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Output :-

The Value of arr[0] is : 10

The Value of arr[1] is : 38

The value of arr[2] is : 23

The value of arr[3] is : 56

The value of arr[4] is : 76

Program - 1

```
// WAP to show compile time Initialization.

# Include <stdio.h>
# Include <conio.h>
  void main()
{
  int arr[10] = {10, 38, 23, 56, 76};
  printf("\n The value of arr[0] is: %d", arr[0]);
  printf("\n The value of arr[1] is: %d", arr[1]);
  printf("\n The value of arr[2] is: %d", arr[2]);
  printf("\n The value of arr[3] is: %d", arr[3]);
  printf("\n The value of arr[4] is: %d", arr[4]);

  getch();
}
```

Output :

Enter the size of an array 5

Enter the elements : 21
22
34
35
45

Elements Given by User:
21
22
34
35
45

Program = 2

```
// WAP to show run time initialization.
# include< stdio.h>
# include< conio.h>
void main()
{
  int arr [7], n, i;
  printf("\n Enter the size of an array");
  scanf("%d", &n);
  printf("\n Enter the elements:");
  for (i= 0; i<n ; i++)
{
  scanf( "\n %d ", &arr[i]);
}
  printf (" \n Elements Given by User:");
  for (i = 0; i<n ; i++)
{
  printf("\n %d ", arr[i] );
}
}
```

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Output :-

Input no. of elements : 5

Array elements are :

2
6
8
10
12

Array after reversing :

12
10
8
6
2

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Program - 3

```
//WAP to reverse an array.

# include <stdio.h>
# include < conio.h>
  void main()
{
   int arr[10], i, n ;
   printf("Input no. of elements:" );
   scanf(" %d ", &n);
   printf("Array elements are : \n");
   for (i= 0; i<n ; i++)
{
    scanf(" %d", &arr[i]);
}
   printf("Array after reversing : \n");
   for (i= n-1; i>= 0; i--)
{
    printf("\n %d", a[i]);
}
}
```

Date / /

Output :-

```
enter no. of elements : 5
Enter elements : 45
98
65
34
21

Array elements enter by you :
45
98
65
34
21
```

Program - 4

```
//WAP to input and display the array by using
  function.
# include <stdio.h>
# include <conio.h>
 void input (int m[], int n);
 void display (int m[], int n);

 void input ( int m[], int n )
{
   int i;
   for (i=0; i<n; i++)
{
    scanf("%d", &m[i]); }
}
   void display (int m[], int n)
{
   int i;
   for (i=0 ; i<n ; i++)
{
    Printf("\n %d ", [i]); }
}
   int main() {
   int m[10], n;
   printf(" enter no. of elements:");
   scanf("%d ", &n);
   input ( m, n);
   printf(" Array elements enter by you:");
    display (m,n);
      getch ();
}
```

Program = 5

//WAP to show max and min element with the help of functions.

```
# include <stdio.h>
# include <conio.h>
void input (int arr[], int n)
{
  int i;
  printf("Enter elements: /n ");
  for(i= 0; i<n; i++)
{
   scanf("\n %d", & arr[i]); }
}
  void display (int arr[], int n)
{
   int i;
   printf("Array elements enter by you:");
   for (i=0; i<n; i++)
{
   Printf("\n %d", arr [i]); }
}
  void minmax (int arr[], int n)
{
   int i, max, min;
   max = arr[0];
   for (i= 0; i<n; i++)
{
   if (arr [i] > max)
{
    max = arr[i];
}
}
```

```
  min = arr [0];
  for (i=0; i<n; i++)
{
   if (arr [i] < min)
{
    min = arr [i];
  }
}
  printf("\n largest number is = %d", max);
  printf("\n smallest number is = %d", min);
}
  int main()
{
  int arr[10], n, b [10], s [10];
  printf("Enter no. of elements: ");
  scanf("%d", &n);
  input (arr, n);
  display (arr, n);
  minmax (arr, n);

}
```

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Output :-

```
Enter no. of elements : 5
Enter elements :
21
98
54
45
3

Array elements enter by you :
21
98
54
45
3

Largest number is = 98
Smallest number is = 3
```

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Program = 6

```
// WAP to find odd and even element with
   the help of functions.
#Include< stdio.h>
#include < conio.h>

void input (int arr[10], int n)
{
   int i;
   printf("Input array elements:");
   for( i=0; i<n; i++)
{
   Scanf("\n%d", &arr[i]);
}}
   void display ( int arr[10], int n)
{
   int i;
   printf("Array Elements Enter by you:");
   for (i=0; i<n; i++)
{
   printf("\n %d", arr[i]);
}}
   void even odd (int arr [10], int even [10], int
   odd [10], int n)
{
   int i, J=0, K=0;
   for( i=0; i<n ; i++)
{
   if( arr[i] %2 == 0)
{
   even [J] = arr [i];
   j++;
}
```

```
    else
    {
      odd [K] = arr [i];
      K++;
    }
  }

    printf("\n Even numbers are : ");
    for (i = 0; i < j ; i++)
  printf("\n %d", even [i]);
  printf("\n odd numbers are ");
    for (i = 0; i < K ; i++)
    printf("\n %d", odd [i]); }

    int main()
  {
    int arr [10], n, even [10], odd [10];
  printf("Enter the no. of Elements : ");
  scanf("%d", &n);
  input (arr, n);
  display (arr, n);
  evenodd (arr, even, odd, n);

  }
```

