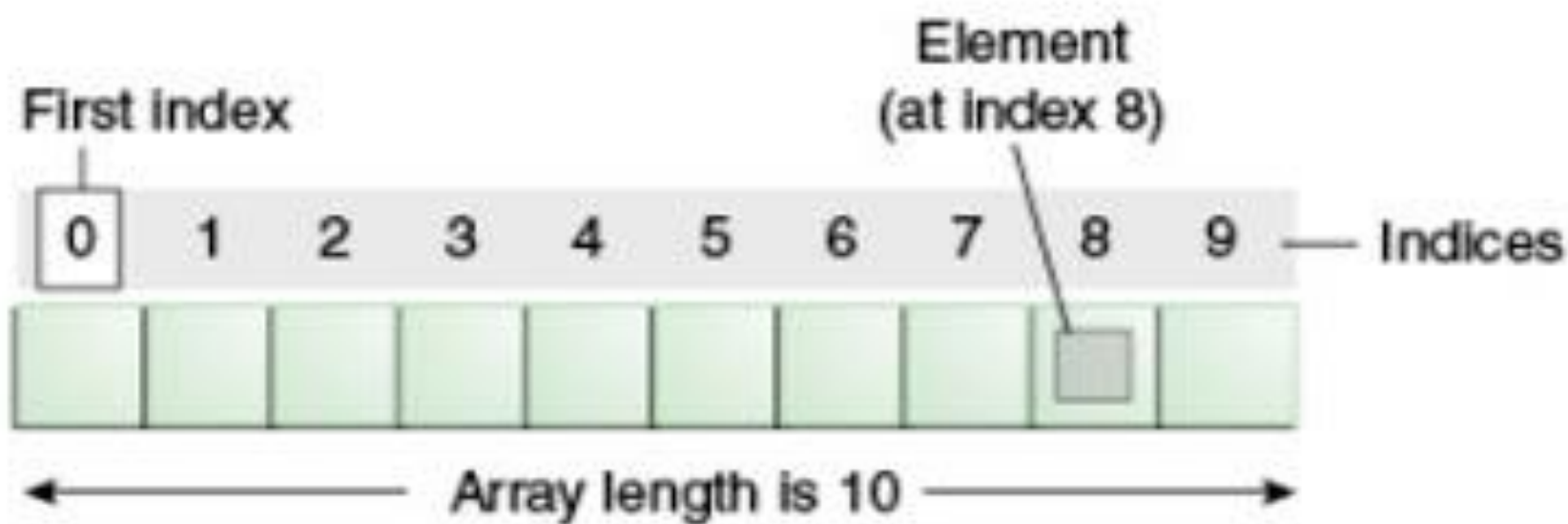# برنامه نویسی با زبان C

مجتبی اعجمی

استادیار دانشگاه آزاد اسلامی واحد زنجان

آرایه (Array)

- آرایه یک ساختار ذخیره سازی است که در آن می توان چندین داده از یک نوع یکسان را قرار داد.

