Importance of Data Structures and Algorithms

Efficient data structures and algorithms are essential for managing large inventories because they: Optimize performance: Ensure fast access, modification, and retrieval of data.

Reduce complexity: Simplify the management of large data sets.

Improve scalability: Allow the system to handle ever-increasing amounts of data without significant performance degradation.

Suitable data structures

ArrayList: Suitable for dynamic arrays that do not need to be added and deleted frequently.

HashMap: Best for fast searching, inserting, and deleting based on unique keys (e.g. ProductId).

TreeMap: Useful if you need to sort the order of items.

Linked List: Suitable for cases where frequent insertion and deletion are required.

Analysis

Time Complexity

Add Product: O(1) - HashMap allows constant time insertion.

Update Product: O(1) - Similar to adding, updating is also O(1).

Delete Product: O(1) - Deletion in a HashMap is constant time.

Retrieve Product: O(1) - Lookup in a HashMap is constant time.