WEEK\_1\_ALGORITHMS\_DATA\_STRUCTURES

Exercise 1: Inventory Management System.

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

Data structures and algorithms are an easy way for us to efficiently optimize tasks in software engineering. In case of handling large inventories, we need to take notice of efficient data storage and retrieval in order to ensure quick access and updates. It would also help us in scaling the inventory when the inventory grows with time. Algorithms help us to optimize operations like searching, adding, retrieval and deletion of data items since they’re frequent in inventory management.

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

The two data structures suitable for this problem are:

**ArrayList**: Helps in fast access to elements using an index. Suitable for smaller inventories where operations are not frequent.

**HashMap**: Has average constant-time complexity for insert, update, and delete operations. Suitable for larger inventories due to efficient key-based access.

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

Add product: Average O(1) time complexity due to HashMap insertion.

Update product: Average O(1) time complexity since it's essentially a re-insertion if the key exists.

Delete product: Average O(1) time complexity as it involves removing the key.

1. Discuss how you can optimize these operations.

We can optimize the operations by involving indexing procedures. This is true if searches are based on attributes and not productids.