

برنامه نویسی با زبان C

مجتبی اجمی

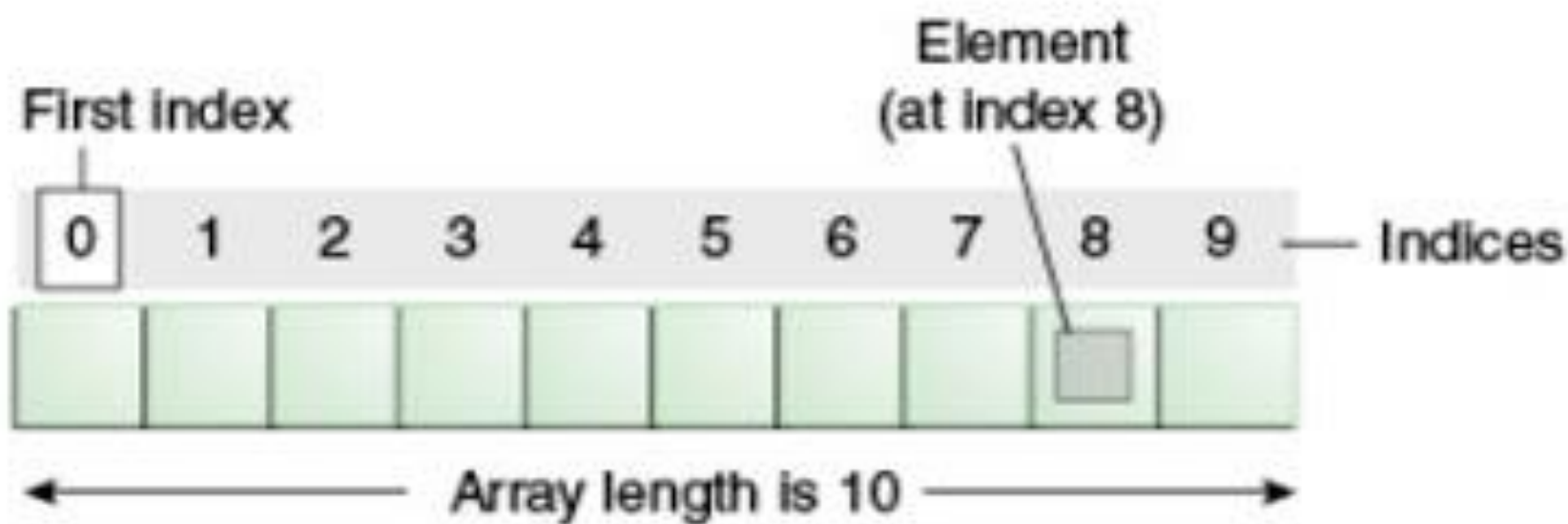
استادیار دانشگاه آزاد اسلامی واحد زنجان

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.

نحوه تعریف آرایه

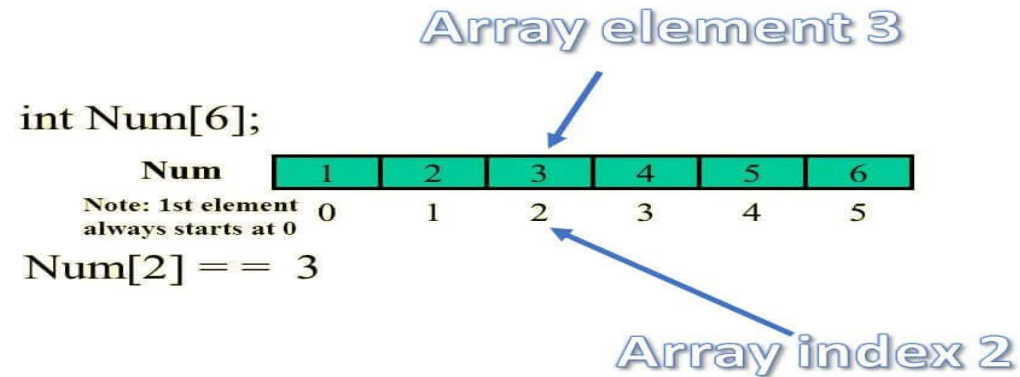
[تعداد عناصر آرایه] نام آرایه نوع عناصر آرایه