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Output:-

Enter the no. of elements : 5

Input array elements : 3
4
5
6
8

Even numbers are :
4
6
8

Odd numbers are :
3
5

Chitra
"Whenever you take a step forward, you are bound to disturb something." —Indira Gandhi

Program = 7

// WAP to add 10 in all the elements of an array with the help of functions.

```
# include <stdio.h>
# include <conio.h>
void input (int arr[ ], int n)
{
   int i;
   printf("Enter elements: \n ");
   for( i= 0; i<n; i++)
{
   scanf("\n %d", &arr[i]);
}}
void display (int arr[], int n)
{
   int i;
   printf("Array elements enter by you: ");
   for (i=0; i<n; i++)
{
   scanf(" \n %d", &arr[i]);
}}
void add ( int arr[], int n)
{
   int i;
   printf("\n Elements of an array after
          adding 10 : \n");
   for( i=0; i<n; i++)
{
   arr[i] = arr[i] + 10;
   printf ("\n %d", arr[i]);
}
}
```

```
int main()
{
    int arr[10], n;
    printf("Enter no. of elements:");
    scanf("%d", &n);
    input (arr, n);
    display (arr, n);
    add (arr, n);

}
```

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Output :-

Enter no. of elements = 5

Enter elements:
2
3
4
5
6

Array elements enter by you:
2
3
4
5
6

Elements of an array after adding 10:
12
13
14
15
16

Chitra

"Whenever you take a step forward, you are bound to disturb something." —Indira Gandhi

Program 8

```
// WAP to show linear search by using function
#include <stdio.h>
void input (int arr[], int n);
void display (int arr[], int n);
void linearsearch(int arr[], int n, int target);
int main()
{
  int n, arr[10], target;
  printf("Enter the number of elements in the
        array : ");
scanf("%d", &n);
printf ("Enter the elements of the array : \n");
input (arr, n);
printf("The array is : ");
display (arr, n);
printf ("Enter the element to search for : "
scanf("%d", &target);
linearsearch (arr, n, target);
return 0;
}
void input (int arr[], int n)
{
  for (int i=0; i<n; i++)
{
  printf("Element [%d] : ", i);
  scanf("%d", &arr[i]);
}
}
void display (int arr[], int n)
{
```


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```
  for (int i = 0; i < n; i++)
{
    printf("%d", arr[i]);
}
    printf("\n");
}
void linearsearch (int arr[], int n, int target)
{
  int i;
for (i = 0; i < n; i++)
if (arr[i] = = target)
{
printf("Element %d found at Index %d
        \n", target, i);
}
}
```

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Output:-

Enter the number of elements in the array:
5

Enter the elements of the array:
Element [0]: 7
Element [1]: 2
Element [2]: 21
Element [3]: 45
Element [4]: 17

The array is: 7 2 21 45 17
Enter the element to search for: 21
Element 21 found at Index 2

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Program - 9

// WAP to show binary search by using functions

```
# include <stdio.h>
void inputArray ( int arr[ ], int size );
void display Array ( int arr[ ], int size);
int binarysearch (Int arr[ ], int size, int target);

int main()
{
int size, target, index;
printf (" Enter the number of elements in the
    array : ");
scanf ("%d", &size );
int arr [size ];
printf (" Enter the elements : \n");
input Array ( arr, size )
printf(" The array is : ");
display array ( Arr, size );
printf (" Enter the element to search for:");
scanf("%d", &target);
index = binarysearch (arr, size, target );
if (index != -1)
{
printf(" Element %d found at index %d.\n",
        target, index); }
else
{
printf( " Element not found \n "); }
return 0;
}
```

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```
int binarysearch(int arr[], int size, int target)
{
    int low = 0;
    int high = size - 1;
    int mid;

  while (low <= high)
  {
    mid = (low+ high)/2;
    if (arr [mid] == target)
  {
      return mid;
  }
    else
    if (arr [mid ] < target )
  {
    low = mid+1;
  }
  else
{
    high = mid-1;
  }
}
    return-1;  // target not found
}
  void input Array (int arr [], int size)
{
  for ( int i=0; i< size ; i++)
{
  printf ("element [%d] : ", i);
  scanf ("%d", & arr [i]);
}
```


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```
void displayArray (int arr[], int size)
{
    for (int i=0; i<size; i++)
{
    printf("%d", arr[i]);
}
    printf("\n");
}
```

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Output :-

Enter the number of elements in the array: 5

Enter the elements:
Element [0]: 3
Element [1]: 5
Element [2]: 7
Element [3]: 9
Element [4]: 12

The array is: 3 5 7 9 12
Enter the element to search for: 9
Element 9 found at index 3

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Program = 10

//WAP to show bubblesort by using function.

