1. Explain how arrays are represented in memory and their advantages.

Arrays are stored in contiguous memory locations. This means that the elements of the array are placed in consecutive memory addresses. The index of an array element directly maps to its position in memory

Advantages:

1. Fast access and retrieval
2. Ease of iteration
3. Easy of use
4. Compatible and versatile
5. Analyze the time complexity of each operation (add, search, traverse, delete).

1. Add Operation

Time Complexity: O(1)

2. Search Operation

Linear Search:

Time Complexity: O(n)

Binary Search:

Time Complexity: O(log n)

3. Traverse Operation

Time Complexity: O(n)

4. Delete Operation

Time Complexity: O(n)

1. Discuss the limitations of arrays and when to use them.

Limitations:

* 1. The size of an array must be defined at the time of creation and cannot be changed dynamically.
  2. Inserting or deleting elements (except at the end) requires shifting elements, which takes O(n) time.
  3. Memory may be wasted if the allocated size is not fully utilized.
  4. Arrays are less flexible compared to dynamic data structures like linked lists or hash tables.

When to use array:

Ideal when the size of the dataset is known in advance and doesn’t change.

When you need fast and constant-time access to elements using indices.

When you need to use memory efficiently with a fixed amount of elements.