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## Chapter 1

# Introduction to Arrays

1.1 Definition and Overview

1.2 Why Use Arrays?

1.3 Advantages and Disadvantages

1.4 Memory Layout and Storage



## Chapter 2

# Static Arrays

### 2.1 Single-Dimensional Arrays

#### 2.1.1 Declaration and Initialization

#### 2.1.2 Accessing Elements

#### 2.1.3 Iterating Through an Array

#### 2.1.4 Common Operations

Insertion

Deletion

Searching

#### 2.1.5 Memory Considerations

### 2.2 Multi-Dimensional Arrays

#### 2.2.1 2D Arrays

Declaration and Initialization

Accessing Elements

Iterating Through a 2D Array

#### 2.2.2 3D Arrays and Higher Dimensions

Declaration and Initialization

Accessing Elements

Use Cases and Applications





## Chapter 3

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#### 3.2.2 Resizing Arrays with **realloc**

#### 3.2.3 Using **ArrayList** in Java

#### 3.2.4 Using **Vector** in C++

#### 3.2.5 Using **List** in Python

### 3.3 Multi-Dimensional Dynamic Arrays

#### 3.3.1 2D Dynamic Arrays

Creating and Resizing 2D Arrays

#### 3.3.2 3D and Higher Dimensions

Memory Allocation Techniques

Use Cases and Applications





## Chapter 4

# Advanced Topics in Arrays

### 4.1 Array Algorithms

#### 4.1.1 Sorting Algorithms

Bubble Sort

Merge Sort

#### 4.1.2 Searching Algorithms

Linear Search

Binary Search

### 4.2 Memory Management in Arrays

#### 4.2.1 Static vs. Dynamic Memory

#### 4.2.2 Optimizing Memory Usage

### 4.3 Handling Large Data Sets

#### 4.3.1 Efficient Storage Techniques

#### 4.3.2 Using Arrays in Big Data Applications

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# Specialized Arrays and Applications

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## Chapter 6

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6.1 Singly Linked List

6.2 Doubly Linked List

6.3 Circular Linked List