Lab manual 9

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ME-15(A)

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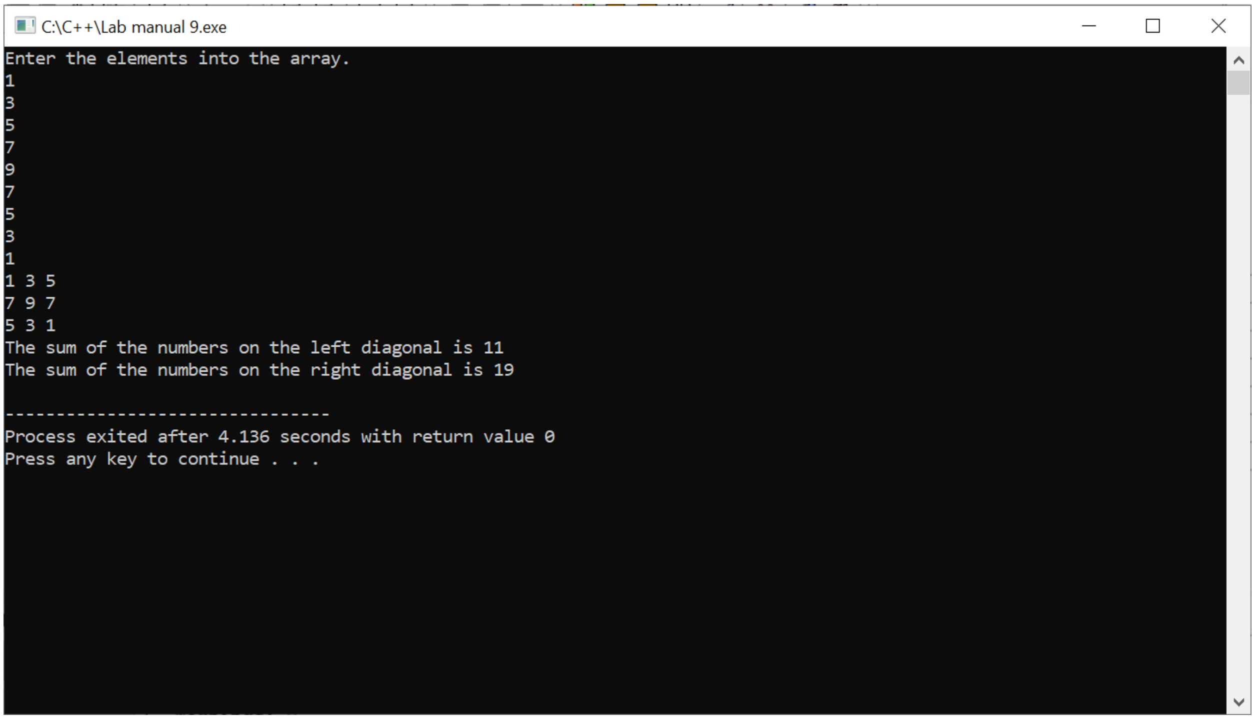
List of all Global Functions

```
    1. void table(int number, int n){
        if(n>10){
                return;
        }
        cout<<number<<" x "<<n<<" = "<<number*n<<endl;
        table(number,n+1);
}
    2. void matrix_multiplication(int matrix1[3][3],int matrix2[3][3]){
        int sum;
        for(int i=0;i<3;i++){
                for(int j=0;j<3;j++){
                        sum=0;
                        for(int k=0;k<3;k++){
                                sum=sum+(matrix1[i][k]*matrix2[k][j]);
                        }

                        cout<<sum<<" ";
                }
                cout<<endl;
        }
}
    3. void array2display(int matrix2[3][3]){
        for(int i=0;i<3;i++){
                for(int j=0;j<3;j++){
                        cout<<matrix2[i][j]<<" ";
                }
                cout<<endl;
        }
}
    4.  void array1display(int matrix1[3][3]){
        for(int i=0;i<3;i++){
                for(int j=0;j<3;j++){
                        cout<<matrix1[i][j]<<" ";
                }
                cout<<endl;
        }
}
    5.  void array2 (int matrix2[3][3]){
        cout<<"Enter the elements into the second array.\n";
        for(int i=0;i<3;i++){
                for(int j=0;j<3;j++){
                        cin>>matrix2[i][j];
                }
        }
}
    6.  void array1 (int matrix1[3][3]){
        cout<<"Enter the elements into the array.\n";
        for(int i=0;i<3;i++){
                for(int j=0;j<3;j++){
                        cin>>matrix1[i][j];
                }
        }
        }
```

```
  7. void transpose(int matrix1[3][3],int matrix2[3][3]){
     for(int i=0;i<3;i++){
             for(int j=0;j<3;j++){
                     matrix1[i][j]=matrix2[j][i];
                     cout<<matrix1[i][j]<<" ";
             }
             cout<<endl;
     }
}
  8. void matrix_sum(int matrix1[3][3], int matrix2[3][3]){
     for (int i=0;i<3;i++){
             for(int j=0;j<3;j++){
                     cout<<matrix1[i][j]+matrix2[i][j]<<" ";
             }
             cout<<endl;
     }
}
```