مثال:

```
int Num[6];
```

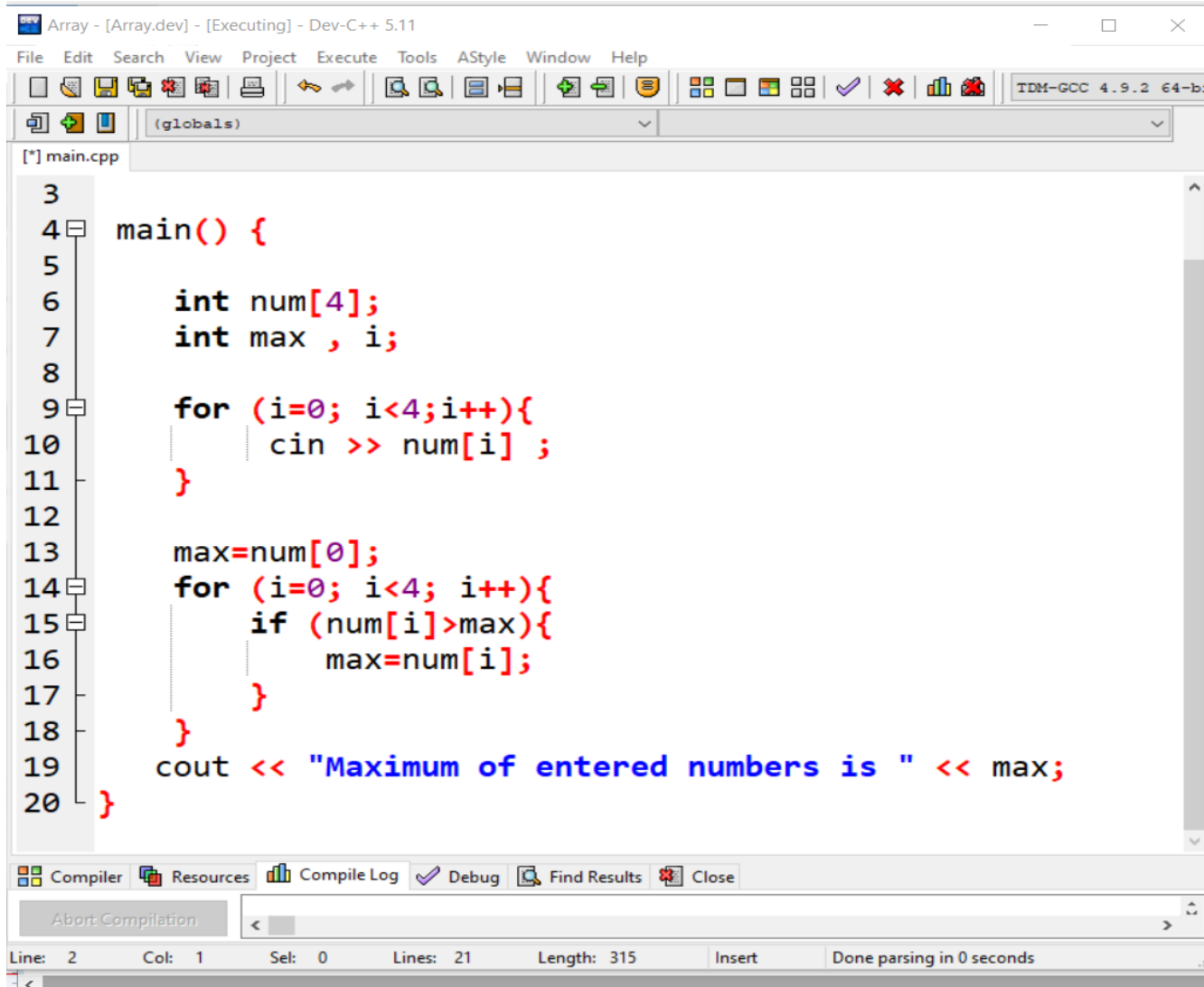
```
float rate[10];
```

```
char sym[4];
```



