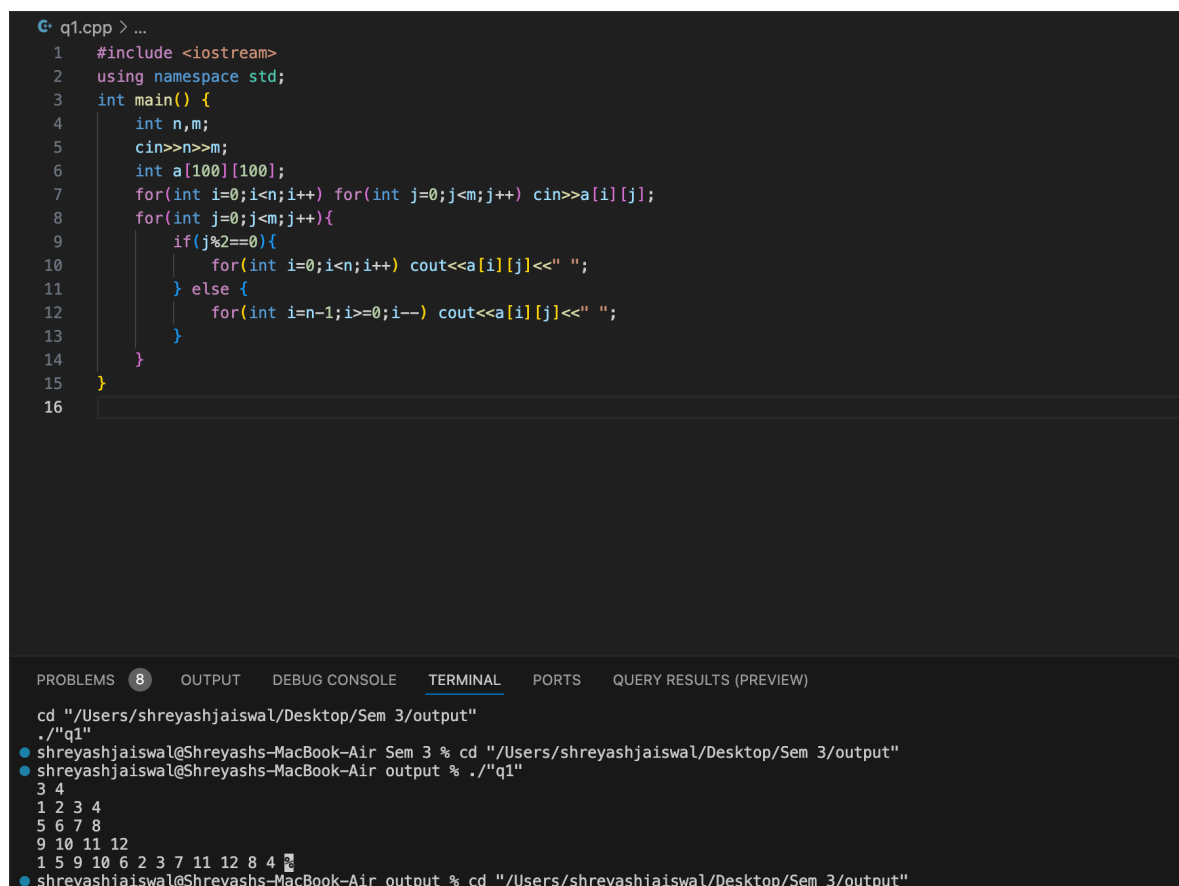


Wave Form Traversal

```
#include <iostream>
using namespace std;
int main() {
    int n,m;
    cin>>n>>m;
    int a[100][100];
    for(int i=0;i<n;i++) for(int j=0;j<m;j++) cin>>a[i][j];
    for(int j=0;j<m;j++){
        if(j%2==0){
            for(int i=0;i<n;i++) cout<<a[i][j]<<" ";
        } else {
            for(int i=n-1;i>=0;i--) cout<<a[i][j]<<" ";
        }
    }
}
```



The screenshot shows a C++ IDE with a code editor and a terminal window. The code editor displays the same code as the previous block. The terminal window shows the execution of the program, with the output being a wave form traversal of a 12x12 matrix. The output is as follows:

```
cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"
./"q1"
shreyashjaiswal@Shreyashs-MacBook-Air Sem 3 % cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"
shreyashjaiswal@Shreyashs-MacBook-Air output % ./"q1"
3 4
1 2 3 4
5 6 7 8
9 10 11 12
1 5 9 10 6 2 3 7 11 12 8 4
```

