

**PROGRAMMING FOR
PROBLEM SOLVING --
PPS
SUBJECT CODE-
BTPS-101-18**

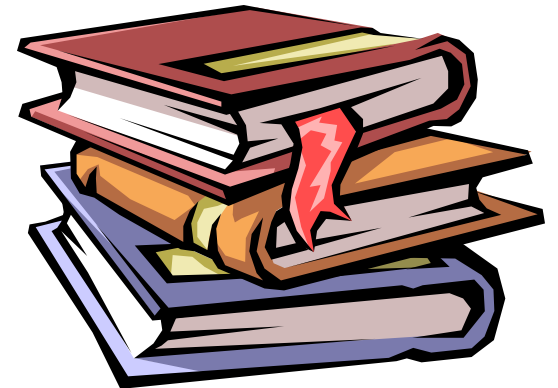


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UNIT-3

Arrays

Arrays (1-D, 2-D), Character arrays and Strings



Session Objectives

- **Explain Arrays**
- **Explain Declaration, Initialization of Array**
- **Explain Types of Array**
- **One Dimensional, Two Dimensional and Multi Dimensional Array**

Array is defined as a set of homogeneous data items.

An Array is a group of elements that share a common name that are differentiated from one another by their positions within the array

DECLARATION OF AN ARRAY

```
Datatype arrayname[subscript];
```

POINTS TO BE NOTED :

- 1) Arrayname should be a valid "C" variable
- 2) Arrayname should be unique
- 3) The elements in the array should be of same type
- 4) Subscript (array size) cannot be negative
- 5) Subscript must always be an integer

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Examples where arrays can be used

- ❖ Storing the temperature recorded every hour in a day
- ❖ List of students in a class
- ❖ List of marks of all the students in a subject
- ❖ Attendance of all the students in the session.
- ❖ Contact number of all the students

TYPES OF ARRAY

One Dimensional Array

Two Dimensional Array

Multi Dimensional Array

Single or One Dimensional Arrays

➤ Arrays whose elements are specified by one subscript are called One dimensional array or linear array.

➤ Syntax :

```
datatype arrayname[size];
```

➤ *For Example :*

```
int a[3];
```

➤ Note :

By default array index should starts with zero (0)

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Write a program for entering data into an array & Reading data from an array

```
#include<stdio.h>
void main()
{
    int arr[10],I,n;
    printf("\n ENter N Elements");
    scanf("%d",&n);
    for(i=0;i<n;i++)
    {
        printf("enter arr[%d]=",i);
        scanf("%d",&arr[i]);
    }
    for(i=0;i<n;i++)
    {
        printf("%d\n",arr[i]);
    }
}
```

Input

```
Enter N Elements : 3
Enter arr[0] : 2
Enter arr[1] : 5
Enter arr[2] : 3
```

Output

```
2
5
3
```

PROGRAM-ARRAY INITIALIZATION

Array Initialization

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[5]={10,20,30,40,50};
    int i;
    clrscr();
    for(i=0;i<5;i++)
    {
        printf("%d\n",a[i]);
    }
    getch();
}
```

Output

10
20
30
40
50

Write a “C” program to sort the given number is in ascending order using one dimensional array

```
#include<stdio.h>
void main()
{
int i,j,n, a[10],temp;
printf("\n size of vector=");
scanf("%d",&n);
printf("vector elements:");
for (i=0;i<n;i++)
{
scanf("%d",&a[i]);
}
for(i=0;i<n-1;i++)
for(j=i+1;j<n;j++)
if(a[i]>a[j])
{
temp=a[i];
a[i]=a[j];
a[j]=temp;
}
printf("\n\nElements in asending order is=\n");
for(i=0;i<n;i++)
printf("%d",a[i]);
printf("\n\nElements in descending order is=\n");
for(i=n-1;i>=0;i--)
printf("%d",a[i]);
getch();
}
```

Two Dimensional Arrays

- Arrays whose elements are specified by two subscript such as row and column are called One dimensional array or linear array.
- Row → means horizontally
- Column → means vertically
- A two - dimensional array looks like a school time-table consisting of rows and columns.
- A two – dimensional array is declared as -

```
int a [3] [3]
```

Two Dimensional Array Initialization

```
int ary [3] [4] = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 };
```

➤ The result of the above assignment will be as follows :

```
ary [0] [0] = 1    ary [0] [1] = 2    ary [0] [2] = 3    ary [0] [3] = 4  
ary [1] [0] = 5    ary [1] [1] = 6    ary [1] [2] = 7    ary [1] [3] = 8  
ary [2] [0] = 9    ary [2] [1] = 10   ary [2] [2] = 11   ary [2] [3] = 12
```

(OR)

```
int ary [3] [4] =  
    {  
    { 1, 2, 3 },  
    { 4, 5, 6 },  
    { 7, 8, 9 },  
    { 10, 11, 12 }  
    };
```

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Write a “C” program to perform the addition of two matrices

