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◇ What is an Array?

An **array** is a collection of **multiple values of the same data type** stored in **continuous memory locations** under **one variable name**.

👉 Instead of creating many variables, we use an array.

Example:

```
int marks[5];
```

This stores **5 integer values**.

◇ One-Dimensional Array

A **one-dimensional array** stores data in a **single line (row)**.

📌 Syntax:

```
data_type array_name[size];
```

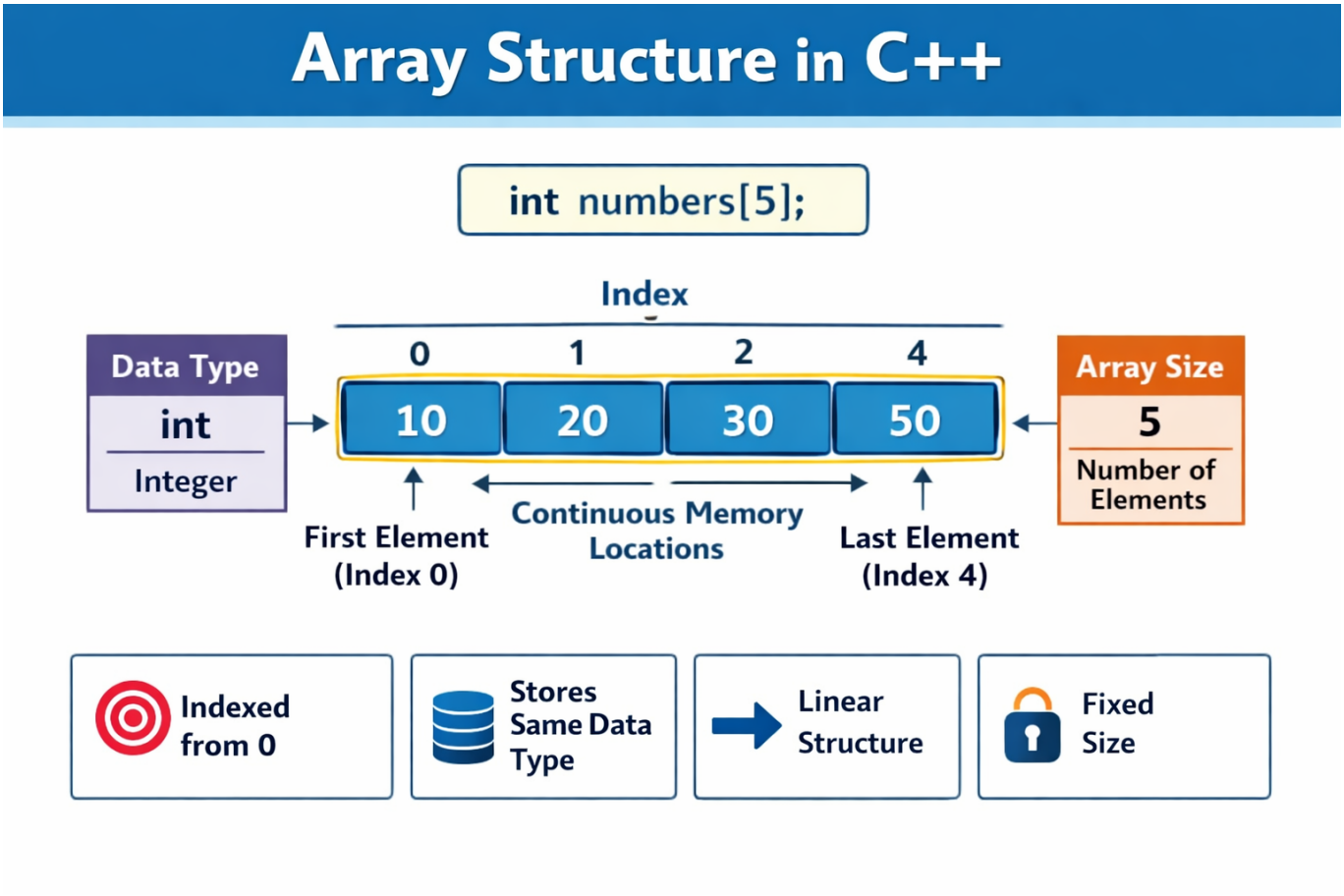
◇ Declaring a One-Dimensional Array

Declaration means **reserving memory** for the array.

Example:

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

📌 This creates an array named `numbers` that can store **5 integers**.



