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ONE-DIMENSIONAL ARRAYS IN THE C++ PROGRAMMING LANGUAGE

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Abstract: This article provides an in-depth exploration of one-dimensional arrays in the C++ programming language. It discusses the concept of arrays, the theoretical foundations of working with arrays, and practical problems associated with them. Additionally, it highlights the use of arrays in solving various algorithmic problems and their application in programming practice. This article is intended for students, novice programmers, and educators.

Keywords: C++, array, one-dimensional array, index, loop, algorithm, programming, data structure.

Introduction

In programming, managing collections of data is one of the essential tasks. Arrays in C++ are widely used for storing and processing such data. An array is a data structure designed to store elements of the same type in a contiguous memory location. A one-dimensional array is a simple linear arrangement of such elements.

One-dimensional arrays allow programmers to work with multiple variables using a single name and access elements via indices. This simplifies code, reduces errors, and enables the resolution of complex problems in a structured manner.

In this article, we will thoroughly analyze the topic of one-dimensional arrays. We will explore the types of arrays, methods for working with them, practical code samples, and solutions to algorithmic problems to help master the concept deeply.

Theoretical Section

What is an Array?

An array is a collection of elements of the same type placed in consecutive memory locations. With arrays, many variables can be managed under a single name.

In C++, arrays are declared as follows:

```
int numbers[5];
```

This declares an array named numbers that consists of 5 integers.

Accessing Array Elements

Array elements are accessed via indices. Indexing in C++ starts at 0. For example:

```
numbers[0] = 10;
```

```
numbers[1] = 20;
```

Using Loops with Arrays

Loops like for or while are convenient for inserting and displaying array elements:

```
for (int i = 0; i < 5; i++) {  
    cin >> numbers[i];  
}
```



Date: 27th May-2025

```
for (int i = 0; i < 5; i++) {  
    cout << numbers[i] << " ";  
}
```

Initializing Arrays

Arrays can be initialized when declared:

```
int numbers[5] = {1, 2, 3, 4, 5};
```

If fewer values are provided, the remaining elements are automatically initialized to zero.

Common Operations: Sum, Maximum, Minimum

Calculating the sum of array elements:

```
int sum = 0;  
for (int i = 0; i < 5; i++) {  
    sum += numbers[i];  
}
```

Finding the maximum value in an array:

```
int max = numbers[0];  
for (int i = 1; i < 5; i++) {  
    if (numbers[i] > max)  
        max = numbers[i];  
}
```

Finding the minimum value in an array:

```
int min = numbers[0];  
for (int i = 1; i < 5; i++) {  
    if (numbers[i] < min)  
        min = numbers[i];  
}
```

Practical Problems and Solutions

Problem 1: Given 10 integers, find their average value.

```
#include <iostream>
```

```
using namespace std;
```

```
int main() {  
    int a[10], sum = 0;  
    for (int i = 0; i < 10; i++) {  
        cin >> a[i];  
        sum += a[i];  
    }  
    cout << "Average value: " << (float)sum / 10 << endl;  
    return 0;  
}
```



Date: 27th May-2025

Problem 2: Display only positive numbers from the array.

```
#include <iostream>
using namespace std;
```

```
int main() {
int a[10];
for (int i = 0; i < 10; i++) cin >> a[i];
for (int i = 0; i < 10; i++) {
if (a[i] > 0)
cout << a[i] << " ";
}
return 0;
}
```

Problem 3: Print the array elements in reverse order.

```
#include <iostream>
using namespace std;
```

```
int main() {
int a[5];
for (int i = 0; i < 5; i++) cin >> a[i];
for (int i = 4; i >= 0; i--) cout << a[i] << " ";
return 0;
}
```

Problem 4: Count the number of even elements in the array.

```
#include <iostream>
using namespace std;
```

```
int main() {
int a[8], count = 0;
for (int i = 0; i < 8; i++) cin >> a[i];
for (int i = 0; i < 8; i++) {
if (a[i] % 2 == 0) count++;
}
cout << "Number of even elements: " << count;
return 0;
}
```

Conclusion

One-dimensional arrays are among the fundamental topics in C++ programming. They simplify and enhance the efficiency of operations on data. By using arrays,



Date: 27th May-2025

programmers can easily manipulate large sets of data. The theoretical background and practical exercises presented in this article provide a deep understanding of array operations.

Working with arrays strengthens foundational programming concepts such as loops, conditional statements, and indexing. Moreover, arrays help to develop algorithmic thinking.

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Date: 27th May-2025

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Date: 27th May-2025

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Date: 27th May-2025

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