SAXONY EGYPT UNIVERSITY
FOR APPLIED SCIENCE AND TECHNOLOGY

ECT 121
Computer Programming I

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Lecture five

- Arrays and Application

What is Array?

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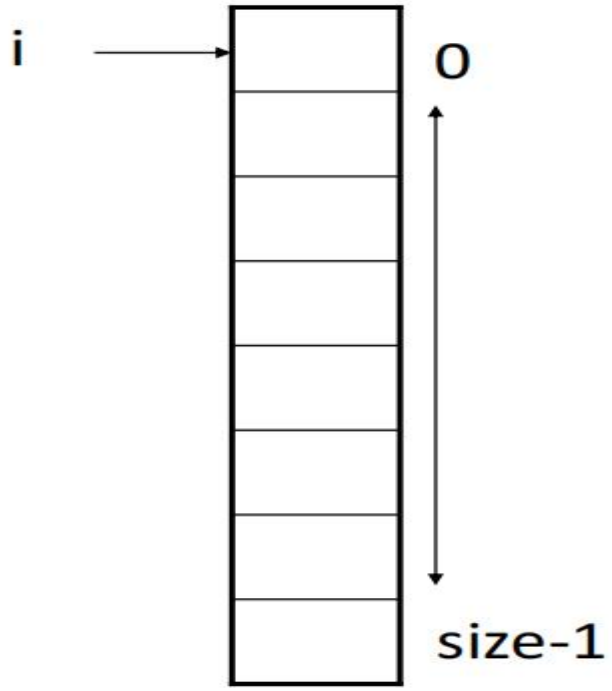
- An array is a sequence of elements all of which have the same type and are numbered consecutively 0,1,2,3,....., these numbers are called index values of the array.



One-Dimensional Array

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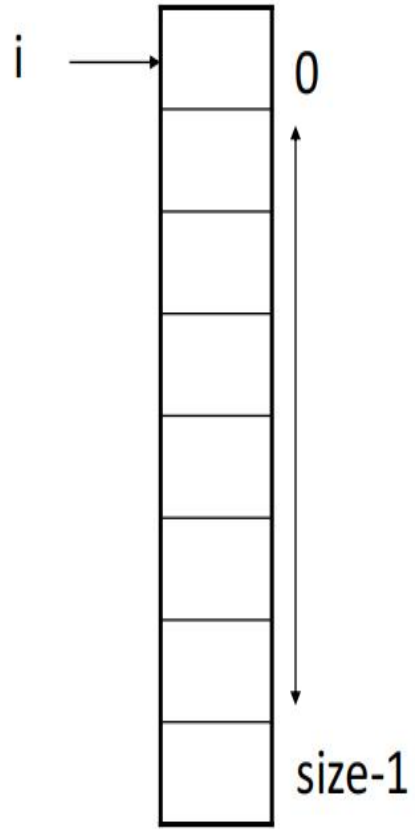
- If the name of the array is a, then a[0] is the name of the element that is in position 0, a[1] is the name of the element that is in position1, etc.

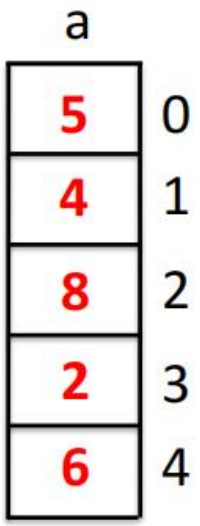


- In general the ith element is in position i-1, so if the array has n elements, their names are a[0], a[1], a[2],……., a[n-1].

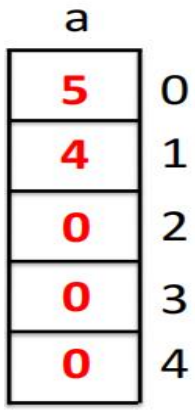
One Dimensional Array

- Initializing an array:

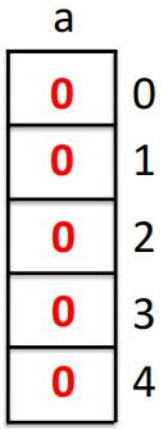
```
int a[5] = {5, 4, 8, 2, 6 };
```




```
int a[5] = { 5, 4 };
```



