**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.
   * Describe the best, average, and worst-case scenarios for search operations.
2. **Setup:**
   * Create a class **Product** with attributes for searching, such as **productId, productName**, and **category**.
3. **Implementation:**
   * Implement linear search and binary search algorithms.
   * Store products in an array for linear search and a sorted array for binary search.
4. **Analysis:**
   * Compare the time complexity of linear and binary search algorithms.
   * Discuss which algorithm is more suitable for your platform and why.

Big O notation is a mathematical formula that is applied to quantify an algorithm's performance with respect to input size. It is concerned with the rate at which runtime or space consumption increases, allowing developers to compare and analyze algorithms. Through examining time complexity, Big O assists in finding scalable solutions, particularly for handling large sets of data or high-performance applications.

Performance is quantified in the best, average, and worst case in search operations. Best case, when the item is instantly located (O(1)), the average case, usual performance over a period of time (O(n)), and worst case, when the item isn't located (O(n) or O(log n) if sorted).

Output:

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 1

Product List

[101, Laptop, Electronics]

[205, Shampoo, Personal Care]

[150, Mobile Phone, Electronics]

[302, Notebook, Stationery]

[180, Smart Watch, Wearable]

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 2

Enter Product ID: 101

Product Found: [101, Laptop, Electronics]

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 3

Enter Product ID: 150

Product Found: [150, Mobile Phone, Electronics]

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 4

Enter Product Name: laptop

Products Found:

[101, Laptop, Electronics]

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 5

Enter Category: care

No products found in category: care

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 6

Enter Product ID: 120

Enter Product Name: Facewash

Enter Category: Beauty

Product added successfully.

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 1

Product List

[101, Laptop, Electronics]

[205, Shampoo, Personal Care]

[150, Mobile Phone, Electronics]

[302, Notebook, Stationery]

[180, Smart Watch, Wearable]

[120, Facewash, Beauty]

E-commerce Product Search

1. View Products

2. Search by Product ID (Linear Search)

3. Search by Product ID (Binary Search)

4. Search by Product Name

5. Search by Category

6. Add New Product

7. Exit

Enter your choice: 7

Exiting. Thank you!

C:\Users\KIIT\OneDrive\Desktop\Digital-Nurture-4.0-DotNetFSE-main\Solution\week-1\algorithms\ex2\bin\Debug\ex2.exe (process 23880) exited with code 0 (0x0).