

ICPC Assiut Community

Newcomers Training

Arrays



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community

Arrays

If we want to take from user 10 integers ?
In normal, you will think to create 10 integer variables.

But

If we want to take from user 1000 integers
that's look so boring.

So

in C++ there is something will
help you in that called **Arrays**



Arrays

- **Array** : is a series of elements of the same type placed in contiguous memory locations that can be individually referenced by adding an index to a unique identifier

Arrays

Declaring Arrays :

- Like a regular variable, an array must be declared before it is used. A typical declaration for an array in C++ is:

DataType **Name** [**Number of elements**];

```
int x[5];
```

Arrays

Initializing Arrays :

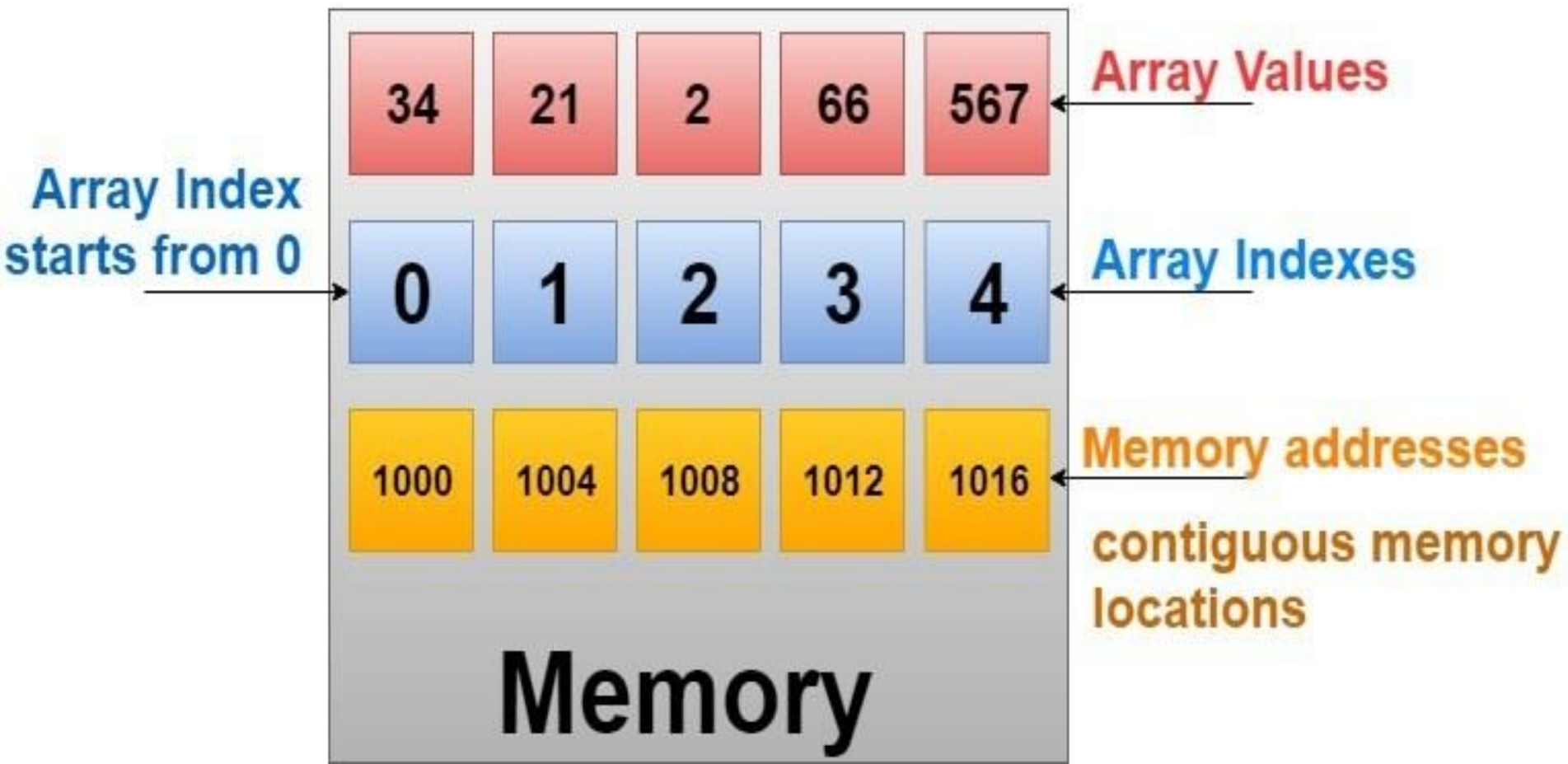
```
int x[5] = {1, 2, 3, 4, 5} ;
```

OR

```
int x[] = {1, 2, 3, 4, 5} ; size of array will be 5
```

Arrays

```
int x[5] = {34, 21, 2, 66, 567}
```



Arrays

Accessing the values of an array:

```
#include <iostream>
using namespace std;
int main() {
    int x[1000];

    x[0] = 5;
    x[1] = 20 + x[0];

    x[2] = x[0] * x[1];

    int y = x[0];

    return 0;
}
```

Arrays

Accessing the values of an array using loops:

```
#include <iostream>
using namespace std;
int main() {
    int x[10];
    for(int i = 0; i < 10; i++) {
        cin >> x[i];
    }

    for(int i = 0; i < 10; i++) {
        cout << x[i] << endl;
    }
    return 0;
}
```


Problems

1. Write a program to take from user ***N* numbers** and print their Summation.
2. Write a program to take array of size ***N*** from user and number ***X*** then check if ***X*** is exist in array or not.
3. Write a program to take a **10 numbers** from user and print largest and smallest numbers.
4. Write a program to take array of size ***N*** from user then if number even change its value to 0 otherwise to 1 then print the array.

Arrays

Array of Char Declaring and Initializing

```
#include <iostream>