```
#include< stdio.h>
# include < conio.h>
void input (int arr[], int n);
void display (int arr[], int n);
void bubblesort (int arr[], int n);
void main()
{
int arr [10], n;
printf(" Enter the size of array: ");
scanf("%d", &n);
input (arr,n);
printf(" \n The array is \n");
display (arr, n);
printf("\n After the sorting array is \n");
bubblesort (arr,n);
display (arr,n);
getch();
}
void bubblesort (int arr[], int n)
{
int i, j, temp;
for (i=0; i<n-1; i++)
{
for (j= 0; j <n-1; j++)
{
if (arr[j] > arr[j+1])
{
temp = arr[j];
arr [j] = arr [j+1];
arr [j+1] = temp;
```

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```
  }
 }
}}
 void input (int arr[], int n)
 {
   int i;
   for (i=0; i<n; i++)
 {
   printf ("Enter the array %d element", i);
   scanf ("%d", &arr[i]);
  }
 }
   void display (int arr[], int n)
 {
   int i;
   for (i=0; i<n; i++)
 {
   printf ("\n %d", arr[i]);
  }
 }
```

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Output :-

```
Enter the size of array : 5
Enter the array [0] element 9
Enter the array [1] element 5
Enter the array [2] element 1
Enter the array [3] element 21
Enter the array [4] element 29

The array is 9 5 1 21 29
After the Sorting array is
1
5
9
21
29
```

Program = 11

```
// WAP for selection Sort

# include <stdio.h>
# include <conio.h>
void input (int arr[], int n);
void selectionsort (int arr[], int n);
void display (int arr[], int n);
void main()
{
  int arr[10], n;
  clrscr();
  printf("Enter the size of array");
  scanf("%d", &n);
  printf("Enter the array \n");
  input (arr, n);
  printf("\n The array is \n");
  display (arr, n);
  printf("\n After sorting the array is \n");
  selectionsort (arr, n);
  display (arr, n);
  getch();

}
  void selectionsort (int arr[], int n)
{
  int i, j, temp, min_index;
  for (i=0; i<n; i++)
{
  min_index = i;
  for (j = i+1; j<n; j++)
{
```

```
if (arr[j]<arr[min_index])
{
  min-index = j;
}
temp = arr[i];
arr[i] = arr[min_index];
arr[min_index] = temp;
}
}
void input (int arr[], int n)
{
  int i;
  for (i=0; i<n; i++)
{
  scanf("%d", &arr[i]);
}
  printf("\n");
}
void display (int arr[], int n)
{
  int i;
  for (i=0; i<n; i++)
{
  printf("%d ", arr[i]);
}
}
```

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Output :-

Enter the size of array : 5

Enter the array
99
66
55
21
10

The array is
99 66 55 21 10

After the sorting the array is
10 21 55 66 99

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Program - 12

// WAP to show insertion sort

```
# include <stdio.h>
void insertionsort (int arr[], int n);
void print Array (int arr[], int n);
int main()
{
int arr[] = {12, 11, 13, 5, 6};
int n = size of (arr) / size of (arr[0]);
printf("Original array : \n");
print Array (arr, n);
insertionsort (arr, n);
printf("Sorted array : \n");
print Array (arr, n);
return 0;
}
void insertionsort (int arr[], int n)
{
int i, key, j;
for (i = 1; i < n; i++)
{
key = arr[i];
j = i - 1;
while (j >= 0 && arr[j] > key)
{
arr[j+1] = arr[j];
j = j - 1;
}
arr[j+1] = key;
}
}
```

```
void printArray (int arr[], int n)
{
  int i;
  for (i=0; i<n; i++)
{
  printf(" %d", arr[i]);
}
  printf ("\n");
}
```

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Output :-

Original array:

12 11 13 5 6

Sorted Array:

5 6 11 12 13

Program = 13

```
// WAP for addition of two matrices.
#include <stdio.h>
void input matrix (int matrix[10][10], int row,
                    int col);
void display matrix (int matrix[10][10], int row
                    int col);
void add matrices( int matrix1 [10][10], int
                    matrix 2 [10][10], int result [10]
                    [10], int row, int col);
int main()
{
  int row, col;
  int matrix1[10][10], matrix 2 [10][10], result [10]
                    [10];
printf (" Enter the number of rows and columns:")
scanf ("%d %d", &row, &col);
printf("Input for first matrix: \n");
input matrix (matrix 1, row, col);
printf("Input for second matrix: \n");
input matrix (matrix 2, row, col);
add matrix (matrix 1, matrix 2, result, row,
                    col);
printf(" first matrix : \n");
display matrix ( matrix 1, row, col);
printf("second matrix : \n");
display matrix (matrix 2, row, col);
printf("Resultant matrix after addition : \n");
display matrix (result, row, col);
return 0;
}
```

```
void Input matrix(int matrix [10][10], int row,
                  int col)
{
    printf(" Enter elements of the matrix: \n");
    for(int i=0; i<row; i++)
    {
      for (int j=0; j<col; j++)
      {
        printf(" Element [%d][%d]: ",i,j);
        scanf("%d", &matrix [i][j]);
      }
    }
}

void display matrix (int matrix [10][10],
                     int row, int col)
{
    for (int i=0; i<row; i++)
    {
      for (int j=0; j<col; j++)
      {
        printf("%d", matrix [i][j]);
      }
      printf("\n");
    }
}

void add matrices (int matrix 1 [10][10],
                   int matrix 2 [10][10], int result
                   [10][10], int row, int col)
{
    for (int i=0; i<row; i++)
    {
```

```
    for (int j=0; j<col; j++)
    {
        result[i][j] = matrix1[i][j] + matrix2
                       [i][j];
    }
}
}
```

