E-commerce Platform: Search Function using Linear and Binary Search

# 1. Understanding Asymptotic Notation

Big O notation is used to describe the efficiency of algorithms in terms of their time or space complexity. It helps us understand how the algorithm will perform as the size of the input data grows.

For search operations, we evaluate best-case, average-case, and worst-case time complexities. Here's how it looks:

- Linear Search: Best - O(1), Average - O(n), Worst - O(n)  
- Binary Search: Best - O(1), Average - O(log n), Worst - O(log n)

# 2. Product Class Setup

We created a simple `Product` class that holds attributes like productId, productName, and category. This helps simulate real-world product data in an e-commerce platform.

# 3. Implementation of Search Algorithms

We implemented two types of search functions:  
- Linear Search: Goes through the product list one by one to find a match.  
- Binary Search: Requires the array to be sorted. It divides the array and searches efficiently.

# 4. Algorithm Comparison

Linear Search is simple and works on unsorted arrays, but it's slow for large datasets.  
Binary Search is faster but needs the data to be sorted. It's ideal for large platforms where quick searches matter.

# 5. Conclusion and Sample Output

Both search methods were tested on a sample product array. The binary search gave fast results after sorting.  
Sample Output:  
--- Linear Search ---  
Found: [103] Phone - Electronics  
  
--- Binary Search ---  
Found: [103] Phone - Electronics