1)

```c
#include <stdio.h>

void  main()
{
   int arr[10];
   int i;
      printf("\n\nRead and Print elements of an array:\n");
      printf("-----------------------------------------\n");

   printf("Input 10 elements in the array :\n");
   for(i=0; i<10; i++)
   {
              printf("element - %d : ",i);
      scanf("%d", &arr[i]);
   }

   printf("\nElements in array are: ");
   for(i=0; i<10; i++)
   {
      printf("%d  ", arr[i]);
   }
   printf("\n");
}
```

2)

```c
#include <stdio.h>

void main()
{
  int i,n,a[100];

      printf("\n\nRead n number of values in an array and display it in reverse order:\n");
      printf("-------------------------------------------------------------------------\n");

  printf("Input the number of elements to store in the array :");
  scanf("%d",&n);

  printf("Input %d number of elements in the array :\n",n);
  for(i=0;i<n;i++)
     {
            printf("element - %d : ",i);
            scanf("%d",&a[i]);
            }
```

```
  printf("\nThe values store into the array are : \n");
  for(i=0;i<n;i++)
    {
            printf("% 5d",a[i]);
          }

  printf("\n\nThe values store into the array in reverse are :\n");
  for(i=n-1;i>=0;i--)
    {
            printf("% 5d",a[i]);
          }
  printf("\n\n");
}

3)
#include <stdio.h>

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


     printf("\n\nFind sum of all elements of array:\n");
     printf("---------------------------------------\n");

     printf("Input the number of elements to be stored in the array :");
     scanf("%d",&n);

     printf("Input %d elements in the array :\n",n);
     for(i=0;i<n;i++)
      {
              printf("element - %d : ",i);
              scanf("%d",&a[i]);
            }

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

   printf("Sum of all elements stored in the array is : %d\n\n", sum);
}
```

4)

```
#include <stdio.h>

void main()
{
   int arr1[100], arr2[100];
   int i, n;


      printf("\n\nCopy the elements one array into another array :\n");
      printf("-------------------------------------------------\n");

      printf("Input the number of elements to be stored in the array :");
      scanf("%d",&n);

      printf("Input %d elements in the array :\n",n);
      for(i=0;i<n;i++)
       {
                printf("element - %d : ",i);
                scanf("%d",&arr1[i]);
              }
   /* Copy elements of first array into second array.*/
   for(i=0; i<n; i++)
   {
      arr2[i] = arr1[i];
   }

   /* Prints the elements of first array   */
   printf("\nThe elements stored in the first array are :\n");
   for(i=0; i<n; i++)
   {
      printf("% 5d", arr1[i]);
   }

   /* Prints the elements copied into the second array. */
   printf("\n\nThe elements copied into the second array are :\n");
   for(i=0; i<n; i++)
   {
      printf("% 5d", arr2[i]);
   }
                printf("\n\n");
}
```

5)

```
#include <stdio.h>

void main()
{
   int arr1[100];
          int arr2[100];
          int arr3[100];
   int n,mm=1,ctr=0;
   int i, j;


      printf("\n\nCount total number of duplicate elements in an array:\n");
      printf("------------------------------------------------------\n");

      printf("Input the number of elements to be stored in the array :");
      scanf("%d",&n);

      printf("Input %d elements in the array :\n",n);
      for(i=0;i<n;i++)
       {
                printf("element - %d : ",i);
                scanf("%d",&arr1[i]);
              }
/*----------------- copy in other array ----------------------------------*/
                    for(i=0;i<n; i++)
      {
                    arr2[i]=arr1[i];
                    arr3[i]=0;
      }
/*------------------- mark the elements are duplicate -------------------------*/
           for(i=0;i<n; i++)
      {
                    for(j=0;j<n;j++)
                                {
                                        if(arr1[i]==arr2[j])
                                        {
                                        arr3[j]=mm;
                                        mm++;
                                        }
                                }
                                mm=1;
      }
/*--------------- Prints the array ----------------------------------*/
```

```
  for(i=0; i<n; i++)
   {
    if(arr3[i]==2){ctr++;}
   }
    printf("The total number of duplicate elements found in the array is: %d \n", ctr);

            printf("\n\n");
}
```