Output:-

Enter the number of rows and columns: 2
2

Input for first matrix:
Element [0][0]: 2
Element [0][1]: 4
Element [1][0]: 6
Element [1][1]: 8

Input for second matrix:
enter elements of the matrix:
Element [0][0]: 1
Element [0][1]: 3
Element [1][0]: 5
Element [1][1]: 7

first matrix:
2 4
6 8

Second matrix:
1 3
5 7

Resultant matrix after addition:
3 7
11 15

Program = 14

```
//WAP to find transpose of a matrix
#include <stdio.h>
 void input matrix (int matrix [ ][10], int row, int col);
void display matrix (int matrix[ ][10], int row, int col);
void transpose matrix (int matrix [ ][10], int row, int col);
 int main()
{
 int row, col;
 int matrix [10] [10], transposed [10][10];
 printf("Enter the number of rows and columns:");
 scanf(" %d %d", &row, &col);
 printf("Input for matrix : \n");
  input matrix (matrix, row, col);
  transpose matrix (matrix, transposed, row, col);
 printf(" Original matrix : \n");
  display matrix (transposed, col, row);
  return 0;
}
 void input matrix (int matrix [ ] [10], int row,
                    int col)
{
 printf(" Enter elements of the matrix : \n");
  for (int i = 0; i < row; i++)
{
   for ( int j = 0 ; j < col < j++)
{
    Printf (" Element [%d][%d]; ", i, j);
    Scanf (" %d", & matrix [i][j] );
  }
 }
}
```

```
void display matrix (int matrix[][10], int
                row, int col).
{
  for (int i=0; i< row; i++)
{
  for (int j=0; j< col; j++)
{
  printf("%d ", matrix[i][j]);
}
  printf("\n");
}
}
void transpose matrix (int matrix[][10], int
                transposed[][10], int row,
                int col)
{
  for (int i=0; i< row; i++)
{
  for (int j=0; j< col; j++)
{
  transposed[j][i]= matrix[i][j];
}
}
}
```

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Output:

Enter the number of rows and columns: 2
2
Input for matrix:
Enter elements of the matrix:
Element [0][0]: 9
element [0][1]: 8
element [1][0]: 7
element [1][1]: 6

Original matrix:

9	8
7	6

Transposed matrix:

9	7
8	6

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Program = 15

```
//WAP to multiply two matrices

# include <stdio.h>
void input (int matrix[][10], int row, int col);
void display (int matrix[][10], int row, int col);
void multiply (int matrix1[][10], int matrix2[][10],
        int result[][10], int row1, int col1, int row
        2, int col2);
int main()
{
  int row1, col1, row2, col2;
  int matrix[10][10], matrix2[10][10], result[10][10];
  printf("Enter the number of rows and columns for
        first matrix:");
  scanf("%d %d", &row1, &col1);
  printf("Enter the number of rows and columns
        for second matrix:");
  scanf("%d %d", &row2, &col2);
  printf("Input for first matrix :\n");
  input (matrix1, row1, col1);
  printf("Input for second matrix:\n");
  input (matrix2, row2, col2);
  multiply (matrix1, matrix2, result, row1, col1,
        row2, col2);
  printf("first matrix :\n");
  display (matrix1, row1, col1);
  printf("second matrix :\n");
  display (matrix2, row2, col2);
  printf("Resultant matrix after multiplication:
        \n");
  display (result, row1, col2);
```

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```
return 0;
}
void input (int matrix[][10], int row, int col)
{
printf(" Enter elements of the matrix: \n");
for( int i=0; i< row; i++)
{
for (int j=0 ; j<col ; j++)
{
printf("Element [%d][%d]: ", i, j);
scanf("%d", &matrix[i][j]);
}
}
}
void display (int matrix [][10], int row, int col)
{
for (int i=0; i< row; i++)
{
for (int j=0; j<col; j++)
{
printf("%d", matrix [i][j]);
}
printf("\n");
}
}
void multiply ( int matrix1 [][10], int matrix2
[][10], int result [][10], int row1, int
col1, int row2, int col2)
{
for( int i=0; i<row1; i++)
```

```
{ for (int j=0; j< col2; j++)
    result [i][j] = 0;
  { for (int k=0; k < col1; k++)
      result [i][j] += matrix [i][k] * matrix 2
                                      [k][j];
    }
  }
}
```

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Output =

Enter the number of rows and columns for first matrix : 2 2
Enter the ~~second~~ matrix of rows and columns for second matrix : 2 2

Input for first matrix :
Enter elements of the matrix :
Element [0][0] : 2
Element [0][1] : 4
Element [1][0] : 6
Element [1][1] : 8

Input for second matrix :
Enter elements of the matrix :
Element [0][0] : 1
Element [0][1] : 3
Element [1][0] : 5
Element [1][1] : 7

First matrix :
2 4
6 8
Second matrix :
1 3
5 7
Resultant matrix after multiplication :
22 34
47 74

