**Exercise 1: Inventory Management System**

**Scenario:**

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

**Understanding the Problem:**

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

Data structures and algorithms are essential in handling large inventories because they provide efficient ways to store, retrieve, and manipulate data. Proper use of data structures ensures that operations such as adding, updating, and deleting inventory items are performed quickly, even as the inventory size grows. Algorithms help in optimizing these operations, ensuring that the system remains performant and scalable.

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

1. **ArrayList**: Useful for maintaining an ordered collection of products. However, searching, adding, and deleting can be slow for large inventories.
2. **HashMap**: Provides fast access, insertion, and deletion based on keys. It is ideal for inventory management where each product can be identified by a unique product ID.

**Setup:**

I have used Visual Studio to create a new project for InventoryManagement

**Implementation:**

I used HashMap data structure for implementation of this exercise. Feel free to refer code in java files

**Analysis:**

**Add Operation:**

Time Complexity: O(1) - Adding a product to the HashMap is a constant-time operation.

**Update Operation:**

Time Complexity: O(1) - Updating a product in the HashMap is a constant-time operation.

**Delete Operation:**

Time Complexity: O(1) - Deleting a product from the HashMap is a constant-time operation.