◇ Array Initialization

Initialization means **assigning values** to the array.

Method 1: Initialize at Declaration

```
int numbers[5] = {10, 20, 30, 40, 50};
```

Method 2: Let Compiler Count Size

```
int numbers[] = {5, 10, 15, 20};
```

Method 3: Initialize One by One

```
int numbers[3];
numbers[0] = 10;
numbers[1] = 20;
numbers[2] = 30;
```

◇ Index Number (Very Important)

- Array index **starts from 0**
- Last index = `size - 1`

Index	Value
0	First element
1	Second element
2	Third element

◇ Accessing Individual Elements

We use **index number** to access elements.

Example:

```
int numbers[5] = {10, 20, 30, 40, 50};

cout << numbers[0]; // Output: 10
cout << numbers[3]; // Output: 40
```

📌 Example: Assigning Value to Individual Array Elements

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

int main() {
    int numbers[5];   // Array declaration

    // Assigning values to individual elements
    numbers[0] = 10;
    numbers[1] = 20;
    numbers[2] = 30;
    numbers[3] = 40;
    numbers[4] = 50;

    // Displaying values
    cout << numbers[0] << endl;
    cout << numbers[1] << endl;
    cout << numbers[2] << endl;
    cout << numbers[3] << endl;
    cout << numbers[4] << endl;

    return 0;
}
```

🔍 Explanation

- `int numbers[5];` → creates an array of size **5**
- `numbers[0] = 10;` → assigns **10** to the **first element**
- `numbers[1] = 20;` → assigns **20** to the **second element**
- Index starts from **0**, not 1
- Each element is accessed using **array name + index**

🧱 Memory View (Simple)

Index	Value
0	10
1	20
2	30
3	40
4	50

◇ Accessing Array Elements Using `for` Loop

The **for loop** is best for accessing array elements.

Example:

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

int main() {
    int numbers[5] = {10, 20, 30, 40, 50};

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

📌 `i` represents the **index number**.

◇ Example 1: Print Student Marks

Problem:

Store and display marks of 5 students.

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

int main() {
    int marks[5] = {78, 85, 90, 66, 88};

    for(int i = 0; i < 5; i++) {
        cout << "Student " << i+1 << " Marks: " << marks[i] << endl;
    }

    return 0;
}
```

◇ Example 2: Sum of Array Elements

Problem:

Find sum of array values.

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

int main() {
    int numbers[5] = {10, 20, 30, 40, 50};
    int sum = 0;

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

    cout << "Sum = " << sum;

    return 0;
}
```

◇ Example 3: Store and Display Marks of Students

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

int main() {
    int marks[5];   // Declare an array of size 5

    // Taking input
```

```
    cout << "Enter marks of 5 students:" << endl;
    for(int i = 0; i < 5; i++) {
        cin >> marks[i];
    }

    // Displaying output
    cout << "Marks of students are:" << endl;
    for(int i = 0; i < 5; i++) {
        cout << marks[i] << endl;
    }

    return 0;
}
```

🔍 Explanation (Very Simple)

1️⃣ Array Declaration

```
int marks[5];
```

- `int` → data type
- `marks` → array name
- `5` → size (number of elements)

2️⃣ Taking Input Using `for` Loop

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

- `i` is the **index**
- Index starts from **0**
- Values are stored one by one

3️⃣ Displaying Array Values

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

- Prints each element of the array

How Data is Stored

Index	Value
0	marks of student 1
1	marks of student 2
2	marks of student 3
3	marks of student 4
4	marks of student 5

◇ Example 4: Find the Sum of Numbers Using an Array

Problem Statement

Store **5 numbers** in an array and calculate their **sum**.

Program:

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

int main() {
    int numbers[5];
    int sum = 0;

    // Taking input
    cout << "Enter 5 numbers:" << endl;
    for(int i = 0; i < 5; i++) {
        cin >> numbers[i];
    }

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

    // Displaying result
    cout << "Sum of numbers = " << sum << endl;

    return 0;
}
```

Explanation (Simple Words)

Array Declaration

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

Creates an array to store **5 integers**.

2️⃣ Input Using Loop

- Values stored in:

```
numbers[0] to numbers[4]
```

3️⃣ Sum Calculation

```
sum = sum + numbers[i];
```

Adds each element to `sum`.

📊 Example Input / Output

Input:

```
10 20 30 40 50
```

Output:

```
Sum of numbers = 150
```