```
// WAP of sparse array.
#include<stdio.h>
struct sparse
{
    int row;
    int col;
    int ele; };
void input( int mat[5][5], int r, int c);
void display (int mat[5][5], int r, int c);
void storesparse matrix( int mat[5][5], int r, int c,
                        structsparse sp[]);
void showsparseinfo( struct sparse sp[], int count);
void restorematrix (struct sparse sp[], int N[5][5]
                                        );

int main()
{
    int mat[5][5], r, c, N[5][5];
    struct sparse sp [25];
    printf("Enter no. of rows and columns");
    scanf("%d %d", &r, &c);
    input (mat, r, c);
    printf("\n The sparse matrix is: \n");
    display (mat, r, c);
    Storesparse matrix (mat, r, c, sp);
    Showsparseinfo ( sp, sp[0].ele);
    restore matrix (sp, N);
    printf("Restored matrix is : \n");
    display (N, r, c);
    return 0;
}
```

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```
void input (int mat [5][5], int r, int c)
{
    int i, j;
printf ("Enter the elements ");
for (i=0; i<r; i++)
{
  for (j=0; j<c; j++)
{
  scanf("%d", & mat[i][j]);
}
}}
void display (int mat[5][5], int r, int c)
{
    int i, j;
  for (i=0; i<r; i++)
{
  for (j=0; j<c; j++)
{
  printf("%d", mat[i][j]);
}
  printf("\n");
}}
void showsparseinfo (struct sparse sp[],
        int count)
{
    int i;
  printf("sparse matrix Info :\n");
  printf("Rows : %d, columns : %d, Non-zero
        elements: %d \n", sp[0].row, sp[0].
        col, sp[0].ele);
```

```
for (i=0; i<=count; i++)
{
  printf("Element %d: row= %d, col= %d, value=
          %d \n", i, sp[i].row, sp[i].col, sp[i].
          ele);
}

void storesparsematrix(int mat[s][s], int r, int
          c, struct sparse sp[])
{ int i, j, count=0;
  sp[0].row = r;
  sp[0].col = c;
  for(i=0; i<r; i++)
{ for( j=0; j<c; j++)
{ if(mat[i][j] != 0)
{ count++;
  sp[count].row=i;
  sp[count].col = j;
  sp[count].ele = mat[i][j]; }}}
  sp[0].ele = count; }
void restorespsmatrix(struct sparse sp[], int N
          [s][s])
{ int i, j, k=1;
  for (i=0; i<sp[0].row; i++)
{ for (j=0; j<sp[0].col; j++)
{ N[i][j]=0
}}
  for(i=1; i<=sp[0].ele; i++)
{
  N[sp[i].row][sp[i].col] = sp[i].ele;
}
}
```

Output:

Enter no. of rows and columns 3
3
Enter the array 0
0
5
0
0
6
0
0
2
9

The sparse matrix is:
0 0 5
0 6 0
0 2 9

Sparse matrix info:
Rows: 3, Columns: 3, Non-zero elements: 4
Element 0: row = 3, col = 3, value = 4
Element 1: row = 0, col = 2, value = 5
Element 2: row = 1, col = 1, value = 6
Element 3: row = 2, col = 1, value = 2
Element 4: row = 2, col = 2, value = 9

Restored matrix is:
0 0 5
0 6 0
0 2 9

Program 17

```
//WAP in C to show vector representation of lower
   triangular sparse matrix
# include <stdio.h>
# include <conio.h>
void storesparse( int sparse [ ] );
void restoresparse ( int sparse [ ] );
void main( )
{
  int sparse [7];
  storesparse (sparse);
  restoresparse (sparse);
   getch();
}
  void storesparse (int sparse [ ])
{
    int i, j, rc, K=2, count;
    clrscr();
  printf( "Enter no of rows & col ");
  scanf("%d", &rc);
  sparse [0] = rc;
   count = rc* (rc+1)/2;
    sparse [1] = count;
     for (i=0; i<rc; i++)
  {
     for (j=0; j<=i ; j++)
  {
   printf( " Enter [%d] [%d] element ", i, j);
  scanf( "%d", &sparse [K]);
   K++;
}
}
}
```

```
void restoresparse(int sparse[])
{
  int i, j, K = 2;
  for (i = 0; i < sparse[0]; i++)
{
  for (j = 0; j < sparse[0]; j++)
{
  if (i >= j)
{
  printf("%d ", sparse[K]);
  K++;
}
  else
{
  printf("\n");
}
}
```

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Output =

Enter no. of rows & col 3
Enter [0][0] element 1
Enter [1][0] element 2
Enter [1][1] element 3
Enter [2][0] element 4
Enter [2][1] element 5
Enter [2][2] element 6

