Online Discussion session

Two Dimensional Array

Instructor:

Er. Manisha Bhattarai

NCIT

Date :2077-02-25

Two Dimensional Array:

- Declaration Syntax:

  datatype arrayName[rowSize][columnSize];

  Example:

  int A[2][4];

A[0][0]	A[0][1]	A[0][2]	A[0][3]
A[1][0]	A[1][1]	A[1][2]	A[1][3]

Two Dimensional Array

- Initialization of 1D array

➢ Compile time initialization:

Syntax:

```
int A[2][3]={1,2,3,4,5,6};
```

or

```
int A[2][3]={{1,2,3},{4,5,6}};
```

or

```
int A[2][3];
A[0][0]=1;
A[0][1]=2;
```

➢ Run time initialization:

```
int A[2][3];
 for(i=0;i<2;i++)
 {
     for(j=0;j<3;j++)
      {
          scanf("%d",&A[i][j]);
      }
 }
```

1. Program to input m*n order matrix and display them.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n;
    printf("Enter the number of rows and columns of a matrix");
    scanf("%d%d",&m,&n);
    printf("Enter the data elements of a matrix");
      for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
            {
            scanf("%d",&a[i][j]);
            }
        }
```

1. Program to input m*n order matrix and display them.

```
printf("The data elements of matrix are:\n");
      for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
                {
                printf("%d\t",a[i][j]);
              }
           printf("\n");
         }
getch();
   }
```

2. Program to input m*n order matrix and display the sum and average of its data elements.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n,sum=0;
    float avg;
    printf("Enter the number of rows and columns of a matrix");
    scanf("%d%d",&m,&n);
    printf("Enter the data elements of a matrix");
      for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
            {
            scanf("%d",&a[i][j]);
          }
      }
```

2. Program to input m*n order matrix and display the sum and average of its data elements.

```
printf("The data elements of matrix are:\n");
      for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
                {
                printf("%d\t",a[i][j]);
              }
           printf("\n");
         }
```

```
for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
                {
                sum+=a[i][j];
              }
         }
```

2. Program to input m*n order matrix and display the sum and average of its data elements.

- avg=(sum*1.0)/(m*n);
- printf("Sum of all elements=%d\nAverage=%.2f",sum,avg);
- getch();
- }

3. Program to input m*n order matrix and display the sum of odd and even elements separately. Also count their numbers.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
  int a[20][20],i,j,m,n,esum=0,ecount=0,osum=0,
ocount=0;
     printf("Enter the number of rows and columns of a matrix");
     scanf("%d%d",&m,&n);
printf("Enter the data elements of a matrix");
     for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
              {
              scanf("%d",&a[i][j]);
           }
        }
```

3. Program to input m*n order matrix and display the sum of odd and even elements separately. Also count their numbers.

```
printf("The data elements of matrix are:\n");
    for(i=0;i<m;i++)
      {
      for(j=0;j<n;j++)
          {
          printf("%d\t",a[i][j]);
         }
       printf("\n");
      }
```

```
for(i=0;i<m;i++)
      {
      for(j=0;j<n;j++)
          {
          if(a[i][j]%2==0)
              {
                  esum+=a[i][j];
              ecount++;
                }
```

3. Program to input m*n order matrix and display the sum of odd and even elements separately. Also count their numbers.

```
else
                {
                    osum+=a[i][j];
                  ocount++;
                }
            }
        }
```

```
printf("Total number of even elements=%d and their sum=%d\nTotal number of odd elements=%d and their sum=%d",ecount,esum,ocount,osum);
    getch();
}
```

4. Program to input m*n order matrix and check whether a number is present in an array or not. If present, also display its position.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n,sum,num,flag=0;
    printf("Enter the number of rows and columns of a matrix");
    scanf("%d%d",&m,&n);
    printf("Enter the data elements of a matrix");
      for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
            {
            scanf("%d",&a[i][j]);
          }
        }
```

4. Program to input m*n order matrix and check whether a number is present in an array or not. If present, also display its position.

```
printf("The data elements of matrix are:\n");
    for(i=0;i<m;i++)
    {
    for(j=0;j<n;j++)
        {
        printf("%d\t",a[i][j]);
       }
     printf("\n");
    }
```

```
printf("\nEnter the number that you want to check:");
    scanf("%d",&num);
    for(i=0;i<m;i++)
    {
    for(j=0;j<n;j++)
        {
```

4. Program to input m*n order matrix and check whether a number is present in an array or not. If present, also display its position.

```
if(a[i][j]==num)
                    {
                    flag++;
                    printf("%d is present at position a[%d][%d]",num,i,j);
                }
            }
        }
```

```
if(flag==0)
                {
            printf("%d is not present",num);
        }
    getch();
}
```

5 . Program to input m*n order matrix and display its transpose.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n;
     printf("Enter the number of rows and columns of a matrix");
     scanf("%d%d",&m,&n);
printf("Enter the data elements of a matrix");
      for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
                {
                scanf("%d",&a[i][j]);
              }
         }
```

5 . Program to input m*n order matrix and display its transpose.