1. Make 2D Array in C++ and print left diagonal and right diagonal sum of a 3x3 matrix.

```
int sum=0;
array1(matrix1);
for (int i=0;i<3;i++){
    for(int j=0;j<3;j++){
        if(i==j){
            sum=sum+matrix1[i][j];
        }
    }
}
for(int i=0;i<3;i++){
    for(int j=0;j<3;j++){
        cout<<matrix1[i][j]<<" ";
    }
    cout<<endl;
}
cout<<"The sum of the numbers on the left diagonal is "<<sum<<endl;
sum=0;
for (int i=0;i<3;i++){
    for(int j=0;j<3;j++){
        if(abs(i-j)==2||i+j==2){
            sum+=matrix1[i][j];
        }
    }
}
cout<<"The sum of the numbers on the right diagonal is "<<sum<<endl;
```



```
Enter the elements into the array.
1
3
5
7
9
7
5
3
1
1 3 5
7 9 7
5 3 1
The sum of the numbers on the left diagonal is 11
The sum of the numbers on the right diagonal is 19

--------------------------------
Process exited after 4.136 seconds with return value 0
Press any key to continue . . .
```

2. Write a function to add two 2D arrays of size 3x3.

   array1(matrix1);

   array2(matrix2);

   cout<<"First array:\n";

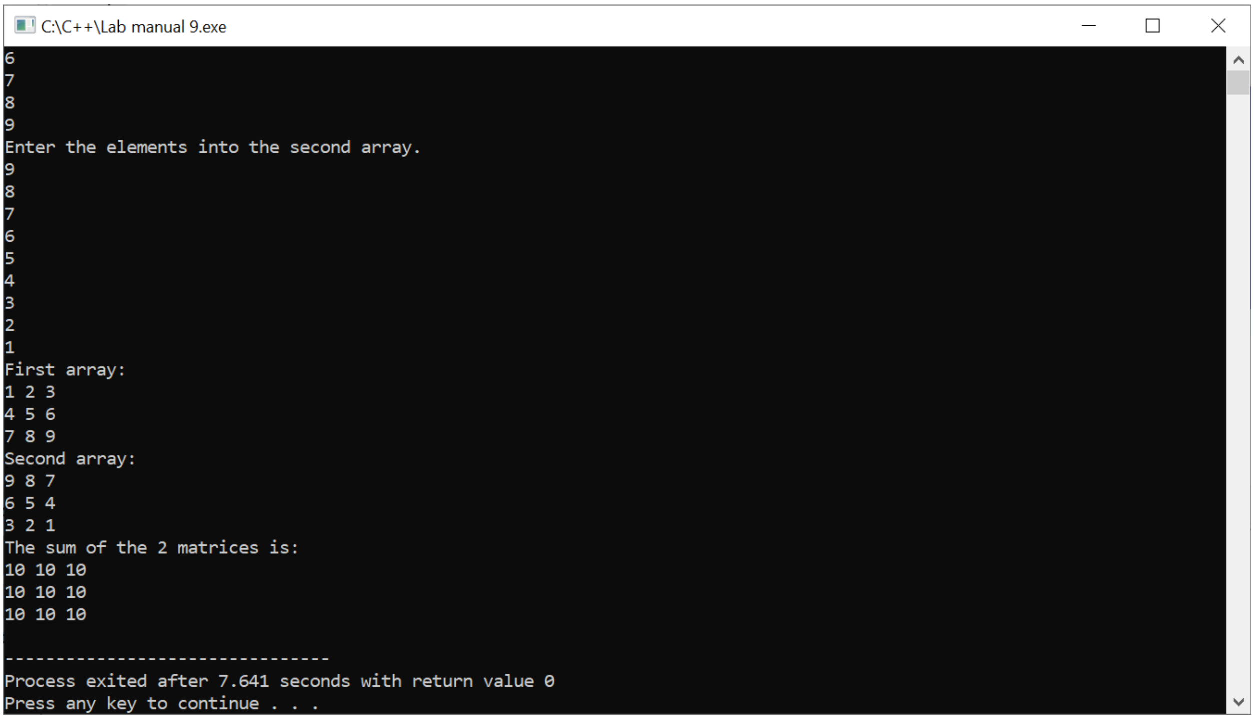
   array1display(matrix1);