6)

```
#include <stdio.h>

void main()
{
   int arr1[100], n,ctr=0;
   int i, j, k;


    printf("\n\nPrint all unique elements of an array:\n");
    printf("----------------------------------------\n");

    printf("Input the number of elements to be stored in the array :");
    scanf("%d",&n);

    printf("Input %d elements in the array :\n",n);
    for(i=0;i<n;i++)
        {
            printf("element - %d : ",i);
            scanf("%d",&arr1[i]);
        }

  /*Checking duplicate elements in the array */
  printf("\nThe unique elements found in the array are : \n");
  for(i=0; i<n; i++)
  {
     ctr=0;

                /*Check duplicate bifore the current position and
                increase counter by 1 if found.*/
     for(j=0; j<i-1; j++)
     {
        /*Increment the counter when the seaarch value is duplicate.*/
        if(arr1[i]==arr1[j])
        {
```

```
            ctr++;
          }
       }
       /*Check duplicate after the current position and
                    increase counter by 1 if found.*/
      for(k=i+1; k<n; k++)
       {
          /*Increment the counter when the seaarch value is duplicate.*/
          if(arr1[i]==arr1[k])
          {
             ctr++;
          }
       }
                  /*Print the value of the current position of the array as unique value
                  when counter remain contains its initial value.*/
      if(ctr==0)
       {
         printf("%d ",arr1[i]);
       }
   }
      printf("\n\n");
}
```

7)

```
#include <stdio.h>

void main()
{
   int arr1[100], arr2[100], arr3[200];
   int s1, s2, s3;
   int i, j, k;


      printf("\n\nMerge two arrays of same size sorted in decending order.\n");
      printf("-------------------------------------------------------------\n");

      printf("Input the number of elements to be stored in the first array :");
      scanf("%d",&s1);

      printf("Input %d elements in the array :\n",s1);
      for(i=0;i<s1;i++)
          {
              printf("element - %d : ",i);
              scanf("%d",&arr1[i]);
```

```
        }


    printf("Input the number of elements to be stored in the second array :");
    scanf("%d",&s2);

    printf("Input %d elements in the array :\n",s2);
    for(i=0;i<s2;i++)
        {
            printf("element - %d : ",i);
            scanf("%d",&arr2[i]);
        }

  /* size of merged array is size of first array and  size of second array */
  s3 = s1 + s2;
/*---------------- insert in the third array----------------------------------*/
  for(i=0;i<s1; i++)
    {
      arr3[i] = arr1[i];
    }
   for(j=0;j<s2; j++)
    {
      arr3[i] = arr2[j];
      i++;
    }
/*---------------- sort the array in decending order ---------------------------*/
  for(i=0;i<s3; i++)
    {
      for(k=0;k<s3-1;k++)
       {

         if(arr3[k]<=arr3[k+1])
          {
           j=arr3[k+1];
           arr3[k+1]=arr3[k];
           arr3[k]=j;
          }
       }
    }

/*--------------- Prints the merged array ----------------------------------*/
   printf("\nThe merged array in decending order is :\n");
  for(i=0; i<s3; i++)
  {
```

```
      printf("%d   ", arr3[i]);
   }
         printf("\n\n");
}
```

8)

```
#include <stdio.h>

void main()
{
   int arr1[100], fr1[100];
   int n, i, j, ctr;


     printf("\n\nCount frequency of each element of an array:\n");
     printf("-------------------------------------------------\n");

     printf("Input the number of elements to be stored in the array :");
     scanf("%d",&n);

     printf("Input %d elements in the array :\n",n);
     for(i=0;i<n;i++)
         {
              printf("element - %d : ",i);
              scanf("%d",&arr1[i]);
                   fr1[i] = -1;
             }
   for(i=0; i<n; i++)
   {
      ctr = 1;
      for(j=i+1; j<n; j++)
      {
         if(arr1[i]==arr1[j])
         {
            ctr++;
            fr1[j] = 0;
         }
      }

      if(fr1[i]!=0)
      {
         fr1[i] = ctr;
      }
   }
```

```
   printf("\nThe frequency of all elements of array : \n");
   for(i=0; i<n; i++)
   {
      if(fr1[i]!=0)
      {
         printf("%d occurs %d times\n", arr1[i], fr1[i]);
      }
   }
}
```

9)

```
#include <stdio.h>

void main()
{
   int arr1[100];
   int i, mx, mn, n;


      printf("\n\nFind maximum and minimum element in an array :\n");
      printf("-------------------------------------------------\n");

      printf("Input the number of elements to be stored in the array :");
      scanf("%d",&n);

      printf("Input %d elements in the array :\n",n);
      for(i=0;i<n;i++)
          {
              printf("element - %d : ",i);
              scanf("%d",&arr1[i]);
            }


   mx = arr1[0];
   mn = arr1[0];

   for(i=1; i<n; i++)
   {
      if(arr1[i]>mx)
      {
         mx = arr1[i];
      }
```

```
      if(arr1[i]<mn)
      {
         mn = arr1[i];
      }
   }
   printf("Maximum element is : %d\n", mx);
   printf("Minimum element is : %d\n\n", mn);
}
```

