Exercise 1: Inventory Management System Theory

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

Ans-> Efficient data structures and algorithms are essential for handling large inventories to ensure quick access, modification, and storage of data, minimizing processing time and maximizing performance.

2.) Discuss the types of data structures suitable for this problem.

Ans-> The suitable data structures for this problem are:

- **ArrayList**: For maintaining a simple list of products with efficient indexing.
- **HashMap**: For quick access, insertion, and deletion based on product IDs. This reduces time complexity and increases efficiency.

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

Ans-> **Time Complexity**

- **Add Operation**: O(1) - Constant time.
- **Update Operation**: O(1) - Constant time.
- **Delete Operation**: O(1) - Constant time.

4.) Discuss how you can optimize these operations.

Ans-> Since all our CRUD operations time complexity are of constant time i.e O(1) there is no need for more optimization unless some other functionalities are added to the system.

Output of the following Inventory Management System Code –

```
77d4e49adbe734794e12\redhat.java\jdt_ws\WEEK_1_1c5717f5\bin' 'InventoryManagementSystem
.InventoryManagementTest'
The following products are added :
Product [Id=P001, Name=Sunlight, quantity=10, price=100.0]
Product [Id=P002, Name=Dettol, quantity=5, price=150.0]
Updated product P002:
Product [Id=P002, Name=Dettol(Big), quantity=15, price=200.0]
Deleted product P001:
null
```