Arrays in Programming

An **array** is one of the most fundamental data structures in computer programming. It is used to store multiple values of the same data type in a single variable, allowing efficient access and manipulation of data.

1. What is an Array?

An array is a collection of elements stored at contiguous memory locations. Each element can be accessed directly using its index, which usually starts from 0.

2. Why Use Arrays?

- Efficient data storage and retrieval

- Easy traversal using loops

- Simplifies handling of large datasets

- Improves code readability and organization

3. Types of Arrays

- **One-Dimensional Array:** A simple list of elements

- **Two-Dimensional Array:** Data stored in rows and columns (matrix form)

- **Multi-Dimensional Array:** Arrays with more than two dimensions

4. Example (Conceptual)

If we store the marks of 5 students, instead of creating 5 separate variables, we can store them in a single array and access each value using an index.

5. Advantages and Limitations

- **Advantages:** Fast access, simple structure

- **Limitations:** Fixed size, inefficient insertion/deletion

6. Conclusion

Arrays form the backbone of many advanced data structures such as stacks, queues, and matrices. Understanding arrays is essential for writing efficient and structured programs.