1	0	0
2	3	0
4	5	6

Program - 18

//WAP to show vector representation of upper triangular matrix (sparse).

```
#include<stdio.h>
#include<conio.h>
void storesparse(int sparse[]);
void restoresparse (int sparse[]);
void main()
{
  int sparse[7];
  storesparse (sparse);
  restoresparse (sparse);
  getch();
}
void storesparse(int sparse[])
{
  int i, j, rc, K=2, count;
  clrscr();
  printf("Enter no. of rows & col");
  scanf("%d", &rc);
  sparse[0] = rc;
  count = rc * (rc+1) / 2;
  Sparse[1] = count;
  for(i=0; i<rc; i++)
{
  for (j=i; j<=rc; j++)
{
  printf("Enter [%d][%d] element", i, j);
  scanf("%d", &sparse[K]);
  K++;
}}}
```

```
void restoresparse (int sparse[])
{
    int i, j, k = 2;
  for (i=0; i<sparse[0]; i++)
{
  for (j=0; j<sparse[0]; j++)
{
    if (i<=j)
  {
    printf("%d", sparse[k]);
     k++;
  }
  else
  {
   printf("0");
   }
  }
   printf("\n");
  }
  }
```

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Output =

Enter no. of rows & col 3
Enter [0][0] element 2
Enter [0][1] element 3
Enter [0][2] element 4
Enter [0][3] element 5
Enter [1][1] element 6
Enter [1][2] element 7
Enter [1][3] element 8
Enter [2][2] element 9
Enter [2][3] element 11

2	3	4
0	5	6
0	0	7

"Whenever you take a step forward, you are bound to disturb something." —Indira Gandhi

Program = 19

```
//WAP to show vector representation of diagonal
 sparse matrix.
#include<stdio.h>
#include<conio.h>
void restaresparse (int sparse[]);
void staresparse (int sparse[]);
void main()
{
  int sparse[10];
  clrscr();
  staresparse (sparse);
  restaresparse (sparse);
  getch();
}
void staresparse (int sparse[])
{
  int i, rc, count, K=2;
  printf(" Enter no. of rows and columns");
  scanf("%d", &rc);
  sparse[0] = rc;
  count = rc;
  sparse[1] = count;

  for (i=0; i<rc; i++)
{
  printf(" Enter [%d][%d] element", i, j);
  scanf("%d", &sparse[K]);
  K++;
}}
```

```
void restoresparse(int sparse[])
{
  int i, j, k = 2;
  printf("sparse matrix Info \n");
  printf("No. of Rows & columns = %d \n", sparse[0]);
  printf("No. of non zero element = %d \n", sparse[1]);
  for(i=0; i< sparse[0]; i++)
{
  for(j=0; j<sparse[0]; j++)
{
  if (i==j)
{
  printf("%d", sparse[k]);
  k++; }
  else
  printf("0");
}
  printf("\n");
}
}
```

Output =

Enter no. of rows and columns 3
Enter [0][0] element 7
Enter [1][1] element 6
Enter [2][2] element 8
Sparse matrix Info
no. of rows & columns = 3
No. of non zero element = 3

7	0	0
0	6	0
0	0	8

Program = 20

//WAP to show the vector representation of tri-diagonal sparse matrix.

```
# include<stdio.h>
# include<conio.h>
void storesparse (int sparse[]);
void restoresparse (int sparse[]);
void main()
{
 int sparse [15];
 storesparse (sparse);
 restoresparse (sparse);
 getch();
}
 void storesparse (int sparse[])
{
 int i, j, rc, K=2, count;
 clrscr();
 printf("enter no. of rows & col");
 scanf("%d", &rc);
 sparse [0] = rc;
 count = 3 * rc - 2;
 sparse [1] = count;
 for (i=0; i<rc; i++)
{
 for (j=0; j<rc; j++)
{
 if((i==j) :: (i==j+1) || (i==j-1))
{
 Printf("Enter [%d][%d] element", i, j);
 scanf("%d", &sparse [K]);
 K++;
```

```
}}
}}
void restaresparse (int sparse[])
{
int i, j, k=2;
for (i=0; i<sparse[0]; i++)
{
for (j=0; j<sparse[0]; j++)
{
if ((i==j) || (i==j+1) || (i==j-1))
{
printf("%d ", sparse[k]);
k++;
}
else
{
printf("0 ");
}
}
printf("\n");
}
}
```

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Output =

Enter no. of rows & col 4
Enter [0] [0] element 1
Enter [0] [1] element 2
Enter [1] [0] element 3
Enter [1] [1] element 4
Enter [1] [2] element 5
Enter [2] [1] element 6
Enter [2] [2] element 7
Enter [2] [3] element 8
Enter [3] [2] element 9
Enter [3] [3] element 11

1	2	0	0
3	4	5	0
0	6	7	8
0	0	9	11

Chitra
"It is the prime responsibility of every citizen to feel that his country." –Sardar Vallabhai Patel