10)

```
#include <stdio.h>

void main()
 {
   int arr1[10], arr2[10], arr3[10];
   int i,j=0,k=0,n;


    printf("\n\nSeparate odd and even integers in separate arrays:\n");
    printf("-------------------------------------------------------\n");

    printf("Input the number of elements to be stored in the array :");
    scanf("%d",&n);

    printf("Input %d elements in the array :\n",n);
    for(i=0;i<n;i++)
        {
            printf("element - %d : ",i);
            scanf("%d",&arr1[i]);
          }

   for(i=0;i<n;i++)
   {
         if (arr1[i]%2 == 0)
         {
           arr2[j] = arr1[i];
           j++;
         }
         else
         {
           arr3[k] = arr1[i];
           k++;
         }
```

```
    }

    printf("\nThe Even elements are : \n");
    for(i=0;i<j;i++)
    {
            printf("%d ",arr2[i]);
    }

    printf("\nThe Odd elements are :\n");
    for(i=0;i<k;i++)
    {
            printf("%d ", arr3[i]);
    }
    printf("\n\n");
}
```

11)

```
#include <stdio.h>

void main()
{
   int arr1[100];
   int n, i, j, tmp;


      printf("\n\nsort elements of array in ascending order :\n ");
      printf("----------------------------------------------\n");

   printf("Input the size of array : ");
   scanf("%d", &n);

      printf("Input %d elements in the array :\n",n);
      for(i=0;i<n;i++)
          {
                  printf("element - %d : ",i);
                  scanf("%d",&arr1[i]);
                }

   for(i=0; i<n; i++)
   {
      for(j=i+1; j<n; j++)
      {
         if(arr1[j] <arr1[i])
         {
```

```
            tmp = arr1[i];
            arr1[i] = arr1[j];
            arr1[j] = tmp;
         }
      }
   }
   printf("\nElements of array in sorted ascending order:\n");
   for(i=0; i<n; i++)
   {
      printf("%d  ", arr1[i]);
   }
                  printf("\n\n");
}
```

12)

```
#include <stdio.h>

void main()
{
   int arr1[100];
   int n, i, j, tmp;


     printf("\n\nsort elements of array in descending order :\n");
     printf("-----------------------------------------------\n");

   printf("Input the size of array : ");
   scanf("%d", &n);

     printf("Input %d elements in the array :\n",n);
     for(i=0;i<n;i++)
         {
             printf("element - %d : ",i);
             scanf("%d",&arr1[i]);
          }
   for(i=0; i<n; i++)
   {
      for(j=i+1; j<n; j++)
      {
         if(arr1[i] < arr1[j])
         {
            tmp = arr1[i];
            arr1[i] = arr1[j];
```

```
            arr1[j] = tmp;
          }
       }
    }

     printf("\nElements of array is sorted in descending order:\n");
    for(i=0; i<n; i++)
    {
       printf("%d  ", arr1[i]);
    }
                  printf("\n\n");
}

13)
#include <stdio.h>

void main()
{
  int arr1[100],i,n,p,inval;
      printf("\n\nInsert New value in the sorted array :\n");
      printf("----------------------------------------\n");

    printf("Input the size of array : ");
    scanf("%d", &n);
/* Stored values into the array*/
      printf("Input %d elements in the array in ascending order:\n",n);
      for(i=0;i<n;i++)
          {
               printf("element - %d : ",i);
               scanf("%d",&arr1[i]);
             }
  printf("Input the value to be inserted : ");
  scanf("%d",&inval);
  printf("The exist array list is :\n ");
  for(i=0;i<n;i++)
     printf("% 5d",arr1[i]);
  /* Determine the position where the new value will be insert.*/
  for(i=0;i<n;i++)
    if(inval<arr1[i])
    {
      p = i;
      break;
    }
  /* move all data at right side of the array */
```

```
  for(i=n;i>=p;i--)
    arr1[i]= arr1[i-1];
  /* insert value at the proper position */
    arr1[p]=inval;

    printf("\n\nAfter Insert the list is :\n ");
  for(i=0;i<=n;i++)
    printf("% 5d",arr1[i]);
            printf("\n");
}
```

