Exercise 5: Task Management System

# 1. Understand Linked Lists

## Singly Linked List:

A Singly Linked List is a data structure in which each node contains data and a reference (link) to the next node in the sequence. It allows traversal in only one direction (from head to tail). Operations such as insertion and deletion are efficient at the beginning but slower at the end.

## Doubly Linked List:

A Doubly Linked List is a more complex structure where each node contains a reference to both the next and the previous node. This allows traversal in both forward and backward directions, making it more flexible but using more memory due to the extra pointer.

# 4. Analysis

## Time Complexity of Operations:

* Add (at end): O(n) in singly linked list, O(1) if tail reference is maintained
* Search: O(n), as we may need to traverse the entire list
* Traverse: O(n), visiting each node once
* Delete: O(n), as we need to find the node and its previous node

## Advantages of Linked Lists over Arrays:

* Dynamic Size: Linked lists can grow and shrink at runtime, unlike arrays which have a fixed size.
* Efficient Insertions/Deletions: Adding or removing elements is easier and faster (especially at the beginning or middle) compared to arrays.
* No Memory Wastage: Unlike arrays, linked lists do not reserve extra memory.