

Array in C

An array in C is a collection of elements of the same data type, stored in contiguous memory locations. It allows you to store multiple values under a single variable name, accessed using index numbers.

Declaration of an Array

```
data_type array_name[size];  
Example:
```

```
int numbers[5]; // declares an integer array of size 5
```

Initialization of an Array

You can initialize an array while declaring it:

```
int numbers[5] = {10, 20, 30, 40, 50};  
You can also let the compiler count the size automatically:
```

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

Accessing Array Elements

Array elements are accessed using index numbers, starting from 0.

```
printf("%d", numbers[0]); // prints 10  
printf("%d", numbers[4]); // prints 50
```

Example Program

```
#include <stdio.h>  
int main() {  
    int marks[5] = {90, 85, 75, 88, 92};  
    int i;  
    printf("Student Marks:\n");  
    for (i = 0; i < 5; i++) {  
        printf("marks[%d] = %d\n", i, marks[i]);  
    }  
    return 0;  
}
```

Output:  
Student Marks:  
marks[0] = 90  
marks[1] = 85  
marks[2] = 75  
marks[3] = 88  
marks[4] = 92

Types of Arrays

- 1. **One-Dimensional Array** – A single list of elements.  
Example: int arr[10];
- 2. **Two-Dimensional Array** – Used to store data in rows and columns (like a matrix).  
Example: int matrix[3][3];
- 3. **Multi-Dimensional Array** – Arrays with more than two dimensions.  
Example: int arr[2][3][4];

Example of 2D Array

```
#include <stdio.h>  
int main() {  
    int matrix[2][3] = {  
        {1, 2, 3},  
        {4, 5, 6}  
    };  
    for (int i = 0; i < 2; i++) {  
        for (int j = 0; j < 3; j++) {  
            printf("%d", matrix[i][j]);  
        }  
        printf("\n");  
    }  
    return 0;  
}
```

Key Points

- Index starts from 0.
- Array size must be a constant in C.
- Stored in contiguous memory.
- Useful for loops and repetitive data handling.

*Handwritten notes and code snippets:*

```
int arr[10];  
arr[0] = 45;  
arr[5] = 25;  
void inputArray(int arr[], int n)  
{  
    for(int i=0; i<n; i++)  
    {  
        printf("Enter the value for index [%d]", i);  
        scanf("%d", &arr[i]);  
    }  
}
```

*Diagram of an array:*

nums: [0] 1 2 3 4 5 6 7 8 9

Handwritten code for printing array elements:

```
printf("[ ");  
for(int i=0; i<n; i++)  
{  
    printf("%d ", arr[i]);  
}  
printf("]\n");
```

*Handwritten binary conversion and array-related notes:*

2, 2, 1

010  
010  
000  
001  
011

num = [2, 2, 1] = 0x2

i = 2  
result = 0  
for(i=0; i<numSize; i++)  
{  
 result = result \* 10 + arr[i];  
}

Mining Number  
Binary Number  
Counting Bits  
Minimum bit flips to convert Numbers