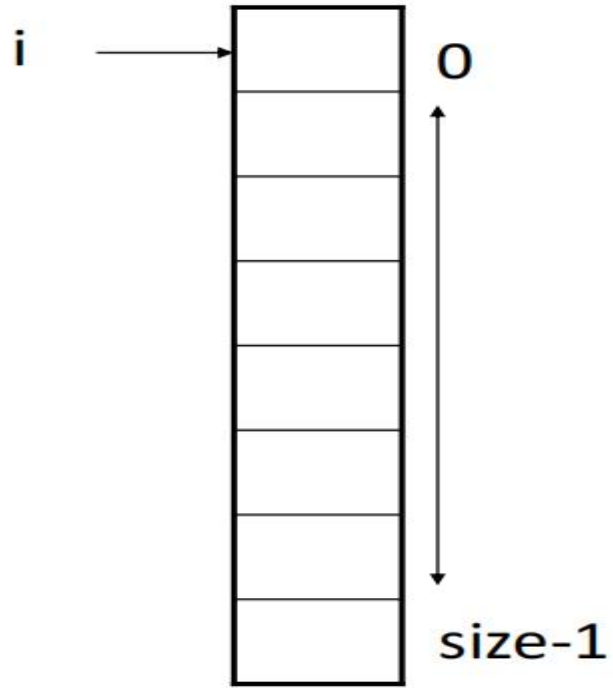

```
int a[5] = { 0 };
```



One Dimensional Array

- Reading one-dimensional array:

```
cout<<"Enter your Data:\n";
for (int i=0; i<n; i++)
      cin>>a[i];
```



- Printing one-dimensional array:

```
cout<<"The Data:\n";
for (int i=0; i<n; i++)
      cout<<a[i]<<endl;
```

One Dimensional Array

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- Getting the sum of the elements in one-dimensional array:

```
int sum =0;
for (int i=0; i<n ; i++)
        sum = sum + a[i];
```

Test the previous code fragment using the following array : int a[5] = { 5, 3, 8, 2, 3 };

	a
0	5
1	3
2	8
3	2
4	3

i	a[i]	sum
-	-	0
0	5	5
1	3	8
2	8	16
3	2	18
4	3	21

One Dimensional Array

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- Find the maximum element in an array:

```
int max=a[0];
for(int i=1;i<n;i++)
    if (a[i]>max) max=a[i];
```

Test the previous code fragment using the following array : int a[5] = { 5, 3, 8, 2, 3 };

i	a[i]	max
-	-	5
1	3	5
2	8	8
3	2	8
4	3	8

	a
0	5
1	3
2	8
3	2
4	3

One Dimensional Array

- Find the minimum element in an array:

```
int min=a[0];
for(int i=1;i<n;i++)
    if (a[i]<min) min=a[i];
```

Test the previous code fragment using the following array : int a[5] = { 5, 3, 8, 2, 3 };

i	a[i]	min
-	-	5
1	3	3
2	8	3
3	2	2
4	3	2

	a
0	5
1	3
2	8
3	2
4	3

One Dimensional Array

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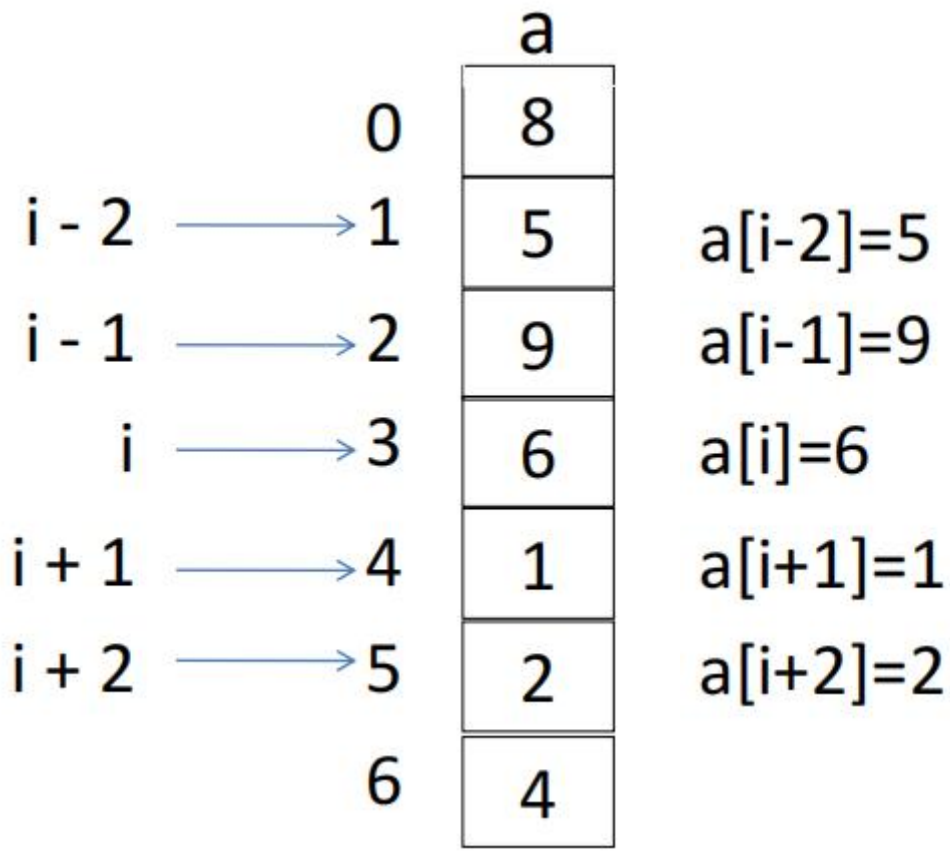
Important Remark:



Example (1)

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Write a program that reads in an array of N elements, and then prints all the elements above the average.

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

int main() {
    int i, n, a[100], sum = 0, aver;

    cout << "Enter the number of elements: "
    cin >> n;

    cout << "Enter your data:" << endl;
    for (i = 0; i < n; i++) {
        cin >> a[i];
        sum += a[i];
    }
    aver = sum / n; // integer division

    cout << "The elements above the average are:" << endl;
    for (i = 0; i < n; i++) {
        if (a[i] > aver)
            cout << a[i] << endl;
    }

    return 0;
}
```

Example (2)

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Write a program that reads in an array of N elements, and then counts all the elements above the average.

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

int main() {
    int i, n, a[100], sum = 0, aver, count = 0;

    cout << "Enter the number of elements: ";
    cin >> n;

    cout << "Enter your data:" << endl;
    for (i = 0; i < n; i++) {
        cin >> a[i];
        sum += a[i];
    }

    aver = sum / n;

    for (i = 0; i < n; i++) {
        if (a[i] > aver)
            count++;
    }

    cout << "No. of elements above the average are: " << count << endl;

    return 0;
}
```

Example (3)

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Trace the following code fragment and show the output

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

int main() {
    int i, a[10];

    a[0] = a[1] = 1;

    for (i = 2; i < 10; i++) {
        a[i] = a[i - 1] + a[i - 2];
    }

    for (i = 0; i < 10; i++) {
        cout << a[i] << endl;
    }

    return 0;
}
```

Trace

	a	
0	1	a[0]=1
1	1	a[1]=1
2	2	a[1]+a[0]
3	3	a[2]+a[1]
4	5	a[3]+a[2]
5	8	a[4]+a[3]
6	13	a[5]+a[4]
7	21	a[6]+a[5]
8	34	a[7]+a[6]
9	55	a[8]+a[7]

Output:

1
1
2
3
5
8
13
21
34
55

Example (4)

Trace the following code fragment and show the output

```
int i, a[5]={2,3,6,7,9};
for(i=0;i<5;i++)
   if(a[i]%2 !=0)
        a[i]+=1;
for(i=4;i>=0;i--)
   cout<<a[i]<<endl;
```

Before

a

0	2
1	3
2	6
3	7
4	9

i	a[i]
0	2 →
1	3
	4 →
2	6 →
3	7
	8 →
4	9
	10 →

After

a

0	2
1	4
2	6
3	8
4	10

Output

10
8
6
4
2

Example 5

Trace the following code fragment and show the output

```
int i, a[5]={3,7,8,5,4}, b[5]={0};
for(i=0; i<5; i++)
{
   if( i > (a[i]/a[i+1]) )
     b[i] += a[i-1];
   else
     b[i] += a[i+4];
   cout<<a[i]<<"\t"<<b[i]<<endl;
}
```

Trace

i	a[i]	b[i]
0	3	4
1	7	3
2	8	7
3	5	8
4	4	5

Output:

```
3    4
7    3
8    7
5    8
4    5
```

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THANK YOU