14)

```
#include <stdio.h>

void main()
{
  int arr1[100],i,n,p,x;

     printf("\n\nInsert New value in the unsorted array : \n ");
     printf("----------------------------------------\n");
     printf("Input the size of array : ");
     scanf("%d", &n);
   /* Stored values into the array*/
     printf("Input %d elements in the array in ascending order:\n",n);
     for(i=0;i<n;i++)
         {
             printf("element - %d : ",i);
             scanf("%d",&arr1[i]);
           }

  printf("Input the value to be inserted : ");
  scanf("%d",&x);
  printf("Input the Position, where the value to be inserted :");
  scanf("%d",&p);

  printf("The current list of the array :\n");
  for(i=0;i<n;i++)
    printf("% 5d",arr1[i]);
  /* Move all data at right side of the array */
  for(i=n;i>=p;i--)
    arr1[i]= arr1[i-1];
  /* insert value at given position */
    arr1[p-1]=x;
```

```
  printf("\n\nAfter Insert the element the new list is :\n");
  for(i=0;i<=n;i++)
    printf("% 5d",arr1[i]);
          printf("\n\n");
}
```

15)

```
#include <stdio.h>

void main(){
 int arr1[50],i,pos,n;

    printf("\n\nDelete an element at desired position from an array :\n");
    printf("-------------------------------------------------------\n");

    printf("Input the size of array : ");
    scanf("%d", &n);
  /* Stored values into the array*/
    printf("Input %d elements in the array in ascending order:\n",n);
    for(i=0;i<n;i++)
        {
            printf("element - %d : ",i);
            scanf("%d",&arr1[i]);
          }

 printf("\nInput the position where to delete: ");
 scanf("%d",&pos);
/*---- locate the position of i in the array -------*/
 i=0;
 while(i!=pos-1)
        i++;
/*---- the position of i in the array will be replaced by the
    value of its right */
 while(i<n){
        arr1[i]=arr1[i+1];
        i++;
 }
 n--;
  printf("\nThe new list is : ");
 for(i=0;i<n;i++)
     {
```

```
                    printf("  %d",arr1[i]);
                }
        printf("\n\n");

}
```

16)

```
#include <stdio.h>

void main(){
  int arr1[50],n,i,j=0,lrg,lrg2nd;

     printf("\n\nFind the second largest element in an array :\n");
     printf("-------------------------------------------------\n");

     printf("Input the size of array : ");
     scanf("%d", &n);
   /* Stored values into the array*/
     printf("Input %d elements in the array :\n",n);
     for(i=0;i<n;i++)
        {
            printf("element - %d : ",i);
            scanf("%d",&arr1[i]);
          }
/* find location of the largest element in the array */
//   lrg=arr1[0];
   lrg=0;
  for(i=0;i<n;i++)
  {
     if(lrg<arr1[i])
          {
        lrg=arr1[i];
        j = i;
     }
  }

/* ignore the largest element and find the 2nd largest element in the array */
   lrg2nd=0;
  for(i=0;i<n;i++)
  {
     if(i==j)
       {
        i++;  /* ignoring the largest element */
                    i--;
```

```
      }
    else
      {
       if(lrg2nd<arr1[i])
             {
          lrg2nd=arr1[i];
         }
      }
 }

 printf("The Second largest element in the array is :  %d \n\n", lrg2nd);
}

17)
#include <stdio.h>

void main()
{
 int arr1[50],n,i,j=0,sml,sml2nd;

     printf("\n\nFind the second smallest element in an array :\n");
     printf("---------------------------------------------------\n");

     printf("Input the size of array : ");
     scanf("%d", &n);
   /* Stored values into the array*/
     printf("Input %d elements in the array (value must be <9999) :\n",n);
     for(i=0;i<n;i++)
        {
            printf("element - %d : ",i);
            scanf("%d",&arr1[i]);
          }
/* find location of the smallest element in the array */
  sml=arr1[0];
 for(i=0;i<n;i++)
 {
    if(sml>arr1[i])
          {
        sml=arr1[i];
        j = i;
    }
 }

/* ignore the smallest element and find the 2nd smallest element in the array */
```

```
 sml2nd=99999;
 for(i=0;i<n;i++)
 {
   if(i==j)
     {
       i++;  /* ignoring the smallest element */
                    i--;
     }
    else
     {
      if(sml2nd>arr1[i])
           {
          sml2nd=arr1[i];
         }
     }
 }

 printf("The Second smallest element in the array is :  %d \n\n", sml2nd);
}
```