Array element 3 is indexed at position 2

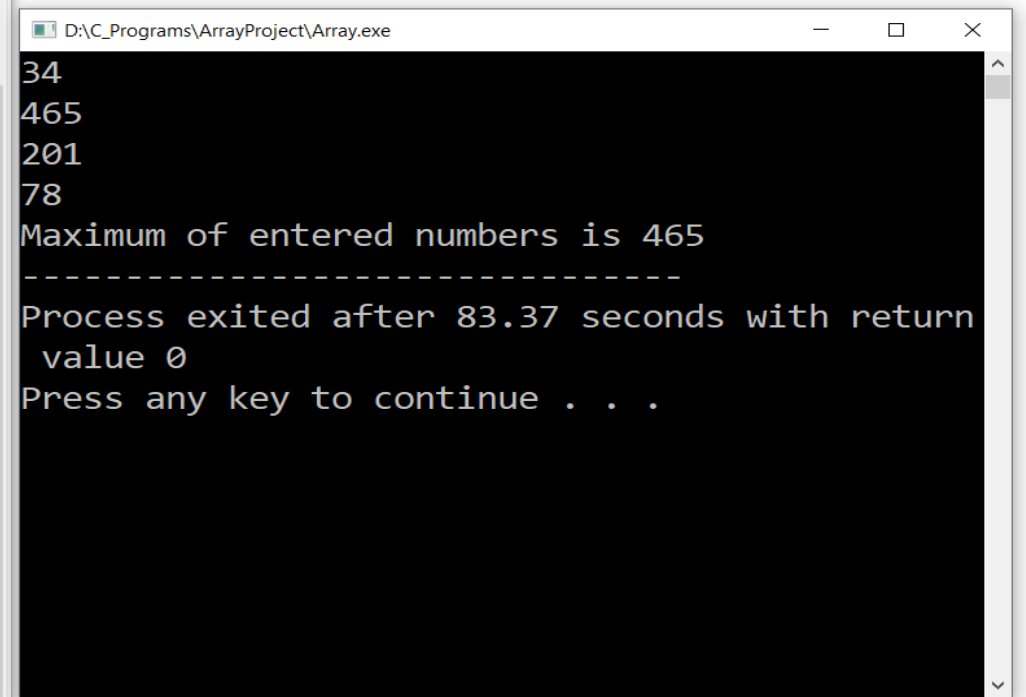
مثال آرایه: پیدا کردن بزرگترین عدد بین عناصر آرایه



The screenshot shows the Dev-C++ IDE with a C++ program open in the editor. The program is titled "Array - [Array.dev] - [Executing] - Dev-C++ 5.11". The code in the editor is as follows:

```
3
4 main() {
5
6     int num[4];
7     int max , i;
8
9     for (i=0; i<4;i++){
10         cin >> num[i] ;
11     }
12
13     max=num[0];
14     for (i=0; i<4; i++){
15         if (num[i]>max){
16             max=num[i];
17         }
18     }
19     cout << "Maximum of entered numbers is " << max;
20 }
```

The IDE interface includes a menu bar (File, Edit, Search, View, Project, Execute, Tools, AStyle, Window, Help), a toolbar, and a status bar at the bottom showing "Line: 2 Col: 1 Sel: 0 Lines: 21 Length: 315 Insert Done parsing in 0 seconds".



The screenshot shows the output window of the program, titled "D:\C_Programs\ArrayProject\Array.exe". The output is as follows:

```
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

```
Array - [Array.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
(globals)
TDM-GCC 4.9.2 64-bit Release
[*] main.cpp
4 main() {
5     int array[10];
6     int i;
7     float total = 0.0, average;
8
9     for (i = 0; i < 10; i++)
10    {
11        cout<<"Enter the Number : "<< (i+1) <<" : ";
12        cin>>array[i];
13    }
14
15    for (i = 0; i < 10; i++)
16    {
17        total = total + array[i] ;
18    }
19    average = total / 10;
20
21    cout<<"\n Sum of all Numbers = "<< total<<"\n";
22    cout<<"\n Average of all input numbers = "<< average<<"\n";
23 }
```

```
D:\C_Programs\ArrayProject\Array.exe
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 return value 0
```

مثال آرایه: جستجوی ترتیبی

```
Array - [Array.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Release
(globals)
main.cpp
3 #define ARRAY_SIZE 5
4
5 main() {
6     int numbers[ARRAY_SIZE]={10,14,25,63,30};
7     int i ,search_key, flag,pos;
8
9     cout<<"Enter the key : ";
10    cin>>search_key;
11
12    flag=0;
13    for (i = 0; i < ARRAY_SIZE; i++) {
14        if(numbers[i] == search_key){
15            flag=1;
16            pos=i;
17            break;
18        }
19    }
20
21    if (flag){
22        cout<<"Search Key Found . Position Is : "<< pos ;
23    }
24    else {
25        cout<<"Search Key Not Found.";
26    }
27 }
```

```
D:\C_Programs\ArrayProject\Array.exe
Enter the key : 25
Search Key Found . Position Is :2
-----
Process exited after 13.84 seconds with return value 0
Press any key to continue . . .
```

مرتب سازی حبابی

```
Array - [Array.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
(globals)
main.cpp
4 const int n=5;
5
6 main() {
7     int a[n];
8     int i,j,temp;
9     cout<<"Enter "<< n << " elements: ";
10
11     for(i=0;i<n;++i)
12         cin>>a[i];
13
14     for(i=1;i<n;++i)
15     {
16         for(j=0;j<(n-i);++j)
17             if(a[j]>a[j+1])
18             {
19                 temp=a[j];
20                 a[j]=a[j+1];
21                 a[j+1]=temp;
22             }
23     }
24
25     cout<<"Array after bubble sort:";
26     for(i=0;i<n;++i)
27         cout<<" "<<a[i];
28 }
```

