**Exercise 4:**

Explain how arrays are represented in memory and their advantages.

Arrays are stored contiguously in memory, meaning all elements are placed in adjacent memory locations.

This enables constant-time access to elements using index (O(1) for read/write).

Arrays have fixed size, which can be a limitation in dynamic systems.

Analyze the time complexity of each operation (add, search, traverse, delete).

| Operation | Time Complexity | Explanation |
| --- | --- | --- |
| Add | O(1) | Insertion at end using count index |
| Search | O(n) | Linear search through array |
| Traverse | O(n) | Printing each element |
| Delete | O(n) | Find + shift elements left |

Discuss the limitations of arrays and when to use them.

Fixed size: Cannot grow or shrink dynamically.

Insertion/deletion in the middle requires shifting (O(n)).

Not memory efficient if reserved size is much larger than needed.

Better alternatives: ArrayList, LinkedList for dynamic storage.

Output:

