# ARRAYS

## 1- D Arrays

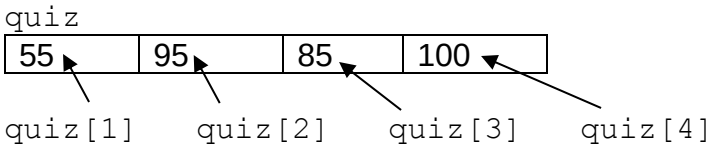
An array is a collection of  a fixed number of objects all of the same type. These objects are stored sequentially and are called elements.

### Declaring Arrays:

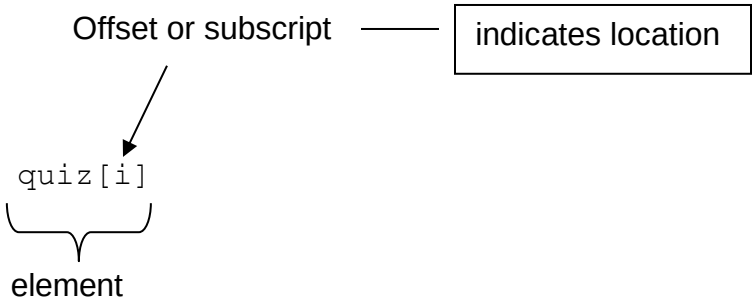
```
array_type array_name[array_size];
```

*Examples:*

```
int       quiz[4];
double    rate[5];
char      name[51];
```




- Each element of an array is numbered by its offset or subscript.




- In an array of size **N**, the valid offset range (subscript values) is from **0** to **N-1**.

### Initializing Arrays

```
int quiz[4]={55,95,85,100};
double rate[5]={0.075,0.080,0.082,0.085,0.088};
```

- If you do not list enough values, the compiler will fill the remaining elements with zeros.

```
int quiz[4]={95,100}
```

means

```
quiz[0]=95, quiz[1]=100, quiz[2]=0, quiz[3]=0;
```

- You can not omit the size of the array if you do not initialize the array.

```
int  mid_term[2]={50,80};      /* valid */
int  mid_term[]={50,80};       /* valid */
```
İnitialization

```
int  mid_term[2];    /* valid */
int  mid_term[];     /* invalid */
```
Declaration

***Example:***

```
#include <stdio.h>
void main(void)
{
   int quiz[4]={55,95,85,100},quizno;
   printf("\n Enter the quiz number (1-4): ");
   scanf("%d",&quiz_no);
     if (quiz_no>=1) && (quiz_no<=4)
        {
          printf("\n Quiz %d=%d",quiz_no,quiz[quiz_no-1]);
        }
     else
       printf("INVALID QUIZ NUMBER");
}
```

**Inputting Array Elements**

```
for  (i=0;i<10;++i)
   {
      printf("\n Enter number %2d:",i+1);
      scanf("%d",&number[i]);
    }
```

**Outputting Array Elements**

```
for  (i=0;i<10;++i)
   {
      printf("\n Number %2d=%6d",i+1,number[i]);
    }
```

***Example***

**Finding the average of 20 integers.**

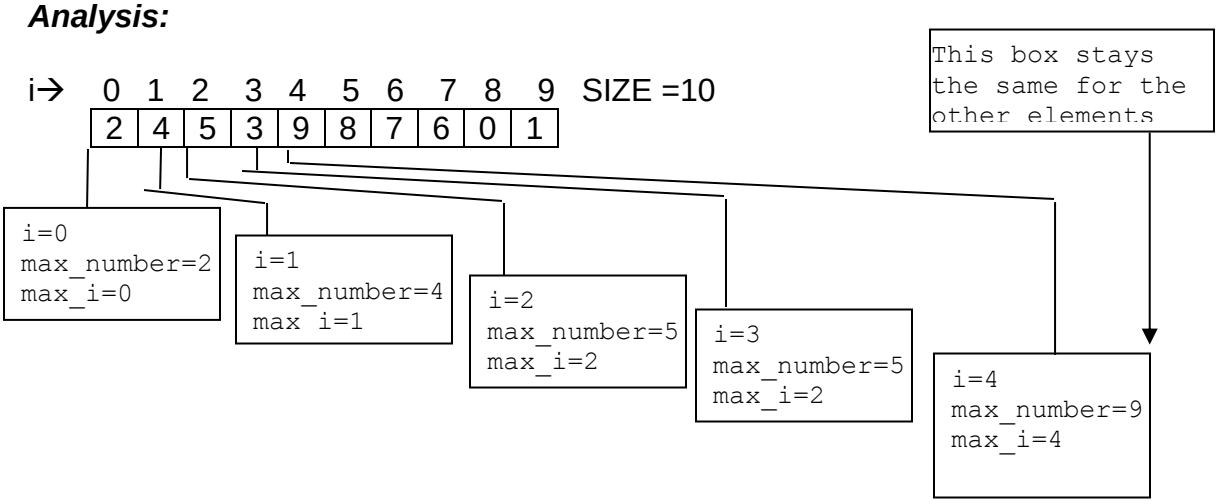
```
#include <stdio.h>
#define SIZE 20
void main(void)
{
int i, number[SIZE],sum=0;
double ave;
for (i=0;i<SIZE;++i)
  {
    printf("\n Enter number %d:",i+1);
    scanf("%d",&number[i]);
    sum+=number[i];
   }
ave=(double)sum/SIZE;
printf("\n The average is: %.2f",ave);
}
```

- It is a good programming technique to define the size of an array as a symbolic constant.

**Finding the largest value in an array.**

```
#include <stdio.h>
#define SIZE 30
void main(void)
{
int i,max_i, max_number, number[SIZE];
for (i=0;i<SIZE;++i)
  {
    printf("\n Enter number %d:",i+1);
    scanf("%d",&number[i]);
   }
max_i=0;
max_number=number[0];
for (i=0;i<SIZE;++i)
  {
    if (number[i]>max_number)
      {
        max_number=number[i];
        max_i=i;
       }
   }
printf("\n The highest number is %d",max_number);
}
```

***Analysis:***




**Finding the lowest value in an array.**

```
#include <stdio.h>
#define SIZE 30
void main(void)
{
 int i,min_i,min_number, number[SIZE];
for (i=0;i<SIZE;++i)
  {
    printf("\n Enter number %d:",i+1);
    scanf("%d",&number[i]);
   }
min_i=0;
min_number=number[0];
for (i=0;i<SIZE;++i)
  {
    if (number[i]<min_number)
      {
        min_number=number[i];
        min_i=i;
       }
   }
printf("\n The lowest number is %d",min_number);
}
```

**Searching an element in an array.**

- Find the quiz number and the corresponding quiz value on which a student achieved at least 85.

```
#include <stdio.h>
#define QUIZ_SIZE 30
#define MIN_GRADE 85
void main(void)
{
 int quiz[QUIZ_SIZE];
 int quiz_no;

for (quiz_no=0;quiz_no<QUIZ_SIZE;++quiz_no)
  {
    printf("\n Enter Quiz %d:",quiz_no+1);
    scanf("%d",&quiz[quiz_no]);
   }

for (quiz_no=0;quiz_no<QUIZ_SIZE;++quiz_no)
  {
  if (quiz[quiz_no]>=MIN_GRADE)
  {
printf("\n The first grade of at least %d is: ",MIN_GRADE);
  printf("\n Quiz %d Grade %d",quiz_no+1,quiz[quiz_no]);
  break;
  }
}
printf("Search completed.");
}
```

**To Display elements having even-numbered subscripts:**

```
#include<stdio.h>
void main(void)
{
 int quiz[10]={55,85,100,0,95,45,68,17,10,20};
 int i;
 for (i=0;i<10;i+=2)
 {
  printf("\n QUIZ[%d]=%3d",i,quiz[i]);
  }
}
```

```
Output:
     QUIZ[0]=55
     QUIZ[2]=100
     QUIZ[4]=95
     QUIZ[6]=68
     QUIZ[8]=10
```

**To Display elements having odd-numbered subscripts.**
Just change the for loop as:

```
for (i=1;i<10;i+=2)
```

**Write a program which displays only the values between 40 and 95 (inclusive) of the array** `quiz[10]={55,85,100,0,95,45,68,17,10,20}`**.**

```
#include <stdio.h>
void main(void)
{
 int quiz[10]={55,85,100,0,95,45,68,17,10,20};
 int i;
for (i=1;i<10;i+=2)
 {
    If (quiz[i]>=40 && quiz[i]<=95)
    {
      printf("\n QUIZ#%d=%2d",i+1,quiz[i]);
    }
  }
}
```

```
Output:
     QUIZ#1=55
     QUIZ#2=85
     QUIZ#5=95
     QUIZ#6=45
     QUIZ#7=68
```