**Exercise-1: Inventory Management System**

**Understand the Problem:**

Efficient data structures and algorithms are essential in handling large inventories because they enable:

* Quick access to product information.
* Easy modification of product details.
* Handling large amounts of data without significant performance degradation.

**Suitable Data Structures:**

**ArrayList**:Provides fast access by index but slow insertions and deletions (O(n) in worst case).

**HashMap**:Offers average O (1) time complexity for insertions, deletions, and lookups. Ideal for our needs since it allows fast access to products by their unique IDs.

**Analysis:**

**1.Time Complexity:**

Add Product: O (1)

Update Product: O (1)

Delete Product: O (1)

**2.Optimization:**

* Using a HashMap ensures that all operations (add, update, delete) have an average time complexity of O(1). This is the optimal choice for handling a large inventory efficiently.