   cout<<"Second array:\n";

   array2display(matrix2);

   cout<<"The sum of the 2 matrices is: "<<endl;

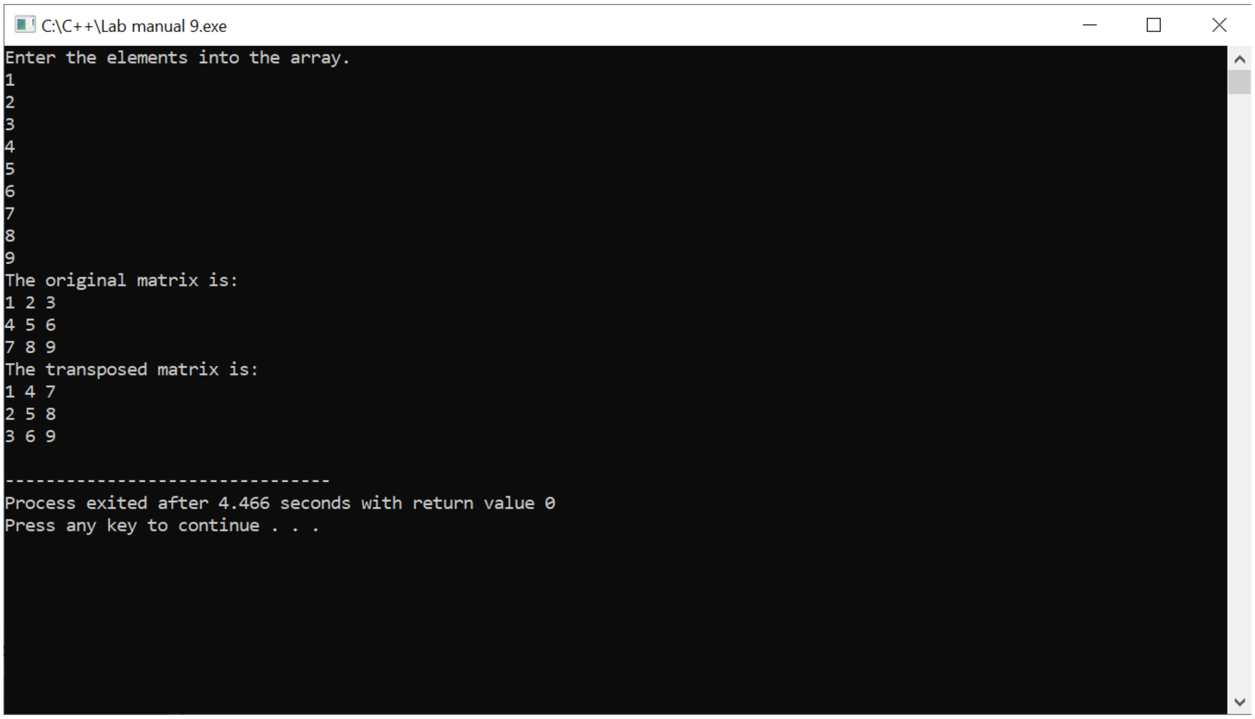
   matrix_sum(matrix1,matrix2);



```
6
7
8
9
Enter the elements into the second array.
9
8
7
6
5
4
3
2
1
First array:
1 2 3
4 5 6
7 8 9
Second array:
9 8 7
6 5 4
3 2 1
The sum of the 2 matrices is:
10 10 10
10 10 10
10 10 10

--------------------------------
Process exited after 7.641 seconds with return value 0
Press any key to continue . . .
```