18)

```
#include <stdio.h>

void main()
{
 int arr1[3][3],i,j;

     printf("\n\nRead a 2D array of size 3x3 and print the matrix :\n");
     printf("---------------------------------------------------\n");


  /* Stored values into the array*/
     printf("Input elements in the matrix :\n");
 for(i=0;i<3;i++)
 {
    for(j=0;j<3;j++)
    {
             printf("element - [%d],[%d] : ",i,j);
             scanf("%d",&arr1[i][j]);
    }
 }

printf("\nThe matrix is : \n");
 for(i=0;i<3;i++)
```

```
 {
    printf("\n");
    for(j=0;j<3;j++)
        printf("%d\t",arr1[i][j]);
 }
printf("\n\n");
}
```

19)

```
#include <stdio.h>

void main()
{
 int arr1[50][50],brr1[50][50],crr1[50][50],i,j,n;

     printf("\n\nAddition of two Matrices :\n");
     printf("------------------------------\n");
      printf("Input the size of the square matrix (less than 5): ");
     scanf("%d", &n);

   /* Stored values into the array*/
     printf("Input elements in the first matrix :\n");
     for(i=0;i<n;i++)
      {
         for(j=0;j<n;j++)
         {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&arr1[i][j]);
         }
      }

     printf("Input elements in the second matrix :\n");
     for(i=0;i<n;i++)
      {
         for(j=0;j<n;j++)
         {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&brr1[i][j]);
         }
      }
  printf("\nThe First matrix is :\n");
 for(i=0;i<n;i++)
   {
    printf("\n");
```

```
    for(j=0;j<n;j++)
        printf("%d\t",arr1[i][j]);
   }

 printf("\nThe Second matrix is :\n");
 for(i=0;i<n;i++)
   {
    printf("\n");
    for(j=0;j<n;j++)
    printf("%d\t",brr1[i][j]);
   }
/* calculate the sum of the matrix */
  for(i=0;i<n;i++)
     for(j=0;j<n;j++)
         crr1[i][j]=arr1[i][j]+brr1[i][j];
  printf("\nThe Addition of two matrix is : \n");
  for(i=0;i<n;i++){
     printf("\n");
     for(j=0;j<n;j++)
         printf("%d\t",crr1[i][j]);
  }
  printf("\n\n");
}
```

20)

```
#include <stdio.h>

void main()
{
 int arr1[50][50],brr1[50][50],crr1[50][50],i,j,n;

     printf("\n\nSubtraction of two Matrices :\n");
     printf("------------------------------\n");
      printf("Input the size of the square matrix (less than 5): ");
     scanf("%d", &n);

   /* Stored values into the array*/
     printf("Input elements in the first matrix :\n");
     for(i=0;i<n;i++)
      {
         for(j=0;j<n;j++)
         {
                  printf("element - [%d],[%d] : ",i,j);
                  scanf("%d",&arr1[i][j]);
```

```
        }
      }

     printf("Input elements in the second matrix :\n");
     for(i=0;i<n;i++)
      {
         for(j=0;j<n;j++)
         {
                  printf("element - [%d],[%d] : ",i,j);
                  scanf("%d",&brr1[i][j]);
         }
      }
  printf("\nThe First matrix is :\n");
 for(i=0;i<n;i++)
   {
     printf("\n");
     for(j=0;j<n;j++)
         printf("%d\t",arr1[i][j]);
   }

 printf("\nThe Second matrix is :\n");
 for(i=0;i<n;i++)
   {
     printf("\n");
     for(j=0;j<n;j++)
     printf("%d\t",brr1[i][j]);
   }
/* calculate the subtraction of the matrix */
  for(i=0;i<n;i++)
     for(j=0;j<n;j++)
         crr1[i][j]=arr1[i][j]-brr1[i][j];
  printf("\nThe Subtraction of two matrix is : \n");
  for(i=0;i<n;i++){
     printf("\n");
     for(j=0;j<n;j++)
         printf("%d\t",crr1[i][j]);
  }
  printf("\n\n");
}
```