using namespace std;
int main() {

    char name1[4];
    name1[0] = 'A';
    name1[1] = 'l';
    name1[2] = 'i';

    char name5[4];
    cin >> name5;

    char name2[4] = {'A', 'l', 'i'};
    //char name2[4] = {'A', 'l', 'i', '\0'};
    char name3[4] = "Ali";

    char name4[4];

    for(int i = 0; i < 3; i++){
        cin >> name4[i];
    }
```

Arrays

Array of Char print to user

```
#include <iostream>
using namespace std;
int main() {
    char name1[4];
    cin >> name1;

    for(int i = 0; i < 3; i++) {
        cout << name1[i];
    }
    cout << endl;

    cout << name1 << endl;
    return 0;
}
```

Problems

- **Write a program to take array of char of size N from user then convert every char that are upper to lower and every char that are lower to upper.**
- **Write a program to take array of char of size N from the user then convert every char in an even index into upper char and every char in the odd index into lower char.**

Bubble Sort

- It is a simple sort algorithm that make a sequence of elements sorted in increasing order.
- It works by repeatedly swapping the adjacent elements if they are in wrong order.

6 5 3 1 8 7 2 4

Bubble Sort

```
#include<iostream>
using namespace std;
int main ()
{
    int i, j, n = 10;
    int a[10] = {10,2,0,14,43,25,18,1,5,45};

    for(i=0; i < (n-1); i++)
    {
        for(j=0; j < (n-i-1); j++)
        {
            if(a[j] > a[j+1])
            {
                swap(a[j], a[j + 1]);
            }
        }
    }

    cout << "Sorted Element List ...\n";
    for(i = 0; i < 10; i++) {
        cout << a[i] << " ";
    }
    return 0;
}
```

Problems

- **Write a program to take array of char of size N from user, reverse it and print it.**
- **Write a program to take array of integer of size N from user, and print the Maximum number and the 2nd Maximum number in the array.**

Arrays 2D

- If you have to take something like a Matrix as input like this :

1	2	3
4	5	6
7	8	9

and do some operations in each cell,
how could you take it ?