```
printf("The data elements of matrix are:\n");
      for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
            {
            printf("%d\t",a[i][j]);
           }
         printf("\n");
       }
printf("\nThe resultant transpose matrix is:\n");
      for(i=0;i<n;i++)
        {
        for(j=0;j<m;j++)
            {
            printf("%d\t",a[j][i]);
           }
         printf("\n");
       }
      getch();
   }
```

6 . Program to input m*n order matrix and sum of main diagonal elements.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n,sum=0;
     printf("Enter the number of rows and columns of a matrix");
     scanf("%d%d",&m,&n);
     printf("Enter the data elements of a matrix");
        for(i=0;i<m;i++)
          {
           for(j=0;j<n;j++)
                {
                 scanf("%d",&a[i][j]);
                }
          }
```

6 . Program to input m*n order matrix and sum of main diagonal elements.

```
printf("The data elements of matrix are:\n");
      for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
              {
              printf("%d\t",a[i][j]);
             }
          printf("\n");
        }
```

```
for(i=0;i<m;i++)
            {
            for(j=0;j<n;j++)
                  {
                  if(i==j)
                  sum+=a[i][j];
              }
          }
      printf("Sum of main diagonal elements=%d",sum);
      getch();
   }
```

7 . Program to input m*n order matrix and sum of next diagonal elements.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n,sum=0;
     printf("Enter the number of rows and columns of a matrix");
     scanf("%d%d",&m,&n);
     printf("Enter the data elements of a matrix");
        for(i=0;i<m;i++)
          {
           for(j=0;j<n;j++)
                {
                 scanf("%d",&a[i][j]);
                }
          }
```

7 . Program to input m*n order matrix and sum of next diagonal elements.

```
printf("The data elements of matrix are:\n");
      for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
              {
              printf("%d\t",a[i][j]);
             }
          printf("\n");
        }
```

```
for(i=0;i<m;i++)
            {
            for(j=0;j<n;j++)
                  {
                  if((i+j)==m-1)
                  sum+=a[i][j];
                }
          }
      printf("Sum of next diagonal elements=%d",sum);
      getch();
   }
```

8 . Program to input m*n order matrix and sum of individual row elements.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n,sum;
     printf("Enter the number of rows and columns of a matrix");
     scanf("%d%d",&m,&n);
     printf("Enter the data elements of a matrix");
        for(i=0;i<m;i++)
          {
           for(j=0;j<n;j++)
                {
                 scanf("%d",&a[i][j]);
                }
          }
```

8 . Program to input m*n order matrix and sum of individual row elements.

```
printf("The data elements of matrix are:\n");
    for(i=0;i<m;i++)
      {
      for(j=0;j<n;j++)
          {
          printf("%d\t",a[i][j]);
         }
       printf("\n");
      }
```

```
for(i=0;i<m;i++)
          {
          sum=0;
          for(j=0;j<n;j++)
                {
                sum+=a[i][j];
           }
        printf("Sum of %d row is %d\n",i+1,sum);
        }
     getch();
  }
```

8 . Program to input m*n order matrix and sum of individual column elements.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],i,j,m,n,sum;
     printf("Enter the number of rows and columns of a matrix");
     scanf("%d%d",&m,&n);
     printf("Enter the data elements of a matrix");
        for(i=0;i<m;i++)
          {
           for(j=0;j<n;j++)
                {
                 scanf("%d",&a[i][j]);
                }
          }
```

8 . Program to input m*n order matrix and sum of individual column elements.

```
printf("The data elements of matrix are:\n");
    for(i=0;i<m;i++)
      {
      for(j=0;j<n;j++)
          {
          printf("%d\t",a[i][j]);
         }
       printf("\n");
      }
```

```
for(i=0;i<n;i++)
          {
          sum=0;
          for(j=0;j<m;j++)
                {
                sum+=a[j][i];
           }
        printf("Sum of %d column is %d\n",i+1,sum);
        }
     getch();
  }
```

9 . Program to input m*n order matrix and display its data elements after multiplying each of them by 3.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
       int a[20][20],i,j,m,n;
    printf("Enter the number of rows and columns of a matrix");
    scanf("%d%d",&m,&n);
    printf("Enter the data elements of a matrix");
      for(i=0;i<m;i++)
        {
          for(j=0;j<n;j++)
              {
                scanf("%d",&a[i][j]);
            }
        }
```

9 . Program to input m*n order matrix and display its data elements after multiplying each of them by 3.

```
printf("The data elements of matrix are:\n");
      for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
                {
                printf("%d\t",a[i][j]);
              }
           printf("\n");
         }
```

```
printf("\nThe resultant matrix after multiplying each element by 3 is:\n");
      for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
          {
                printf("%d\t",a[i][j]*3);
            }
         printf("\n");
         }
      getch();
   }
```

10 . Program to input m*n order matrix and display its lower and upper triangular matrix.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
       int a[20][20],i,j,m,n;
    printf("Enter the number of rows and columns of a matrix");
    scanf("%d%d",&m,&n);
    printf("Enter the data elements of a matrix");
      for(i=0;i<m;i++)
        {
          for(j=0;j<n;j++)
              {
                scanf("%d",&a[i][j]);
              }
        }
```

10 . Program to input m*n order matrix and display its lower and upper triangular matrix.