آرایه (Array)
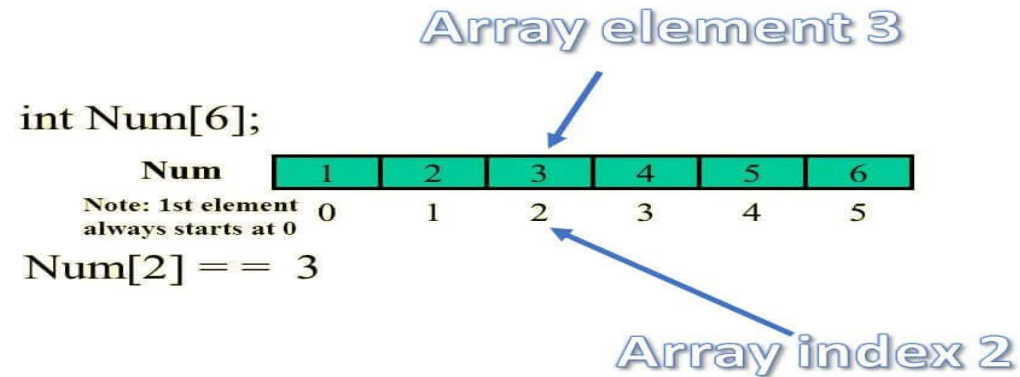

An array of 10 elements.
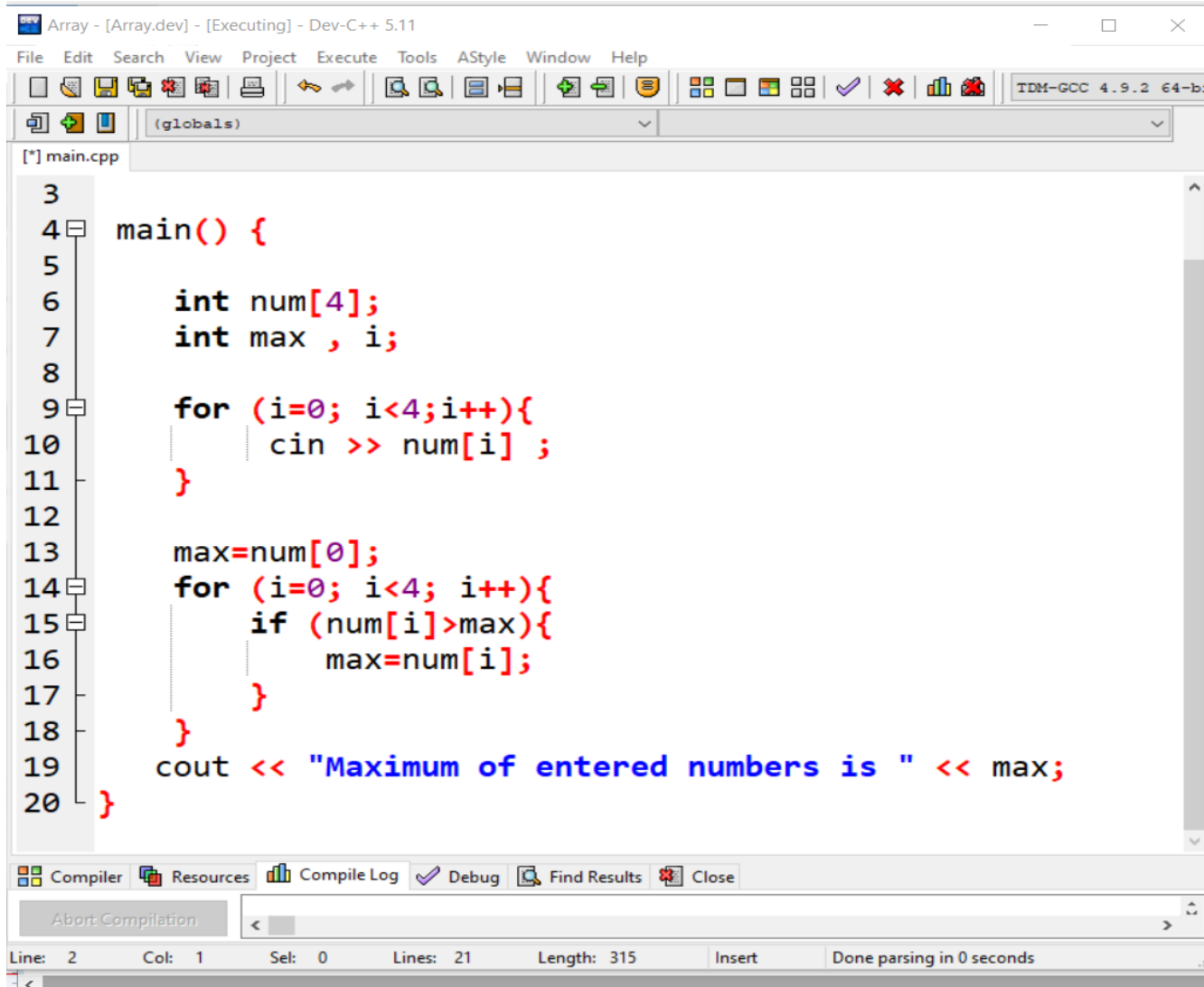
نوع عناصر آرایه   نام آرایه[تعداد عناصر آرایه]

مثال:

int Num[6];

float rate[10];

char sym[4];