21)

```
#include <stdio.h>

void main()
```

```
{
 int arr1[50][50],brr1[50][50],crr1[50][50],i,j,k,r1,c1,r2,c2,sum=0;

     printf("\n\nMultiplication of two Matrices :\n");
     printf("----------------------------------\n");

 printf("\nInput the rows and columns of first matrix : ");
 scanf("%d %d",&r1,&c1);
 printf("\nInput the rows and columns of second matrix : ");
 scanf("%d %d",&r2,&c2);
 if(c1!=r2){
    printf("Mutiplication of Matrix is not possible.");
    printf("\nColumn of first matrix and row of second matrix must be same.");
 }
 else
    {
     printf("Input elements in the first matrix :\n");
     for(i=0;i<r1;i++)
      {
         for(j=0;j<c1;j++)
         {
                  printf("element - [%d],[%d] : ",i,j);
                  scanf("%d",&arr1[i][j]);
         }
      }
     printf("Input elements in the second matrix :\n");
     for(i=0;i<r2;i++)
      {
         for(j=0;j<c2;j++)
         {
                  printf("element - [%d],[%d] : ",i,j);
                  scanf("%d",&brr1[i][j]);
         }
      }
          printf("\nThe First matrix is :\n");
                   for(i=0;i<r1;i++)
                   {
                   printf("\n");
                   for(j=0;j<c1;j++)
          printf("%d\t",arr1[i][j]);
                   }

          printf("\nThe Second matrix is :\n");
                   for(i=0;i<r2;i++)
```

```
                    {
                    printf("\n");
                    for(j=0;j<c2;j++)
                    printf("%d\t",brr1[i][j]);
                    }
//multiplication of matrix
    for(i=0;i<r1;i++)
       for(j=0;j<c2;j++)
        crr1[i][j]=0;
         for(i=0;i<r1;i++)    //row of first matrix
            {
              for(j=0;j<c2;j++)    //column of second matrix
               {
                sum=0;
                 for(k=0;k<c1;k++)
                  sum=sum+arr1[i][k]*brr1[k][j];
                  crr1[i][j]=sum;
               }
            }
 printf("\nThe multiplication of two matrices is : \n");
 for(i=0;i<r1;i++)
   {
     printf("\n");
     for(j=0;j<c2;j++)
      {
        printf("%d\t",crr1[i][j]);
      }
   }
 }
printf("\n\n");
}

22)
#include <stdio.h>

void main()

 {
 int arr1[50][50],brr1[50][50],i,j,k=0,r,c;

     printf("\n\nTranspose of a Matrix :\n");
     printf("--------------------------\n");
```

```
    printf("\nInput the rows and columns of the matrix : ");
    scanf("%d %d",&r,&c);

    printf("Input elements in the first matrix :\n");
    for(i=0;i<r;i++)
     {
        for(j=0;j<c;j++)
        {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&arr1[i][j]);
        }
     }

         printf("\nThe matrix is :\n");
                for(i=0;i<r;i++)
                {
                printf("\n");
                for(j=0;j<c;j++)
         printf("%d\t",arr1[i][j]);
                }

 for(i=0;i<r;i++)
   {
    for(j=0;j<c;j++)
        {
            brr1[j][i]=arr1[i][j];
        }
    }

    printf("\n\nThe transpose of a matrix is : ");
    for(i=0;i<c;i++){
    printf("\n");
    for(j=0;j<r;j++){
        printf("%d\t",brr1[i][j]);
    }
 }
    printf("\n\n");
}
```

23)

```
#include <stdio.h>

void main()
```

```
 {
  int i,j,arr1[50][50],sum=0,n;

    printf("\n\nFind sum of right diagonals of a matrix :\n");
    printf("---------------------------------------\n");

          printf("Input the size of the square matrix : ");
  scanf("%d", &n);
          printf("Input elements in the first matrix :\n");
    for(i=0;i<n;i++)
     {
        for(j=0;j<n;j++)
        {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&arr1[i][j]);
                        if (i==j) sum= sum+arr1[i][j];
        }
     }

          printf("The matrix is :\n");
          for(i=0;i<n;i++)
          {
           for(j=0;j<n ;j++)
            printf("% 4d",arr1[i][j]);
           printf("\n");
          }

    printf("Addition of the right Diagonal elements is :%d\n",sum);
  }

24)
#include <stdio.h>

void main()

 {
  int i,j,arr1[50][50],sum=0,n,m=0;

    printf("\n\nFind sum of left diagonals of a matrix :\n");
    printf("---------------------------------------\n");

          printf("Input the size of the square matrix : ");
  scanf("%d", &n);
```

```
      m=n;
          printf("Input elements in the first matrix :\n");
     for(i=0;i<n;i++)
      {
         for(j=0;j<n;j++)
         {
                  printf("element - [%d],[%d] : ",i,j);
                  scanf("%d",&arr1[i][j]);
         }
     }
          printf("The matrix is :\n");
          for(i=0;i<n;i++)
          {
            for(j=0;j<n ;j++)
              printf("% 4d",arr1[i][j]);
             printf("\n");
          }
// calculate the sum of left diagonals
          for(i=0;i<n;i++)
          {
        m=m-1;
            for(j=0;j<n ;j++)
        {
          if (j==m)
            {
             sum= sum+arr1[i][j];
            }

        }
          }
     printf("Addition of the  left Diagonal elements is :%d\n",sum);
   }

25)
#include <stdio.h>

void main()
{
   int i,j,k,arr1[10][10],rsum[10],csum[10],n;

     printf("\n\nFind the sum of rows an columns of a Matrix:\n");
     printf("-----------------------------------------\n");
```

```
printf("Input the size of the square matrix : ");
scanf("%d", &n);
        printf("Input elements in the first matrix :\n");
 for(i=0;i<n;i++)
  {
     for(j=0;j<n;j++)
     {
              printf("element - [%d],[%d] : ",i,j);
              scanf("%d",&arr1[i][j]);
     }
  }
       printf("The matrix is :\n");
       for(i=0;i<n;i++)
       {
        for(j=0;j<n ;j++)
         printf("% 4d",arr1[i][j]);
        printf("\n");
       }

/* Sum of rows */
for(i=0;i<n;i++)
{
       rsum[i]=0;
       for(j=0;j<n;j++)
       rsum[i]=rsum[i]+arr1[i][j];
}

 /* Sum of Column */
 for(i=0;i<n;i++)
 {
       csum[i]=0;
       for(j=0;j<n;j++)
              csum[i]=csum[i]+arr1[j][i];
 }

 printf("The sum or rows and columns of the matrix is :\n");
 for(i=0;i<n;i++)
 {
        for(j=0;j<n;j++)
          printf("% 4d",arr1[i][j]);
        printf("% 8d",rsum[i]);
        printf("\n");
  }
  printf("\n");
```

```
            for(j=0;j<n;j++)
          {
                printf("% 4d",csum[j]);
          }
         printf("\n\n");
 }
```

