

```
1  #include<iostream>
2  using namespace std;
3
4  const int R=4, C=4;
5  void printSnake(int mat[R][C])
6  {
7      for(int i=0; i<R; i++)
8      {
9          if(i%2 == 0)
10         {
11             for(int j=0; j<C; j++)
12                 cout<<mat[i][j]<<" ";
13             cout<<endl;
14         }
15         else
16         {
17             for(int j=C-1; j>=0; j--)
18                 cout<<mat[i][j]<<" ";
19             cout<<endl;
20         }
21     }
22 }
23
24 int main()
25 {
26     cout<<"Snake Pattern = \n";
27     int mat[4][4] = {{1, 2, 3, 4},
28                     {5, 6, 7, 8},
29                     {9, 10, 11, 12},
30                     {13, 14, 15, 16}};
31     printSnake(mat);
32     cout<<endl;
33 }
```

Snake Pattern =

```
1 2 3 4
8 7 6 5
9 10 11 12
16 15 14 13
```

Process returned 0 (0x0) execution time : 0.370 s  
Press any key to continue.

```
4  const int R=4, C=4;
5  void BTraversal(int mat[R][C])
6  {
7      if(R == 1)
8      {
9          for(int i=0; i<C; i++)
10             cout<<mat[0][i]<<" ";
11             cout<<endl;
12     }
13     else if(C == 1)
14     {
15         for(int i=0; i<R; i++)
16             cout<<mat[i][0]<<" ";
17             cout<<endl;
18     }
19     else
20     {
21         for(int i=0; i<C; i++)
22             cout<<mat[0][i]<<" ";
23             cout<<endl;
24         for(int i=1; i<R; i++)
25             cout<<mat[i][C-1]<<" ";
26             cout<<endl;
27         for(int i = C-2; i>=0; i--)
28             cout<<mat[R-1][i]<<" ";
29             cout<<endl;
30         for(int i=R-2; i>=1; i--)
31             cout<<mat[i][0]<<" ";
32             cout<<endl;
33     }
34 }
35
36 int main()
37 {
38     cout<<"Boundary Traversal = \n";
39     int mat[4][4] = {{1, 2, 3, 4},
40                     {5, 6, 7, 8},
41                     {9, 10, 11, 12},
42                     {13, 14, 15, 16}};
43     BTraversal(mat);
44     cout<<endl;
45 }
```

Boundary Traversal =

1 2 3 4

8 12 16

15 14 13

9 5

Process returned 0 (0x0) execution time : 0.443 s

Press any key to continue.

```
1  #include<iostream>
2  using namespace std;
3
4  const int n=4;
5  void Transpose(int mat[n][n])
6  {
7      int temp[n][n];
8      for(int i=0; i<n; i++)
9          for(int j=0; j<n; j++)
10             temp[j][i] = mat[i][j];
11
12     for(int i=0; i<n; i++)
13         for(int j=0; j<n; j++)
14             mat[i][j] = temp[i][j];
15
16     for(int i=0; i<n; i++)
17     {
18         cout<<endl;
19         for(int j=0; j<n; j++)
20             cout<<mat[i][j]<<" ";
21     }
22 }
23
24 int main()
25 {
26     cout<<"Transpose of Matrix = ";
27     int mat[4][4] = {{1, 2, 3, 4},
28                     {5, 6, 7, 8},
29                     {9, 10, 11, 12},
30                     {13, 14, 15, 16}};
31
32     Transpose(mat);
33     cout<<endl;
34 }
```

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Transpose of Matrix =

```
1 5 9 13
2 6 10 14
3 7 11 15
4 8 12 16
```

Process returned 0 (0x0) execution time : 0.334 s  
Press any key to continue.

```
1  #include<iostream>
2  using namespace std;
3
4  const int n=4;
5  void Transpose(int mat[n][n])
6  {
7      for(int i=0; i<n; i++)
8          for(int j=i+1; j<n; j++)
9              swap(mat[i][j], mat[j][i]);
10
11     for(int i=0; i<n; i++)
12     {
13         cout<<endl;
14         for(int j=0; j<n; j++)
15             cout<<mat[i][j]<<" ";
16     }
17 }
18
19 int main()
20 {
21     cout<<"Transpose of Matrix = ";
22     int mat[4][4] = {{1, 2, 3, 4},
23                     {5, 6, 7, 8},
24                     {9, 10, 11, 12},
25                     {13, 14, 15, 16}};
26
27     Transpose(mat);
28     cout<<endl;
```

Transpose of Matrix =

```
1 5 9 13
2 6 10 14
3 7 11 15
4 8 12 16
```

Process returned 0 (0x0) execution time : 0.202 s  
Press any key to continue.



```
1  #include<iostream>
2  using namespace std;
3
4  const int R=4, C=4, n=4;
5  void rotate90(int mat[R][C])
6  {
7      int temp[n][n];
8      for(int i=0; i<n; i++)
9          for(int j=0; j<n; j++)
10             temp[n-j-1][i] = mat[i][j];
11
12     for(int i=0; i<n; i++)
13         for(int j=0; j<n; j++)
14             mat[i][j] = temp[i][j];
15
16     for(int i=0; i<n; i++)
17     {
18         for(int j=0; j<n; j++)
19             cout<<mat[i][j]<<" ";
20         cout<<endl;
21     }
22 }
23
24 int main()
25 {
26     cout<<"90 deg Rotated Matrix = \n";
27     int mat[4][4] = {{1, 2, 3, 4},
28                     {5, 6, 7, 8},
29                     {9, 10, 11, 12},
30                     {13, 14, 15, 16}};
31
32     rotate90(mat);
33     cout<<endl;
34 }
```

