**Analysis**

**Time Complexity Analysis**

**DataStructure :- HashMap<Integer, Product>:**

The HashMap is chosen because it allows efficient access by productId, which is assumed to be unique.

**Operations:**

**Add –** O(1)

**Update –** O(1)

**Delete –** O(1)

**Search –** O(1) or O(n)

**Why O(1) on average?**  
Because HashMap uses **hashing** to directly access the memory location of the key, making lookup, insertion, and deletion extremely fast under normal conditions.

**Optimization Strategies:**

1. **HashMap** – Fast O(1) operations
2. **Unique IDs** – Avoid collisions
3. **Indexes** – Use name/price maps
4. **Checks** – Avoid redundant operations
5. **Validation** – Ensure valid input
6. **Scalability** – Use databases when needed