1. **Understand the Problem:**

* Explain why data structures and algorithms are essential in handling large inventories.

Soln:

In an inventory management system, handling large amounts of data fast and precisely are crucial for efficient data storage and retrieval. The choice of data structures and algorithms impacts the performance of operations like searching for products, updating quantities, and managing inventory levels. Proper data structures ensure that these operations are performed efficiently, which is essential for maintaining a responsive and effective inventory system.

* Discuss the types of data structures suitable for this problem.

Soln:

1. ArrayList which is good for scenarios where the size of the inventory is relatively small and operations involve frequently accessing elements by index. However, its performance in operations like insertion and deletion is not optimal for larger datasets.
2. HashMap which is excellent for scenarios where quick lookups, insertions, and deletions are needed. It allows you to access elements using a unique key (e.g., productId), providing average O(1) time complexity for these operations.

4. **Analysis:**

* Analyze the time complexity of each operation (add, update, delete) in your chosen data structure.

Soln:

Time Complexity of each operations (add, update, delete) is O(1).

* Discuss how you can optimize these operations.

Soln:

Add and Delete Operations can be optimized by pre allocating capacity (i.e.) initializing the HashMap when the size is known prior, lazy initialization and batch processing.