26)

```
#include <stdio.h>

void main()
  {
 int arr1[10][10],i,j,n;
 float determinant=0;


     printf("\n\nDisplay the lower triangular of a given matrix :\n");
     printf("-------------------------------------------------\n");


    printf("Input the size of the square matrix : ");
    scanf("%d", &n);
          printf("Input elements in the first matrix :\n");
     for(i=0;i<n;i++)
      {
         for(j=0;j<n;j++)
         {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&arr1[i][j]);
         }
      }
          printf("The matrix is :\n");
          for(i=0;i<n;i++)
          {
            for(j=0;j<n ;j++)
              printf("% 4d",arr1[i][j]);
             printf("\n");
          }

  printf("\nSetting zero in lower triangular matrix\n");
  for(i=0;i<n;i++){
    printf("\n");
    for(j=0;j<n;j++)
        if(i<=j)
```

```
            printf("% 4d",arr1[i][j]);
          else
            printf("% 4d",0);
  }
      printf("\n\n");
}
```

27)

```
#include <stdio.h>

void main()
 {
  int arr1[10][10],i,j,n;
  float determinant=0;


 printf("\n\nDisplay the upper triangular of a given matrix :\n");
      printf("-------------------------------------------\n");

    printf("Input the size of the square matrix : ");
    scanf("%d", &n);
           printf("Input elements in the first matrix :\n");
      for(i=0;i<n;i++)
       {
          for(j=0;j<n;j++)
          {
                    printf("element - [%d],[%d] : ",i,j);
                    scanf("%d",&arr1[i][j]);
          }
       }
            printf("The matrix is :\n");
            for(i=0;i<n;i++)
            {
              for(j=0;j<n ;j++)
                printf("% 4d",arr1[i][j]);
              printf("\n");
            }

  printf("\nSetting zero in upper triangular matrix\n");
  for(i=0;i<n;i++)
    {
     printf("\n");
     for(j=0;j<n;j++)
          if(i>=j)
```

```
            printf("% 4d",arr1[i][j]);
          else
            printf("% 4d",0);
  }
      printf("\n\n");
}
```

28)

```
#include <stdio.h>

void main()
  {
 int arr1[10][10],i,j,n;
 int det=0;


      printf("\n\nCalculate the determinant of a 3 x 3 matrix :\n");
      printf("-----------------------------------------------\n");

            printf("Input elements in the first matrix :\n");
      for(i=0;i<3;i++)
       {
          for(j=0;j<3;j++)
          {
                    printf("element - [%d],[%d] : ",i,j);
                    scanf("%d",&arr1[i][j]);
          }
       }
            printf("The matrix is :\n");
            for(i=0;i<3;i++)
            {
              for(j=0;j<3 ;j++)
                printf("% 4d",arr1[i][j]);
              printf("\n");
            }

 for(i=0;i<3;i++)
    det = det + (arr1[0][i]*(arr1[1][(i+1)%3]*arr1[2][(i+2)%3] - arr1[1][(i+2)%3]*arr1[2][(i+1)%3]));

 printf("\nThe Determinant of the matrix is: %d\n\n",det);
}
```