Transpose of a Matrix

```
#include <iostream>
using namespace std;
int main(){
    int n,m;
    cin>>n>>m;
    int a[100][100];
    for(int i=0;i<n;i++) for(int j=0;j<m;j++) cin>>a[i][j];
    for(int j=0;j<m;j++){
        for(int i=0;i<n;i++) cout<<a[i][j]<<" ";
        cout<<endl;
    }
}
```

q2.cpp > main()

```
1  #include <iostream>
2  using namespace std;
3  int main(){
4      int n,m;
5      cin>>n>>m;
6      int a[100][100];
7      for(int i=0;i<n;i++) for(int j=0;j<m;j++) cin>>a[i][j];
8      for(int j=0;j<m;j++){
9          for(int i=0;i<n;i++) cout<<a[i][j]<<" ";
10         cout<<endl;
11     }
12 }
13
```

PROBLEMS 8 OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULTS (PREVIEW)

```
cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"
./"q2"
shreyashjaiswal@Shreyashs-MacBook-Air Sem 3 % cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"
shreyashjaiswal@Shreyashs-MacBook-Air output % ./"q2"
3 3
1 2 3
4 5 6
7 8 9
1 4 7
2 5 8
3 6 9
shreyashjaiswal@Shreyashs-MacBook-Air output % cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"
shreyashjaiswal@Shreyashs-MacBook-Air output % ./"q2"
2 3
1 2 3
4 5 6
1 4
2 5
3 6
shreyashjaiswal@Shreyashs-MacBook-Air output %
```

Spiral Traversal of a Matrix

```
#include <iostream>
using namespace std;
int main(){
    int n,m;
    cin>>n>>m;
    int a[100][100];
    for(int i=0;i<n;i++) for(int j=0;j<m;j++) cin>>a[i][j];
    int top=0,bottom=n-1,left=0,right=m-1;
    while(top<=bottom && left<=right){
        for(int i=left;i<=right;i++) cout<<a[top][i]<<" ";
        top++;
        for(int i=top;i<=bottom;i++) cout<<a[i][right]<<" ";
        right--;
        if(top<=bottom){
            for(int i=right;i>=left;i--) cout<<a[bottom][i]<<" ";
            bottom--;
        }
        if(left<=right){
            for(int i=bottom;i>=top;i--) cout<<a[i][left]<<" ";
            left++;
        }
    }
}
```

The screenshot shows a code editor with a dark theme. At the top, there are tabs for several files: lab2q3.java, lab2q4.java, lab2q5.java 2, lab2q6.java, lab2q7.java 5, q1.cpp, and q2.cpp. The active file is q3.cpp, which contains the C++ code for spiral traversal. The code is as follows:

```
1 #include <iostream>
2 using namespace std;
3 int main(){
4     int n,m;
5     cin>>n>>m;
6     int a[100][100];
7     for(int i=0;i<n;i++) for(int j=0;j<m;j++) cin>>a[i][j];
8     int top=0,bottom=n-1,left=0,right=m-1;
9     while(top<=bottom && left<=right){
10         for(int i=left;i<=right;i++) cout<<a[top][i]<<" ";
11         top++;
12         for(int i=top;i<=bottom;i++) cout<<a[i][right]<<" ";
13         right--;
14         if(top<=bottom){
15             for(int i=right;i>=left;i--) cout<<a[bottom][i]<<" ";
16             bottom--;
17         }
18         if(left<=right){
19             for(int i=bottom;i>=top;i--) cout<<a[i][left]<<" ";
20             left++;
21         }
22     }
23 }
```