```
printf("The data elements of matrix are:\n");
    for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
            {
            printf("%d\t",a[i][j]);
          }
        printf("\n");
      }
```

```
printf("\nThe lower triangular matrix is:\n");
    for(i=0;i<m;i++)
        {
        for(j=0;j<n;j++)
        {
            if(i<j)
            printf("0\t");
          else
            printf("%d\t",a[i][j]);
        }
      printf("\n");
    }
```

10 . Program to input m*n order matrix and display its lower and upper triangular matrix.

```
printf("\nThe upper triangular matrix is:\n");
      for(i=0;i<m;i++)
            {
            for(j=0;j<n;j++)
            {
                  if(i>j)
                  printf("0\t");
               else
                  printf("%d\t",a[i][j]);
             }
           printf("\n");
         }
getch();
   }
```

11 . Program to display third matrix after performing matrix addition.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],b[20][20],c[20][20],i,j,m,n;
     printf("Enter the number of rows and columns of matrices");
     scanf("%d%d",&m,&n);
     printf("Enter the data elements of first matrix");
        for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
                {
                scanf("%d",&a[i][j]);
              }
         }
```

11 . Program to display third matrix after performing matrix addition.

```
printf("\nEnter the data elements of second matrix");
      for(i=0;i<m;i++)
        {
            for(j=0;j<n;j++)
            {
            scanf("%d",&b[i][j]);
            }
        }
```

```
printf("\nThe data elements of  first matrix are:\n");
      for(i=0;i<m;i++)
        {
          for(j=0;j<n;j++)
              {
              printf("%d\t",a[i][j]);
            }
           printf("\n");
        }
```

11 . Program to display third matrix after performing matrix addition.

```
printf("\nThe data elements of second matrix are:\n");
      for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
                {
                printf("%d\t",b[i][j]);
              }
           printf("\n");
         }
```

```
printf("\nThe resultant matrix after addition is:\n");
      for(i=0;i<m;i++)
          {
          for(j=0;j<n;j++)
          {
                c[i][j]=a[i][j]+b[i][j];
              printf("%d\t",c[i][j]);
            }
          printf("\n");
        }
    getch();
  }
```

12 . Program to perform matrix multiplication.

```
#include<stdio.h>
#include<conio.h>


void main()
  {
        int a[20][20],b[20][20],c[20][20],i,j,k,r1,c1,r2,c2;
      printf("Enter the number of rows and columns of first matrix");
      scanf("%d%d",&r1,&c1);
printf("Enter the number of rows and columns of second matrix");
      scanf("%d%d",&r2,&c2);
      if(c1!=r2)
         {
          printf("Matrix multiplication is not possible");
         }
```

12 . Program to perform matrix multiplication.

```
else
        {
        printf("Enter the data elements of first matrix");
        for(i=0;i<r1;i++)
            {
            for(j=0;j<c1;j++)
                {
                scanf("%d",&a[i][j]);
                }
            }
printf("\nEnter the data elements of second matrix");
        for(i=0;i<r2;i++)
            {
            for(j=0;j<c2;j++)
                {
                scanf("%d",&b[i][j]);
                }
        }
```

12 . Program to perform matrix multiplication.

```
printf("\nThe data elements of first matrix are:\n");
        for(i=0;i<r1;i++)
        {
        for(j=0;j<c1;j++)
            {
            printf("%d\t",a[i][j]);
        }
        printf("\n");
        }
```

```
printf("\nThe data elements of second matrix are:\n");
        for(i=0;i<r2;i++)
        {
            for(j=0;j<c2;j++)
            {
                printf("%d\t",b[i][j]);
        }
        printf("\n");
        }
```

12 . Program to perform matrix multiplication.

```
for(i=0;i<r1;i++)
                {
                        for(j=0;j<c2;j++)
                        {
                        c[i][j]=0;
                        for(k=0;k<c1;k++)
                                {
                                c[i][j]+=a[i][k]*b[k][j];
                                 }
                        }
                 }
```

```
printf("\nThe resultant matrix after multiplication is:\n");
    for(i=0;i<r1;i++)
        {
        for(j=0;j<c2;j++)
        {
            printf("%d\t",c[i][j]);
         }
       printf("\n");
      }
  }
    getch();
  }
```

Practice Questions

1. Program to input m*n order matrix and find out the minimum and maximum data elements among them.
2. Program to input m*n order matrix and find the square root of sum of square of all individual elements.

   Hint:

   sum+=a[i][j]*a[i][j](inside loop)

   result=sqrt(sum) (outside loop)


thank you!