Inventory Management System

**Understanding the problem.**

Data structures and algorithms are essential in handling large inventories because of the following reasons :

1. Data structures and algorithms ensure that operations such as adding, updating, and deleting inventory items can be performed quickly, even with large inventories.
2. Ensure that the operations such as searching from a wide range of products and efficient with the scaling inventory.

**Suitable Data Structures:**

* **ArrayList =>** Useful for storing products in a dynamic array that can grow as needed. It allows for fast iteration and access by index but can be slow for inserting or deleting elements in the middle.
* **HashMap =>** Useful for storing products in a key-value pair format where the key is the product ID. This allows for fast lookups, inserts, and deletes by product ID, making it highly efficient for this use case.

**Time Complexity Analysis:**

* **Add Product:** the average time complexity for adding a product is O(1) since it involves inserting a HashMap.
* **Update Product:** The average time complexity for updating a product is O(1) because it involves accessing the product by its key and updating the value.
* **Delete Product:** The average time complexity for deleting a product is O(1) since it involves deleting the element from HashMap.

**Optimization Discussion:**

* Using immutable keys (like Strings) ensures the hash value does not change, preventing accidental mismatches or data loss. Hence we get an optimized approach to solving the problem

4o