Program 21

//WAP to merge two sorted arrays.

```
#include<stdio.h>
void bubblesort (int arr[], int size);
void mergearrays (int arr1[], int size1, int
                arr2[], int size2, int result
                [] );
void display (int arr[], int size);
int main()
{
int size1, size2;
printf("Enter the size of 1st Array: ");
scanf("%d", &size1);
printf("Enter the size of 2nd Array: ");
scanf("%d", &size2);
int arr1[size1], arr2[size2];
int mergesize = size1 + size2;
int result[mergesize];
printf("Enter element of first array: \n");
for (int i=0; i<size1; i++)
{
scanf("%d", &arr1[i]);
}
printf("Enter element of second array: \n");
for (int i= 0; i<size2 ; i++)
{
scanf("%d", &arr2[i]);
}
bubblesort(arr1, size1);
bubblesort (arr2, size2);
```

```
merge arrays(arr1, size1, arr2, size2, result);
printf("\n merged sorted array:\n");
display (result, mergesize);
printf("\n");
return 0;
}
void bubblesort (int arr[], int size)
{
int temp;
for(int i=0; i<size-1; i++)
{
for(int j=0; j<size-1; j++)
{
if(arr[j] > arr[j+1])
{
temp = arr[j];
arr[j] = arr[j+1];
arr[j+1] = temp;
}
}}}
void display (int arr[], int size)
{
for(int i=0; i<size; i++)
{
printf("%d", arr[i]);
}
}
```

```
void mergearrays(int arr1[], int size1, int
  arr2[], int size2, int result[])
{
  int i=0; j=0; K=0;

  while (i<size1 && j< size2)
{
  if (arr1[i] <= arr2[j])
{
   result[K++] = arr1[i++] }

  else
{
   result[K++] = arr2[j++];
 }}
   while (i< size1)
{
   result [K++] = arr1[i++];
}
  while (j<size2)
{
   result [K++] = arr2[j++];
}
}
```

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Output

Enter the size of 1st array : 5
Enter the size of 2nd array : 6
Enter element of first array :
1
9
7
11
5
Enter element of second array :
5
8
1
12
7
14

After sorting 1st array is : 1 5 7 9 11
After sorting 2nd array is : 1 5 7 8 12 14
Merged Sorted array :
1 1 5 5 7 7 8 9 11 12 14

```
//WAP to reverse a string.

#include<stdio.h>
#include<conio.h>
#include<string.h>
#define Max20
#include<stdlib.h>

void push (char stack [20], int *top, char ch);
char pop (char stack[ ], int *top);
void main()
{
 char string [20];
 char stack [MAX];
 int top = -1;
 int i;
 clrscr();
 printf(" Enter the string");
 gets (string);

 for(i =0; i<strlen(string); i++)
{
  Push (stack, &top, string [i]);
}
 for(i=0; i<strlen(string); i++)
{
  string [i] = pop(stack, &top);
}
  printf("\n Reverse string = %s", string);
}
  getch();
}
```

```
void push (char stack[], int * top, char c)
{
  if (*top == MAX-1)
{
  printf("\n The stack is full");
    exit(1);
  (*top)++;

  stack[*top] = c;
}
  char pop(char stack[], int *top)
{
  char item;
  if (*top == -1)
{
  printf("\n The stack is empty");

    exit(1);
}
  item = stack[*top];
  (*top)--;
  return item;

}
```

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Output:-

Enter the string Abhinav

Reverse string = vanihbA

Program 23

//WAP to show the use and representation of stack.

```
#include<stdio.h>
#include<conio.h>
# define MAX 100

void push( int stack[], int* top, int value);
int pop( int stack[], int* top);
void display ( int stack[], int top);

int main ()
{
 int stack[MAX];
 int top = -1;
 int choice, value;
 while (1){
 printf("\n Stack Menu: \n");
 printf("1.push \n");
 printf("2. pop\n");
 printf(" 3. display \n");
 printf(" 4. Exit \n");
 printf(" Enter your choice:");
 scanf("%d", &choice);

 Switch( choice){
  case 1;
 if (top >= MAX-1)
 {
   printf (" Stack overflow \n");
 }
```

```
else {
 printf("Enter the value to push: ");
 scanf("%d", &value);
 push(stack, &top, value);
}
 break;

 Case 2:
  if(top==-1)
{ printf("Stack underflow.\n");
}
  else{
   value = pop(stack, &top);
   printf("Popped value: %d\n", value);
}
  break;

 Case 3:
  if(top==-1){
  printf("stack is empty \n");
}
  else{
   display(stack, top);
}
   break;
 case 4:
  printf("Existing.... \n");
   exit(0);
```

```
default:
 printf("Invalid choice: \n"); }}
  return 0;
}
void push (int stack[], int *top)
{
  int value = stack[*top];
  *top = *top-1;
  return value;
}
void pop (int stack[], int *top)
{
  int value = stack[*top];
  *top = *top-1;
  return value;
}
void display (int stack[], int top)
{
  printf("stack elements are: \n");
  for (int i = top; i >= 0; i--)
{
  printf("%d \n", stack[i]);
}
}
```

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Output -

Stack Menu:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 5
pushed 5 to stack

Stack Menu:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 3
pushed 3 to stack

Stack menu:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice : 3
Stack elements are
5
3

Chitra
"It is the prime responsibility of every citizen to feel that his country." —Sardar Vallabhai Patel

