Exercise 2: E-commerce Platform Search Function

Understand Asymptotic Notation:

1. **Big O Notation** : Big O notation is a mathematical way to describe the efficiency of an algorithm as the input size increases. It tells us how the time or space needed by an algorithm grows, helping us analyze and compare different algorithms regardless of hardware or programming language.Big O focuses on worst-case growth rate and ignores constants or lower-order terms, providing a high-level understanding of performance.

2. **What is the use of this notation** :
    - Helps identify potential bottlenecks in algorithms.
    - Enables selection of optimal algorithms for performance-sensitive applications.
    - Provides a standard metric for comparing search, sort, or other operations.

3. **Comparison** :

Algorithm	Best Case	Average Case	Worst Case
Linear Search	O(1)	O(n/2)	O(n)
Binary Search	O(1)	O(log n)	O(log n)

4. **Analysis** :
    1. Binary Search is more suitable for performance-critical operations such as searching by product ID in a sorted dataset.
    2. Ideal for structured fields like product IDs.
    3. Linear search is used when data is unsorted.
    4. Linear search is used For searching flexible fields like product names, where full-text search or string matching techniques may be needed instead.
    5. Linear Search goes through each element until it finds a match or reaches the end
    6. Binary Search repeatedly divides the sorted array and narrows down the search range logarithmically.