

# Experiment 1

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## **Q1. Advantages of Lists**

Lists are a data structures with various advantages:

- **Direct Access:** Elements in a list can be accessed directly using their index.
- **Dynamic Sizing:** Lists can grow or shrink dynamically, which is useful for applications where the number of elements can change over time.
- **Flexibility:** Lists can store elements of the same type or different types providing versatility in data storage.
- **Versatile Operations:** Lists support a wide range of operations, including insertion, deletion, sorting and searching.
- **Compatibility:** Lists can be easily converted to other data structures.
- **Efficient Iteration:** Lists allow for efficient traversal and iteration over elements.
- **Commonly used:** Lists are supported by most programming languages, making them readily available.

## **Q3. ADT Functions for Lists**

Abstract Data Types (ADTs) define the expected behaviour and operations of a data structure without specifying the implementation details.

- **createList():** Initializes a new, empty list.
- **insertAtPosition(list, position, element):** Inserts an element at a specified position in the list.
- **deleteAtPosition(list, position):** Removes the element at a specified position in the list.
- **getElementAtPosition(list, position):** Returns the element at a specified position.
- **IsEmpty():** Returns true if the list is empty, false otherwise.

These ADT functions provide a comprehensive set of operations for managing lists effectively in various programming contexts.

## Q2. Comparison of ADT, Data Types, and Data Structures

Feature	ADT	Data Type	Data Structure
<b>Definition</b>	Abstract model of a data collection with defined operations	Classification of data based on its value and operations	Concrete implementation of an ADT for storing and organizing data
<b>Focus</b>	Behaviour and operations	Data representation and manipulation	Storage and organization
<b>Implementation</b>	No concern with implementation	Defined by programming languages	Concerned with specific implementation details
<b>Use Case</b>	Software design & modularity	Variable definition & type safety	Efficient data management
<b>Relationship</b>	ADT specifies the interface, data structure implements it	Data type defines the data, ADT defines how to use it	Data structure is a specific way to implement an ADT
<b>Examples</b>	List, Stack, Queue	Integer, Float, String, Boolean	Array, Linked List, Stack, Queue