3. Using 2D arrays in C++, take transpose of a 3x3 matrix. Make a transpose function.

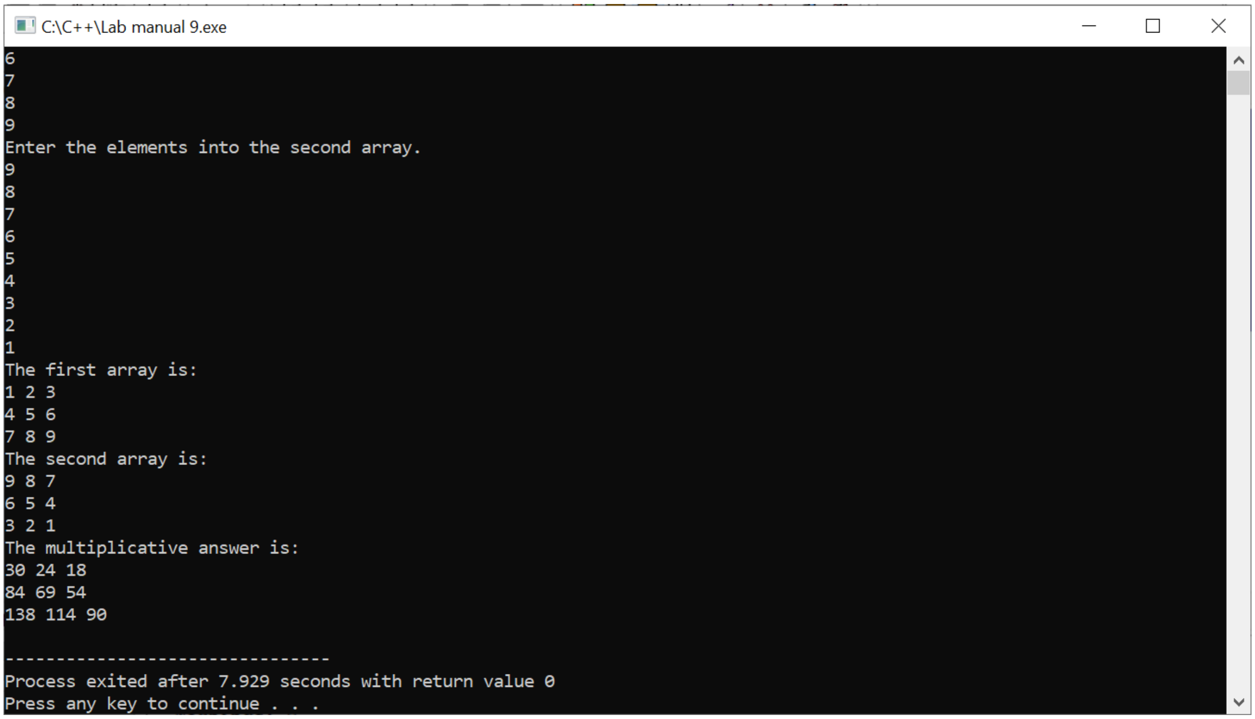
```
int copy_array[3][3];

array1(matrix1);

for(int i=0;i<3;i++){

        for(int j=0;j<3;j++){

                copy_array[i][j]=matrix1[i][j];

        }

}

cout<<"The original matrix is: \n";

array1display(matrix1);

cout<<"The transposed matrix is: \n";

transpose(matrix1,copy_array);
```



```
Enter the elements into the array.
1
2
3
4
5
6
7
8
9
The original matrix is:
1 2 3
4 5 6
7 8 9
The transposed matrix is:
1 4 7
2 5 8
3 6 9

--------------------------------
Process exited after 4.466 seconds with return value 0
Press any key to continue . . .
```