```
D:\C_Programs\ArrayProject\Array.exe
Enter 5 elements: 15
23
11
45
6
Array after bubble sort: 6 11 15 23 45

-----
Process exited after 24.05 seconds with return value 0
Press any key to continue . . .
```


جستجوی دودویی

```
Array - [Array.dev] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help

main.cpp
4
5 main() {
6     int A[]={7,12,23,34,42,51,63,72,80,99};
7     int first, last, middle, search, flag;
8     cout<<"Enter a number to find : ";
9     cin>>search;
10
11     flag=0;
12     first = 0;
13     last = 9;
14     middle = (first+last)/2;
15     while (first <= last) {
16         if(A[middle] < search) {
17             first = middle + 1;
18
19         }
20         else if(A[middle] == search) {
21             cout<<search<<" found at location "<<middle+1<<"\n";
22             flag=1;
23             break;
24         }
25         else {
26             last = middle - 1;
27         }
28         middle = (first + last)/2;
29     }
30     if(flag==0){
31         cout<<"Not found! "<<search<<" is not present in the list.";
32     }
33 }
```

```
D:\C_Programs\ArrayProject\Array.exe
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 . . .
```

```
D:\C_Programs\ArrayProject\Array.exe
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	<code>a[0][0]</code>	<code>a[0][1]</code>	<code>a[0][2]</code>	<code>a[0][3]</code>
Row 1	<code>a[1][0]</code>	<code>a[1][1]</code>	<code>a[1][2]</code>	<code>a[1][3]</code>
Row 2	<code>a[2][0]</code>	<code>a[2][1]</code>	<code>a[2][2]</code>	<code>a[2][3]</code>

آرایه دو بعدی : مثال

```
Array - [Array.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
main.cpp
1 #include <iostream>
2 using namespace std;
3
4
5 main() {
6     int a[5][2] = { {0,0}, {1,2}, {2,4}, {3,6},{4,8}};
7     int i, j;
8
9     for ( i = 0; i < 5; i++ ) {
10
11         for ( j = 0; j < 2; j++ ) {
12             cout << a[i][j] << " ";
13         }
14         cout << endl;
15     }
16 }
```

```
D:\C_Programs\ArrayProject\Array.exe
0 0
1 2
2 4
3 6
4 8
-----
Process exited after 2.555 seconds with return value 0
Press any key to continue . . .
```

آرایه دو بعدی : جمع دو ماتریس

```
Array - [Array.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
[*] main.cpp
5 main() {
6
7     int first[3][3], second[3][3], sum[3][3];
8     int i,j;
9     cout<< "Enter the elements of first matrix\n";
10
11     for (i = 0; i < 3; i++){
12         for (j = 0; j < 3; j++){
13             cin >> first[i][j];
14         }
15     }
16
17     cout<< "Enter the elements of second matrix\n" ;
18
19     for (i = 0; i < 3; i++){
20         for (j = 0; j < 3; j++){
21             cin >> second[i][j];
22         }
23     }
24
25     cout<< "Sum of entered matrices:\n" ;
26
27     for (i = 0; i < 3; i++) {
28         for (j = 0; j < 3; j++) {
29             sum[i][j] = first[i][j] + second[i][j];
30             cout << sum[i][j] << " ";
31         }
32         cout << endl;
33     }
34 }
```

```
D:\C_Programs\ArrayProject\Array.exe
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
100%
```

آرایه دو بعدی : ضرب دو ماتریس

```
Array - [Array.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
main.cpp
1 #include <iostream>
2 using namespace std;
3
4
5 main() {
6
7     int A[2][3]={{1,1,1},{2,0,2}};
8     int B[3][4]={{2,0,1,3},{0,1,0,1},{1,2,2,1}};
9     int C[2][4];
10    int i,j,k;
11    // Multiplying matrix A and A and storing in array C.
12    for(i = 0; i < 2; ++i){
13        for(j = 0; j < 4; ++j){
14            C[i][j]=0;
15            for(k = 0; k < 3; ++k){
16                C[i][j] += A[i][k] * B[k][j];
17            }
18        }
19    }
20    // Displaying the multiplication of two matrix.
21    cout << endl << "Output Matrix: " << endl;
22    for(i = 0; i < 2; ++i) {
23        for(j = 0; j < 4; ++j) {
24            cout << C[i][j] << " ";
25        }
26        cout << endl;
27    }
28
29 }
```

```
D:\C_Programs\ArrayProject\Array.exe
Output Matrix:
3 3 3 5
6 4 6 8

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