29)

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

```
/*A sparse martix is matrix which  has more zero elements than nonzero elements */
void main ()
{
        static int arr1[10][10];
        int i,j,r,c;
        int ctr=0;
   printf("\n\nDetermine whether a matrix is a sparse matrix :\n");
   printf("---------------------------------------------------\n");
   printf("Input the number of rows of the matrix : ");
   scanf("%d", &r);
   printf("Input the number of columns of the matrix : ");
   scanf("%d", &c);
         printf("Input elements in the first matrix :\n");
    for(i=0;i<r;i++)
     {
        for(j=0;j<c;j++)
        {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&arr1[i][j]);
                        if (arr1[i][j]==0)
                        {
                                ++ctr;
                        }
        }
     }
        if (ctr>((r*c)/2))
        {
                printf ("The given matrix is sparse matrix. \n");
        }
        else
                printf ("The given matrix is not a sparse matrix.\n");

        printf ("There are %d number of zeros in the matrix.\n\n",ctr);
}
```

30)

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


void main()
{
  int arr1[50][50], brr1[50][50];
```

```
int i, j, r1, c1, r2, c2, flag =1;

    printf("\n\nAccept two matrices and check whether they are equal :\n ");
    printf("------------------------------------------------------------\n");

printf("Input Rows and Columns of the 1st matrix :");
scanf("%d %d", &r1, &c1);

printf("Input Rows and Columns of the 2nd matrix :");
scanf("%d %d", &r2,&c2);
          printf("Input elements in the first matrix :\n");
    for(i=0;i<r1;i++)
     {
        for(j=0;j<c1;j++)
        {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&arr1[i][j]);
        }
     }
    printf("Input elements in the second matrix :\n");
    for(i=0;i<r2;i++)
     {
        for(j=0;j<c2;j++)
        {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&brr1[i][j]);
        }
     }
          printf("The first matrix is :\n");
          for(i=0;i<r1;i++)
          {
            for(j=0;j<c1 ;j++)
              printf("% 4d",arr1[i][j]);
             printf("\n");
          }
          printf("The second matrix is :\n");
          for(i=0;i<r2;i++)
          {
            for(j=0;j<c2 ;j++)
              printf("% 4d",brr1[i][j]);
             printf("\n");
          }
/* Comparing two matrices for equality */
```

```
  if(r1 == r2 && c1 == c2)
  {
        printf("The Matrices can be compared : \n");
        for(i=0; i<r1; i++)
        {
              for(j=0; j<c2; j++)
              {
                    if(arr1[i][j] != brr1[i][j])
                    {
                          flag = 0;
                          break;
                    }
              }
        }
   }
   else
   {  printf("The Matrices Cannot be compared :\n");
      exit(1);
   }
   if(flag == 1 )
        printf("Two matrices are equal.\n\n");
   else
        printf("But,two matrices are not equal\n\n");
}
```

31)

```
#include <stdio.h>
//In a square matrix if all the main diagonal elements are 1's and
//all the remaining elements are 0's is called an Identity Matrix.

void main()
{
  int arr1[10][10];
  int r1,c1;
  int i, j, yn =1;

     printf("\n\n Check whether a given matrix is an identity matrix :\n ");
     printf("-------------------------------------------------------\n");

  printf("Input number of Rows for the matrix :");
  scanf("%d", &r1);
  printf("Input number of Columns for the matrix :");
  scanf("%d",&c1);
```

```
        printf("Input elements in the first matrix :\n");
    for(i=0;i<r1;i++)
     {
        for(j=0;j<c1;j++)
        {
                printf("element - [%d],[%d] : ",i,j);
                scanf("%d",&arr1[i][j]);
        }
     }
        printf("The matrix is :\n");
        for(i=0;i<r1;i++)
        {
          for(j=0;j<c1 ;j++)
            printf("% 4d",arr1[i][j]);
           printf("\n");
        }

  for(i=0; i<r1; i++)
  {
   for(j=0; j<c1; j++)
   {
        if(arr1[i][j] != 1 && arr1[j][i] !=0)
        {
          yn = 0;
          break;
        }
        }
 }

 if(yn == 1 )
        printf(" The matrix is an identity matrix.\n\n");
 else
        printf(" The matrix is not an identity matrix.\n\n");
}
```