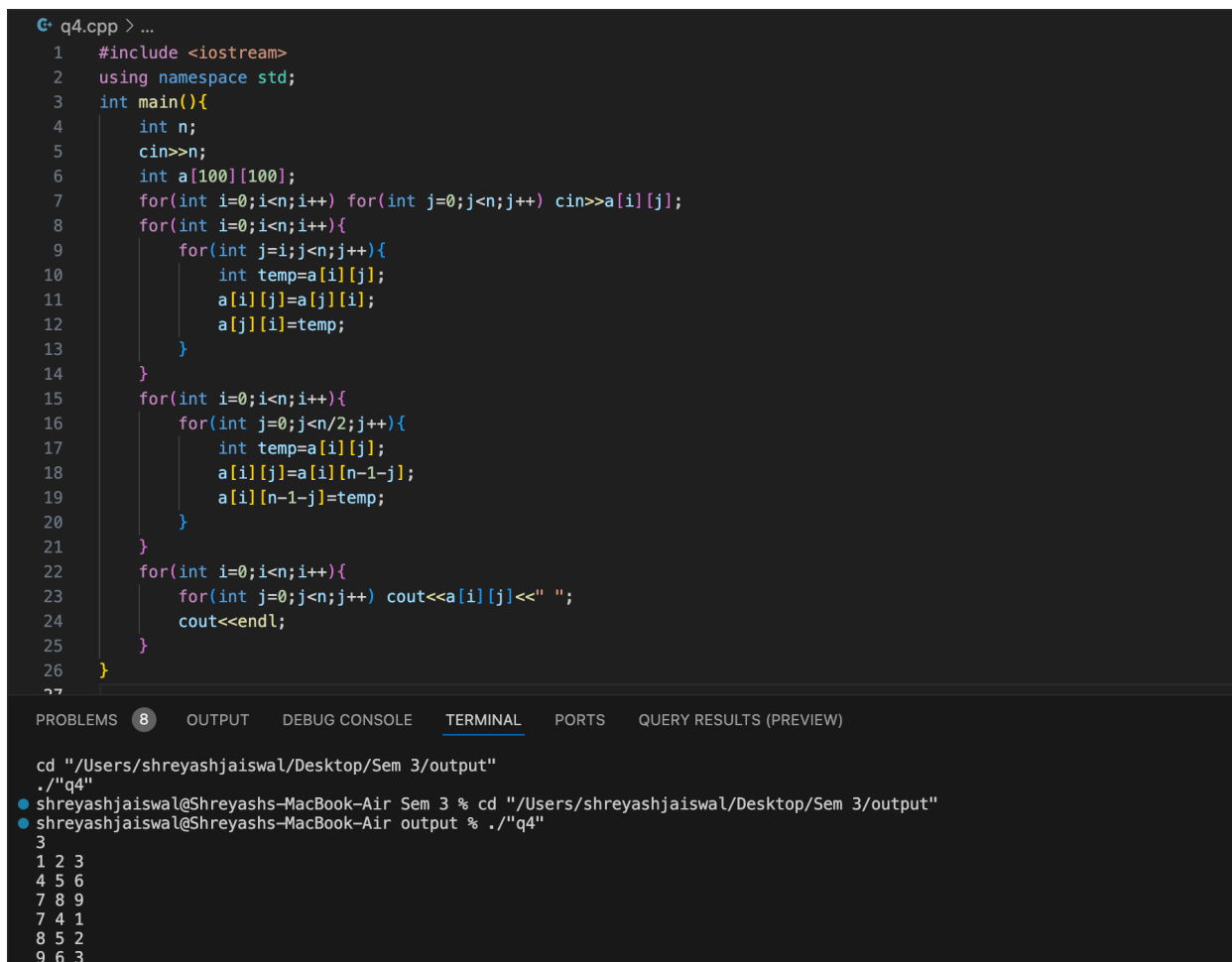
Below the code editor, there is a terminal window. The terminal shows the execution of the program. The first command is `cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"`. The second command is `./"q3"`. The output of the program is shown as follows:

```
3 3
1 2 3
4 5 6
7 8 9
1 2 3 6 9 8 7 4 5
3 4
1 2 3 4
5 6 7 8
9 10 11 12
1 2 3 4 8 12 11 10 9 5 6 7
```

The terminal also shows the prompt `shreyashjaiswal@Shreyashs-MacBook-Air output %` and the command `cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"` being executed.

Rotate Matrix by 90 Degrees Clockwise

```
#include <iostream>
using namespace std;
int main(){
    int n;
    cin>>n;
    int a[100][100];
    for(int i=0;i<n;i++) for(int j=0;j<n;j++) cin>>a[i][j];
    for(int i=0;i<n;i++){
        for(int j=i;j<n;j++){
            int temp=a[i][j];
            a[i][j]=a[j][i];
            a[j][i]=temp;
        }
    }
    for(int i=0;i<n;i++){
        for(int j=0;j<n/2;j++){
            int temp=a[i][j];
            a[i][j]=a[i][n-1-j];
            a[i][n-1-j]=temp;
        }
    }
    for(int i=0;i<n;i++){
        for(int j=0;j<n;j++) cout<<a[i][j]<<" ";
        cout<<endl;
    }
}
```



The screenshot shows a C++ IDE with a code editor and a terminal. The code editor displays the same C++ code as the previous block. The terminal shows the command to compile and run the program, followed by the output of the program.

```
cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"
./"q4"
shreyashjaiswal@Shreyashs-MacBook-Air Sem 3 % cd "/Users/shreyashjaiswal/Desktop/Sem 3/output"
shreyashjaiswal@Shreyashs-MacBook-Air output % ./"q4"
3
1 2 3
4 5 6
7 8 9
7 4 1
8 5 2
9 6 3
```