Array element 3 is indexed at position 2

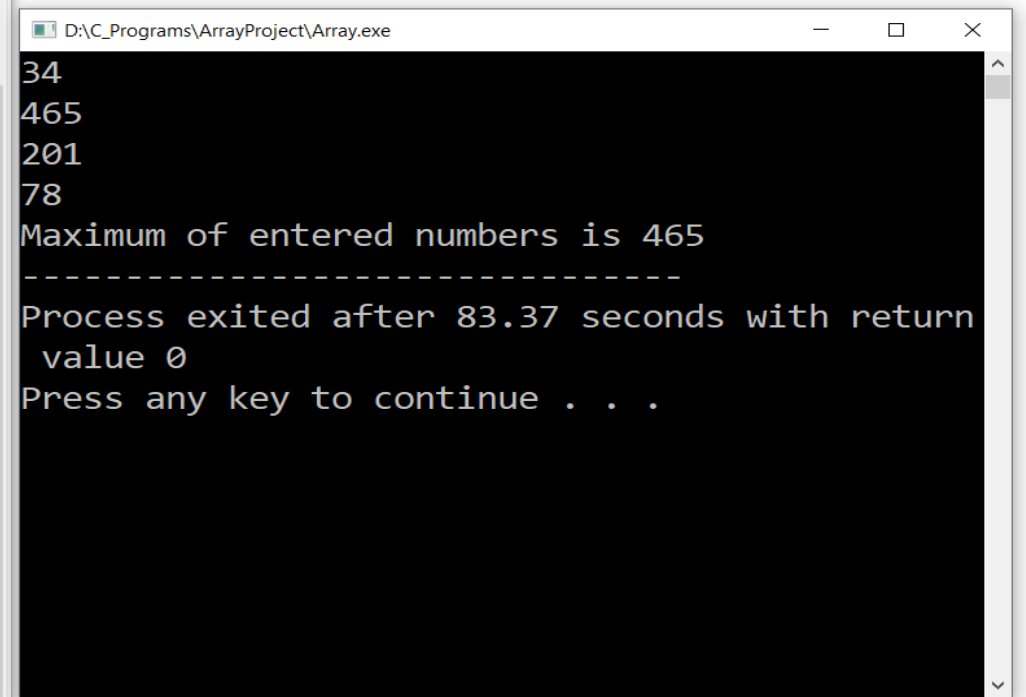# مثال آرایه: پیداکردن بزرگترین عدد بین عناصر آرایه


```cpp
main() {

    int num[4];
    int max , i;

    for (i=0; i<4;i++){
        cin >> num[i] ;
    }

    max=num[0];
    for (i=0; i<4; i++){
        if (num[i]>max){
            max=num[i];
        }
    }
    cout << "Maximum of entered numbers is " << max;
}
```

```
34
465
201
78
Maximum of entered numbers is 465
----------------------------------
Process exited after 83.37 seconds with return
 value 0
Press any key to continue . . .
```

مثال آرایه: میانگین ۱۰ عدد

```cpp
main() {
    int array[10];
    int i;
    float total = 0.0, average;

    for (i = 0; i < 10; i++)
    {
        cout<<"Enter the Number : "<< (i+1) <<"  : ";
        cin>>array[i];
    }

    for (i = 0; i < 10; i++)
    {
        total = total + array[i] ;
    }
    average = total / 10;

    cout<<"\n Sum of all Numbers =  "<< total<<"\n";
    cout<<"\n Average of all input numbers =  "<< average<<"\n";
}
```

```
Enter the Number : 1   : 10
Enter the Number : 2   : 30
Enter the Number : 3   : 40
Enter the Number : 4   : 50
Enter the Number : 5   : 60
Enter the Number : 6   : 70
Enter the Number : 7   : 80
Enter the Number : 8   : 90
Enter the Number : 9   : 100
Enter the Number : 10  : 110

 Sum of all Numbers =  640

 Average of all input numbers =  64

-----------------------------------------
Process exited after 106.4 seconds with ret
urn value 0
```