4. Using 2D arrays in C++, implement 3x3 matrix multiplication. Make a function.

```
int sum;
        array1(matrix1);
        array2(matrix2);
        cout<<"The first array is:\n";
        array1display(matrix1);
        cout<<"The second array is:\n";
        array2display(matrix2);
        cout<<"The multiplicative answer is: \n";
        matrix_multiplication(matrix1,matrix2);
```



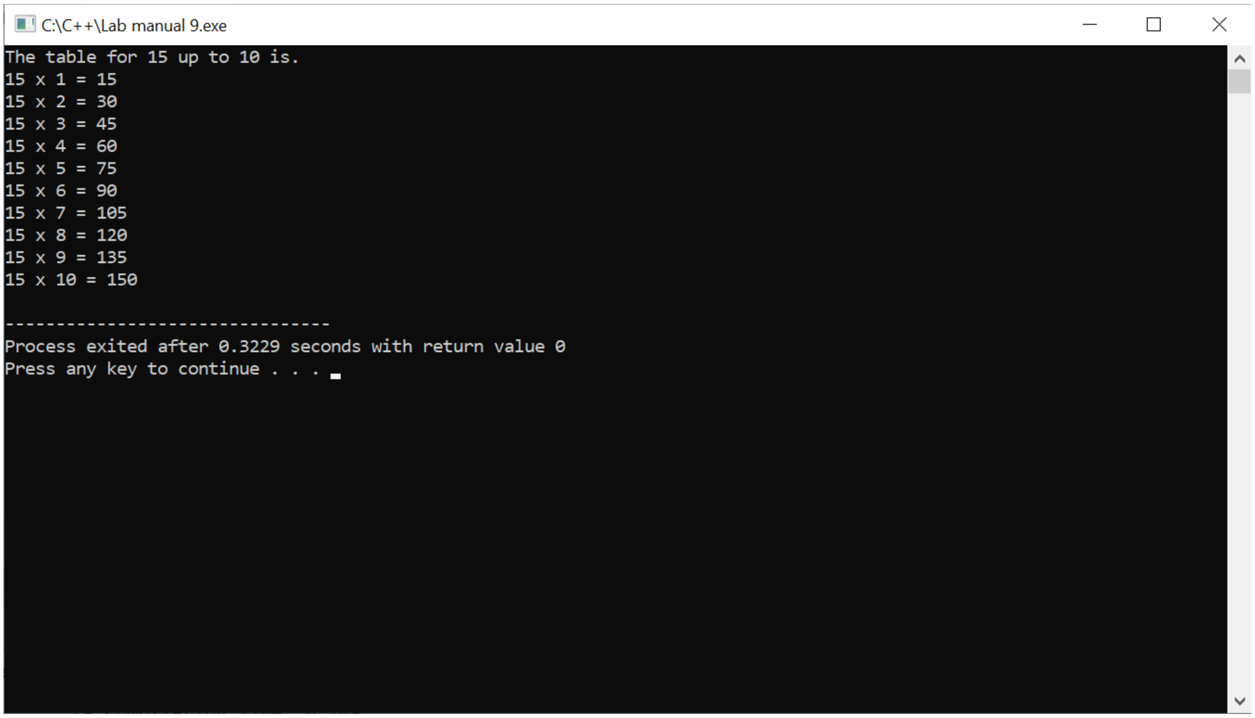
```
6
7
8
9
Enter the elements into the second array.
9
8
7
6
5
4
3
2
1
The first array is:
1 2 3
4 5 6
7 8 9
The second array is:
9 8 7
6 5 4
3 2 1
The multiplicative answer is:
30 24 18
84 69 54
138 114 90

--------------------------------
Process exited after 7.929 seconds with return value 0
Press any key to continue . . .
```

5. Print the multiplication table of 15 using recursion.

   int num=15;

   cout<<"The table for 15 up to 10 is.\n";

   table(num,1)



