is halved each time)

**3. Implementation Summary:**

Linear search is implemented using a simple loop over an array. Binary search requires the array to be sorted and uses a divide-and-conquer approach.

**4. Time Complexity Comparison:**

• Linear Search: O(n)  
• Binary Search: O(log n)

**5. Suitability:**

Binary Search is preferable for large sorted datasets. Linear search is suitable for small or unsorted arrays.

**Conclusion:**

Binary Search is more efficient in terms of time complexity but requires pre-sorted data. Real-world applications like product searches in e-commerce platforms use indexing and search trees for optimization.