```
#include<stdio.h>
void main()
{
int a[3][3],b[3][3],c[3][3],i,j;
printf("Input A - Matrix\n");
for(i=0;i<3;i++)
for(j=0;j<3;j++)
scanf("%d",&a[i][j]);
printf("Input B - Matrix\n");
for(i=0;i<3;i++)
for(j=0;j<3;j++)
scanf("%d",&b[i][j]);
for(i=0;i<3;i++)
for(j=0;j<3;j++)
c[i][j]=a[i][j]+b[i][j];
printf("Sum of A and B Matrix=\n");
for(i=0;i<3;+i)
{
for(j=0;j<3;+j)
printf("%d",c[i][j]);
printf("\n");
}
}
```

Write a "C" program to perform the subtraction of two matrices

```
#include<stdio.h>
void main()
{
int a[3][3],b[3][3],c[3][3],i,j;
printf("Input A - Matrix\n");
for(i=0;i<3;i++)
for(j=0;j<3;j++)
scanf("%d",&a[i][j]);
printf("Input B - Matrix\n");
for(i=0;i<3;i++)
for(j=0;j<3;j++)
scanf("%d",&b[i][j]);
for(i=0;i<3;i++)
for(j=0;j<3;j++)
c[i][j]=a[i][j]-b[i][j];
printf("Sum of A and B Matrix=\n");
for(i=0;i<3;+i)
{
for(j=0;j<3;+j)
printf("%d",c[i][j]);
printf("\n");
}
}
```

Write a “C” program to sort the given names in Alphabetical order using One dimensional array

```
#include<stdio.h>
#include<string.h>
void main()
{
int i,j,n;
char a[10][10],temp[10];
printf("\n Enter the N Values");
scanf("%d",&n);
printf("Enter the Names one by one :\n");
for(i=0;i<n;i++)
{
scanf("%s",&a[i]);
}
for(i=0;i<n-1;i++)
for(j=i+1;j<n;j++)
if((strcmp(a[i],a[j]))>0)
{
strcpy(temp,a[i]);
strcpy(a[i],a[j]);
strcpy(a[j],temp);
}
printf("The Names in Alphabetical Order is =\n");
for(i=0;i<n;i++)
printf("\n%s",a[i]);
}
```

Write a "C" program to perform matrix multiplication using two dimensional array

```
#include<stdio.h>
void main()
{
int a[10][10],b[10][10],c[10][10],i,j,m,n,p,q,k;
printf("Input row and column of A matrix \n");
scanf("%d %d",&n,&m);
printf(" Input row and column of B matrix \n");
scanf("%d %d",&p,&q);
if(n==q){
printf(" Matrices can be Multiplied: \n");
printf(" Input A-matrix \n");
for(i=0;i<n;++i)
for(j=0;j<m;++j)
scanf("%d",&a[i][j]);
printf(" Input B-matrix \n");
for(i=0;i<p;++i)
for(j=0;j<q;++j)
scanf("%d",&b[i][j]);
printf("The resultant matrix is\t:\n");
for(i=0;i<n;++i){
for(j=0;j<m;++j){
c[i][j]=0;
for(k=0;k<m;++k)
c[i][j]=c[i][j]+a[i][k]*b[k][j];
printf("%d",c[i][j]);}
printf("\n");}}
else
printf("Matrices cannot be multiplied \n");
}
```

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Write a “C” program to find the largest and smallest numbers given in the array

```
#include<stdio.h>
void main()
{
int i,n;
float a[20],large,small;
printf("\nEnter the N values=");
scanf("%d",&n);
printf("Enter the values one by one :\n");
for(i=0;i<n;i++)
{
scanf("%f",&a[i]);
}
large=a[0];
for(i=1;i<n;i++)
{
if(a[i]>large)
large=a[i];
}
small=a[0];
for(i=1;i<n;i++)
{
if(a[i]<small)
small=a[i];
}
printf("Largest element is = %f\n",large);
printf("Smallest element = %f\n",small);
}
```

Session Summary

- ✂ **Arrayname should be a unique and valid “C” Variable name**
- ✂ **The number of elements in a multi dimensional array is the product of its subscripts**
- ✂ **Arrays can be initialized to the same type in which they are declared**
- ✂ **The character array receives the terminating ‘\0’ in the string constant**
- ✂ **The individual values in the array are called as elements**
- ✂ **It is not necessary to specify the length of an array, explicitly in case if initializers are provided for the array during declaration itself**

EXERCISES

1. Write a program to search an element and to find how many times it is present in the array?
2. Write a program to find the sum of diagonal elements in a matrix
3. Write a program to find the second largest number in an array?
4. Write a program to remove the duplicate elements of the array?
5. Write a program to merge two arrays and print the merged array in ascending order?
6. Write a program to insert an element into an sorted array of integers?
7. Write a program to display only the negative elements of the array?

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