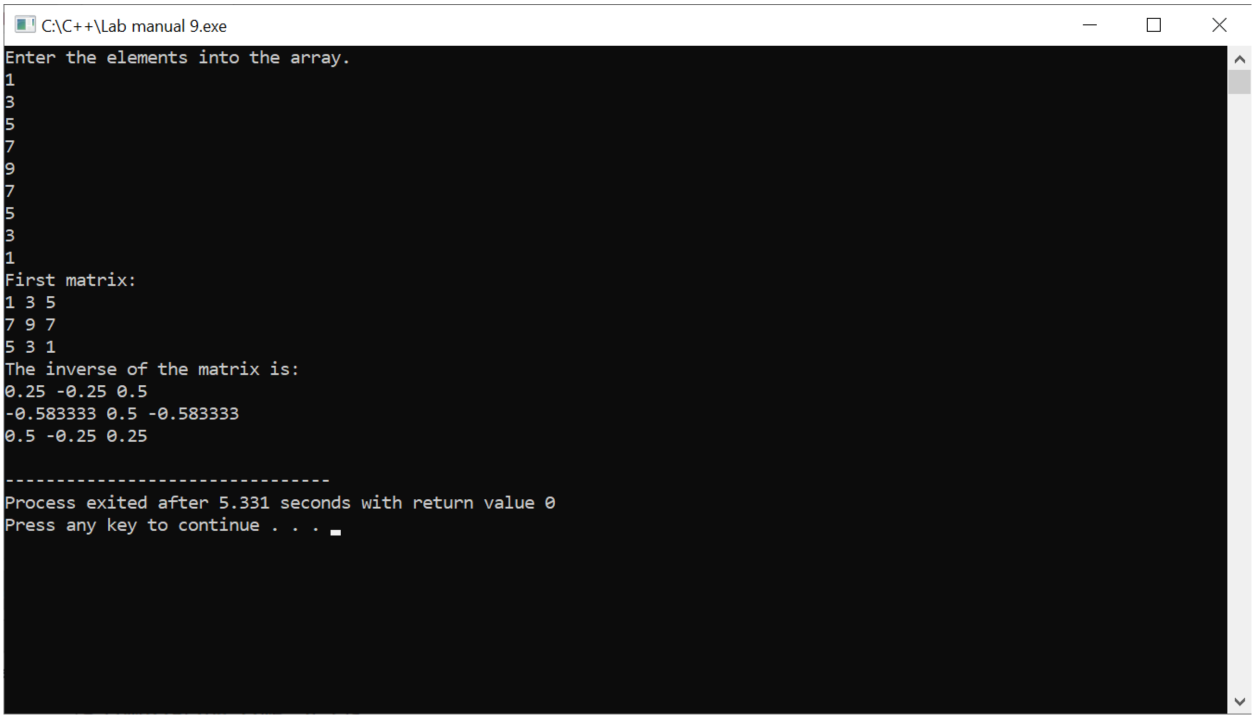
```
The table for 15 up to 10 is.
15 x 1 = 15
15 x 2 = 30
15 x 3 = 45
15 x 4 = 60
15 x 5 = 75
15 x 6 = 90
15 x 7 = 105
15 x 8 = 120
15 x 9 = 135
15 x 10 = 150

--------------------------------
Process exited after 0.3229 seconds with return value 0
Press any key to continue . . .
```

HOME TASK

Write a C++ program to take inverse of a 3x3 matrix using its determinant and adjoint.