Program 24

//WAP to show peek function of stack.

```
# include<stdio.h>
# include <conio.h>
# include <stdlib.h>
# define MAX 100
void push (int stack[], int *top, int item);
int pop(int stack[], int *top);
int peek (int stack[], int* top);

void main()
{
  int stack [MAX];
  int item, ch, top = -1;

  do {
  printf("\n 1. Push");
  printf("\n 2. pop");
  printf("\n 3. peek");
  printf("\n 4. Exit");
  Printf("\n Enter your choice:");
  Scanf("%d", &ch);

  Switch(ch)
{
Case 1: printf("Enter item to insert");
        scanf("%d", &item);
        push(stack, &top, item);
        break;

Case 2: item = pop (stack, &top)
        printf("Deleted item = %d", item);
        break;
```

Chitra
"No real change in history has ever been acheived by discussions." –Subhash chandra bose

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```
Case 3: item = peek (stack, &top);
        printf("item at the top = %d", item);
        break;

Case 4: exit(1);
 default: printf("Wrong choice");
 }
    while (ch);
}
  void push(int stack[], int *top, int item)
{
  if (stack[*top] >= MAX-1)
{
    printf("Stack is full");
     exit (1);
}
  else
{
  (*top)++;
  stack[*top] = item; }
}
  int pop(int stack[], int *top)
{
    int item;
  if (stack[*top] == -1)
{
    printf(" Stack empty");
    exit (1);
}
    item = Stack[*top];
    (*top)--;
```

```
    return item;
}
int peek(int stack[], int * top)
{
    int item;
    if (* top = = -1)
{
    printf("\n stack Empty");
    exit(1);
}
    item = stack [ * top];
    return item;
}
```

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Output:

1. Push
2. Pop
3. Peek
4. Exit

Enter your choice : 1
Enter item to insert 5

1. Push
2. Pop
3. Peek
4. Exit

Enter your choice : 1
Enter item to insert 6

1. Push
2. Pop
3. Peek

Enter your choice : 2
deleted item = 6

1. Push
2. Pop
3. Peek
4. Exit

Enter your choice : 3
item at the top = 5

Program 25

```
//WAP to check validity of brackets in the
   expression.
#include <stdlib.h>
#include <conio.h>
#include <string.h>
#include <stdlib.h>
#define MAX 15

int check (char exp[]);
int match (char a, char b);
void push (char[], int *, char);
char pop( char[], int *);

void main()
{
  char exp[15];
  int valid;
  printf(" Enter an expression");
  gets (exp);
  valid = check (exp);
  if (valid = = 1)
  {
    printf(" Expression is valid ");
  }
  else
  printf("\n Not valid");
}
else
{
printf("\n left paranthesis are more than
      right paranthesis ");
```

Chitra "Religion has mandated killing others as a requirement for its sustenance or promotion." —Dr.A.P.J.Abdul Kalam

```
int check( char exp[ ])
{
 int i;
 char item;
 char stack [MAX];
 int top = -1;
 for ( i=0; i < strlen (exp); i++)
{
 if (exp[i] == '(' || exp[i] == '[' || exp[i] ==
  '{')
 push(stack, &top, exp[i] );
 if (exp[i] == ')' || exp[i] == ']' || exp[i] == '}')
{
 if (top == -1)
{
 printf("\n Right paranthesis are more than left
  paranthesis");
 return 0;
}
 else
{
 item = pop(stack, &top);
 if (!match (item, exp[i]))
{
 printf("\n Paranthesis is Matched");
 return 0;
}}}}
 if (top == -1)
{
 printf("\n Balanced Parenthesis \n");
 return 1;
}
```

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```
return 0; }}
int match (char a, char b)
{
    if (a == '[' && b == '[')
        return 1;
    if (a == '{' && b == '{')
        return 1;
    if (a == '(' && b == ')')
        return 1;
        return 0;

}

void push(char stack[], int * top, char item)
{
  if (* top == MAX-1)
{
  printf ("\n Stack overflow");
    exit (1); }
  (*top) ++;
  stack[* top] = item; }

Char pop (char stack[], int * top)
{
    if (* top == -1)
{
  printf("\n Stack Empty");
    exit (1);
}
    return (stack[(* top) --]);

}
```

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Output:-

Enter an expression (a+b)* d & +e
Left paranthesis are more than right paranthesis
Not Valid

```
// WAP to find the factorial with the help of recursion.
# include <stdio.h>
# include <conio.h>
long int factorial(int);
void main()
{
 int num, fact;
 printf("enter no.");
 scanf("%d", &num);
 fact = factorial(num);
 printf("\n factorial= %d", fact);
 getch();
}
 long int factorial(int n)
{
 if (n==0)
 return 1;
 else
 return (n*factorial(n-1));
}
```

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Output :-

enter no. 3

Factorial = 6

Program 27

```
// WAP to find the fibonacci series in DS.
#include<stdio.h>
#include<conio.h>
int fib (int i);
void main()
{
int term, i;
clrscr();
printf("enter no of term");
scanf("%d\n", &term);
for(i=0; i<term; i++)
{
printf("%d", fib(i));
}
getch();
}
int fib (int i)
{
if (i==0)
return 0;
else
if (i==1)
return 1;
else
return (fib(i-1) + fib(i-2));
}
```

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Output :-

enter no of term 4
4
0 1 1 2