**Exercise 1: Inventory Management System**

**Scenario:**

You are developing an inventory management system for a warehouse. Efficient data storage and retrieval are crucial.

**Steps:**

1. **Understand the Problem:**
   * Explain why data structures and algorithms are essential in handling large inventories.
   * Discuss the types of data structures suitable for this problem.
2. **Setup:**
   * Create a new project for the inventory management system.
3. **Implementation:**
   * Define a class Product with attributes like **productId**, **productName**, **quantity**, and **price**.
   * Choose an appropriate data structure to store the products (e.g., ArrayList, HashMap).
   * Implement methods to add, update, and delete products from the inventory.
4. **Analysis:**
   * Analyze the time complexity of each operation (add, update, delete) in your chosen data structure.
   * Discuss how you can optimize these operations.

**ANSWER:**

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

Data Structures and Algorithm are essential in handling large inventories because they knew how data are stored, organized and retrieved. Selection of suitable data type for the given problem would minimize the time complexity of the given problem. This impacts the system’s performance and the scale ability of the program that is written.

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

The suitable data structure for the given problem would be Array list and hash maps. Both these data structures have their own advantages and disadvantages. For this program I would like to choose Hash map as it has an average time complexity of O(1) .

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

* Add product - O(1).
* Update product - O(1)
* Remove product - O(1)

**Discuss how you can optimize these operations.**

* Indexing
* Concurrency
* Memory management