مثال آرایه: جستجوی ترتیبی

مرتب سازی حبابی

```cpp
const int n=5;

main() {
    int a[n];
    int i,j,temp;
    cout<<"Enter "<< n << " elements: ";

    for(i=0;i<n;++i)
        cin>>a[i];

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

    cout<<"Array after bubble sort:";
    for(i=0;i<n;++i)
        cout<<" "<<a[i];
}
```

```
Enter 5 elements: 15
23
11
45
6
Array after bubble sort: 6 11 15 23 45

--------------------------------

Process exited after 24.05 seconds wit
h return value 0
Press any key to continue . . .
```

```cpp
main() {
    int A[]={7,12,23,34,42,51,63,72,80,99};
    int first, last, middle, search, flag;
    cout<<"Enter a number to find : ";
    cin>>search;

    flag=0;
    first = 0;
    last = 9;
    middle = (first+last)/2;
    while (first <= last) {
        if(A[middle] < search) {
            first = middle + 1;

        }
        else if(A[middle] == search) {
            cout<<search<<" found at location "<<middle+1<<"\n";
            flag=1;
            break;
        }
        else {
            last = middle - 1;
        }
        middle = (first + last)/2;
    }
    if(flag==0){
        cout<<"Not found! "<<search<<" is not present in the list.";
    }
}
```

```
Enter a number to find : 63
63 found at location 7

--------------------------------

Process exited after 3.09 seconds with
return value 0
Press any key to continue . . .
```

```
Enter a number to find : 33
Not found! 33 is not present in the list.

-------------------------------

Process exited after 7.157 seconds with r
eturn value 0
Press any key to continue . . .
```

آرایه های چند بعدی

- در زبان برنامه نویسی C امکان تعریف آرایه های چند بعدی نیز وجود دارد.

- به عبارت ساده تر آرایه چند بعدی را می توان به صورت آرایه ای از آرایه ها تصور کرد.

- تعریف آرایه به طور کلی به صورت زیر است:

type name[size1][size2]...[sizeN];

مثال:

int threedim[5][10][4];

آرایه دوبعدی

- type arrayName [m][n];

- مثال

- int a[3][4]

	Column 0	Column 1	Column 2	Column 3
Row 0	a[0][0]	a[0][1]	a[0][2]	a[0][3]
Row 1	a[1][0]	a[1][1]	a[1][2]	a[1][3]
Row 2	a[2][0]	a[2][1]	a[2][2]	a[2][3]

آرایه دو بعدی : مثال

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


main() {
    int a[5][2] = { {0,0}, {1,2}, {2,4}, {3,6},{4,8}};
    int i, j;

    for ( i = 0; i < 5; i++ ) {

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

```
0 0
1 2
2 4
3 6
4 8

--------------------------------

Process exited after 2.555 seconds wit
h return value 0
Press any key to continue . . .
```

آرایه دو بعدی : جمع دو ماتریس

```cpp
main() {

    int first[3][3], second[3][3], sum[3][3];
    int i,j;
    cout<< "Enter the elements of first matrix\n";

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

    cout<< "Enter the elements of second matrix\n" ;

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

    cout<< "Sum of entered matrices:\n" ;

    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            sum[i][j] = first[i][j] + second[i][j];
            cout << sum[i][j] << " ";
        }
        cout << endl;
    }
}
```

```
Enter the elements of first matrix
10
20
30
11
21
31
12
22
32
Enter the elements of second matrix
1
1
1
2
2
2
3
3
3
Sum of entered matrices:-
11 21 31
13 23 33
15 25 35

------------------------------------
Process exited after 53.45 seconds with return value 0
```

آرایه دو بعدی : ضرب دو ماتریس

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


main() {

    int A[2][3]={{1,1,1},{2,0,2}};
    int B[3][4]={{2,0,1,3},{0,1,0,1},{1,2,2,1}};
    int C[2][4];
    int i,j,k;
    // Multiplying matrix A and A and storing in array C.
    for(i = 0; i < 2; ++i){
        for(j = 0; j < 4 ; ++j){
            C[i][j]=0;
            for(k = 0; k < 3; ++k){
                C[i][j] += A[i][k] * B[k][j];
            }
        }
    }
    // Displaying the multiplication of two matrix.
    cout << endl << "Output Matrix: " << endl;
    for(i = 0; i < 2; ++i) {
        for(j = 0; j < 4; ++j) {
            cout  << C[i][j] << " ";
        }
        cout << endl;
    }
}
```

```
Output Matrix:
3 3 3 5
6 4 6 8

------------------------------------
Process exited after 1.079 seconds with retu
rn value 0
Press any key to continue . . .
```