So, here we introducing the **2D array** (Multidimensional array)

Arrays 2D

It is Multidimensional arrays can be described as “**Arrays of Arrays**”, and it's like matrix.

	Col1	Col2	Col3	Col4
Row1	Arr[0][0]	Arr[0][1]	Arr[0][2]	Arr[0][3]	
Row2	Arr[1][0]	Arr[1][1]	Arr[1][2]	Arr[1][3]	
Row3	Arr[2][0]	Arr[2][1]	Arr[2][2]	Arr[2][3]	
Row4	Arr[3][0]	Arr[3][1]	Arr[3][2]	Arr[3][3]	
⋮					

Arrays 2D

Declaring and assign values to array 2D

```
#include <iostream>
using namespace std;
int main() {
    int a[2][3];

    int a[2][3] = {
        {1, 2, 3},
        {4, 5, 6}
    };

    for(int i = 0; i < 2; i++) {
        for(int j = 0; j < 3; j++) {
            cin >> a[i][j];
        }
    }
    return 0;
}
```

Arrays 2D

Declaring and assign values to array 2D

```
#include <iostream>
using namespace std;
int main() {
    int a[2][3];

    for(int i = 0; i < 2; i++){
        for(int j = 0; j < 3; j++){
            cin >> a[i][j];
        }
    }

    for(int i = 0; i < 2; i++){
        for(int j = 0; j < 3; j++){
            cout << a[i][j] << " ";
        }
        cout << endl;
    }
    return 0;
}
```

Problems

- **Write a program to take an array 2D from user and print largest and smallest number in each row.**
- Write a program that takes 2D array of integers of size (N x N) from the user and print the summation of even numbers in each row and the summation of odd numbers in each row.
- Write a program that takes 2D array of integers of size (N x N) from the user and print the summation of prime numbers in each row.

Problems

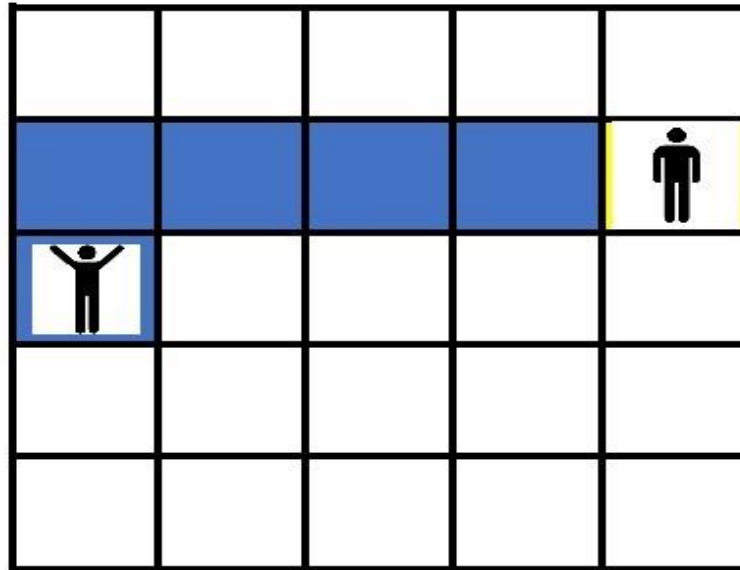
- Write a program to print this 2D array of char of size $N * N$ if $N = 7$, so the 2D array is :

```
* * * * *
*           *
*           *
*           *
*           *
*           *
* * * * *
```

- Write a program that takes 2D array of integer of size $(N \times N)$ and replace each even number with (0) and each odd number with (1) and print the 2D array.

Problems

- You and your friend are lost in 2D array and you want to know the minimum distance between yours, you know your index $(x1, y1)$ and your friend's index $(x2, y2)$, what is distance between yours ?



For more information about 2D Arrays visit this [Link](#)

Now it's time to practise and solve
the problems of Arrays

Arrays Sheet

Good luck <3