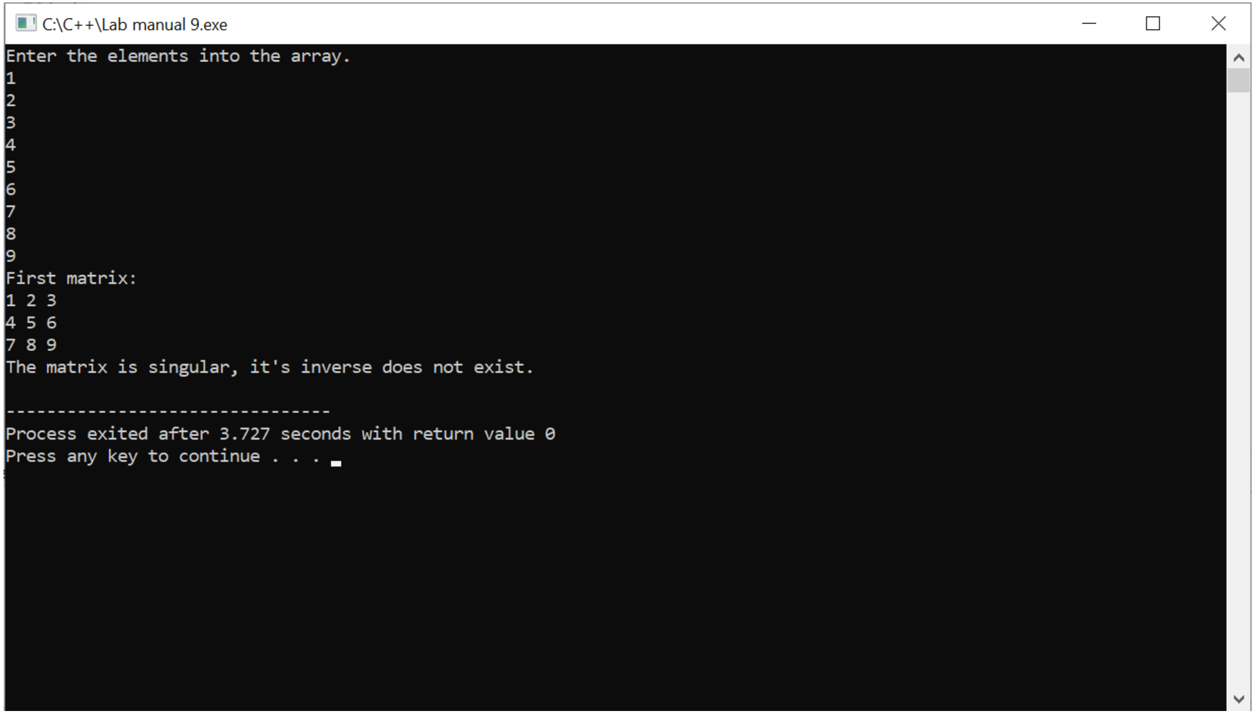
```
float adjoint[3][3],inverse[3][3];

array1(matrix1);

cout<<"First matrix: \n";

array1display(matrix1);

float determinant =
matrix1[0][0] * (matrix1[1][1] * matrix1[2][2] - matrix1[2][1] * matrix1[1][2]) -

matrix1[0][1] * (matrix1[1][0] * matrix1[2][2] - matrix1[2][0] * matrix1[1][2]) +

matrix1[0][2] * (matrix1[1][0] * matrix1[2][1] - matrix1[2][0] * matrix1[1][1]);

if (determinant == 0) {

cout << "The matrix is singular, it\'s inverse does not exist." << endl;

}

else{

    for(int i=0; i<3; i++){

        for(int j=0; j<3; j++){

        adjoint[i][j] = (matrix1[(j+1)%3][(i+1)%3] * matrix1[(j+2)%3][(i+2)%3] -

            matrix1[(j+1)%3][(i+2)%3] * matrix1[(j+2)%3][(i+1)%3]);

        }

    }

for (int i = 0; i < 3; ++i){

    for (int j = 0; j < 3; ++j){

        inverse[i][j] = adjoint[i][j] / determinant;

    }

}

cout << "The inverse of the matrix is:" << endl;

for (int i=0; i<3; i++) {
```

```
                for (int j=0; j<3; j++){
                        cout << inverse[i][j] << " ";
                }
                cout << endl;
        }

}
```



C:\C++\Lab manual 9.exe

```
Enter the elements into the array.
1
3
5
7
9
7
5
3
1
First matrix:
1 3 5
7 9 7
5 3 1
The inverse of the matrix is:
0.25 -0.25 0.5
-0.583333 0.5 -0.583333
0.5 -0.25 0.25

--------------------------------
Process exited after 5.331 seconds with return value 0
Press any key to continue . . .
```



C:\C++\Lab manual 9.exe

```
Enter the elements into the array.
1
2
3
4
5
6
7
8
9
First matrix:
1 2 3
4 5 6
7 8 9
The matrix is singular, it's inverse does not exist.

--------------------------------
Process exited after 3.727 seconds with return value 0
Press any key to continue . . .
```