90 deg Rotated Matrix =

```
4 8 12 16
3 7 11 15
2 6 10 14
1 5 9 13
```

Process returned 0 (0x0) execution time : 0.120 s  
Press any key to continue.

```
4  const int R=4, C=4, n=4;
5  void rotate90(int mat[R][C])
6  {
7      for(int i=0; i<n; i++)
8          for(int j=i+1; j<n; j++)
9              swap(mat[i][j], mat[j][i]);
10
11     for(int i=0; i<n; i++)
12     {
13         int low=0, high=n-1;
14         while(low < high)
15         {
16             swap(mat[low][i], mat[high][i]);
17             low++;
18             high--;
19         }
20     }
21
22     for(int i=0; i<n; i++)
23     {
24         for(int j=0; j<n; j++)
25             cout<<mat[i][j]<<" ";
26         cout<<endl;
27     }
28 }
29
30 int main()
31 {
32     cout<<"90 deg Rotated Matrix = \n";
33     int mat[4][4] = {{1, 2, 3, 4},
34                     {5, 6, 7, 8},
35                     {9, 10, 11, 12},
36                     {13, 14, 15, 16}};
37
38     rotate90(mat);
39     cout<<endl;
40 }
```

90 deg Rotated Matrix =

4 8 12 16

3 7 11 15

2 6 10 14

1 5 9 13

Process returned 0 (0x0) execution time : 0.106 s

Press any key to continue.

```
1  #include<iostream>
2  using namespace std;
3
4  const int R=4, C=4;
5  void printSpiral(int mat[R][C], int R, int C)
6  {
7      int top=0, left=0, bottom=R-1, right=C-1;
8      while(top <= bottom && left <= right)
9      {
10         for(int i=left; i<=right; i++)
11             cout<<mat[top][i]<<" ";
12         cout<<endl;
13         top++;
14
15         for(int i=top; i<=bottom; i++)
16             cout<<mat[i][right]<<" ";
17         cout<<endl;
18         right--;
19
20         if(top <= bottom)
21         {
22             for(int i=right; i>=left; i--)
23                 cout<<mat[bottom][i]<<" ";
24             cout<<endl;
25             bottom--;
26         }
27
28         if(left <= right)
29         {
30             for(int i=bottom; i>=top; i--)
31                 cout<<mat[i][left]<<" ";
32             cout<<endl;
33             left++;
34         }
35     }
36 }
```

Spiral Matrix Traversal =

```
1 2 3 4
8 12 16
15 14 13
9 5
6 7
11
10
```

Process returned 0 (0x0) execution time : 0.133 s  
Press any key to continue.

```
1  #include<iostream>
2  using namespace std;
3
4  const int R=4, C=4;
5  void Row_Column_search(int mat[R][C], int x)
6  {
7      for(int i=0; i<R; i++)
8      {
9          for(int j=0; j<C; j++)
10         {
11             if(mat[i][j] == x)
12             {
13                 cout<<"Found at index ("<< i << "," << j << ")";
14                 return;
15             }
16         }
17     }
18     cout<<"Not Found";
19 }
20
21 int main()
22 {
23     cout<<"Search in Row Wise & Column Wise = \n";
24     int x=11;
25     int mat[4][4] = {{1, 2, 3, 4},
26                     {5, 6, 7, 8},
27                     {9, 10, 11, 12},
28                     {13, 14, 15, 16}};
29
30     Row_Column_search(mat, x);
31     cout<<endl;
32 }
```

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Search in Row Wise & Column Wise =  
Found at index (2,2)

Process returned 0 (0x0) execution time : 0.096 s  
Press any key to continue.



```
1  #include<iostream>
2  using namespace std;
3
4  const int R=4, C=4;
5  void Row_Column_search(int mat[R][C], int x)
6  {
7      int i=0, j=C-1;
8      while(i<R && j>=0)
9      {
10         if(mat[i][j] == x)
11         {
12             cout<<"Found at index ("<< i << "," << j << ")";
13             return;
14         }
15         else if(mat[i][j] > x)
16             j--;
17         else
18             i++;
19     }
20     cout<<"Not Found";
21 }
22
23 int main()
24 {
25     cout<<"Search in Row Wise & Column Wise = \n";
26     int x=11;
27     int mat[4][4] = {{1, 2, 3, 4},
28                     {5, 6, 7, 8},
29                     {9, 10, 11, 12},
30                     {13, 14, 15, 16}};
31
32     Row_Column_search(mat, x);
33     cout<<endl;
34 }
```

Search in Row Wise & Column Wise =  
Found at index (2,2)

Process returned 0 (0x0) execution time : 0.114 s  
Press any key to continue.