In each exercise make your source code and output readable.

Exercise 1. Write a program, which contains the following functions working on some non-square matrix of integers with at most 20 rows and 20 columns:
(a) a function "generate_array(A,n,m,p,q)" which generates pseudorandom number from the range [p,q] for the first n rows and the first m columns of the matrix A.
(b) a function "display_array(A,n,m)" which displays the values of the first n rows and the first m columns of the matrix A on the screen.
(c) a function "sum_rows(A,n,m)" which returns the n sums from each row of the matrix A.
*Complete the program from the file **exercise1start.cpp** from the **lab12** folder. In the program test the above functions.*
EXTENSION. Display the row with the largest sum. To do this define a function that returns the positions of the largest value in a one-dimensional array. One can find that function in the file template.cpp.

Exercise 2. Write a program, which contains the following functions working on some square matrix of integers with at most 20 rows and columns:
(a) the functions "generate_array(A,n,m,p,q)" "display_array(A,n,m)" from Exercise 1 above,
(b) a function "swap_integers(a,b)" defined during the previous laboratory, see file ***exercise2start.cpp*** from the ***lab12*** folder,
(c) a function "transpose_array(A,n)" which transposes the square matrix A. The transpose of a matrix is a matrix whose rows are the columns of the original.
*Correct and complete the file **exercise2start.cpp** from the **lab12** folder. In the program test the above functions.*

Exercise 3. Correct program from ***template.cpp*** from the ***lab12*** folder.

Exercise 4. Write a program which checks whether a square matrix is symmetric. In a program define appropriate functions. Test the functions in a suitably defined main program.

Exercise 5. Complex. Spiraling 2-D array**.** Given a 2-D array, write a program to print it out in spiral order. From 2-D array

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

One should get the following

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

In a program define appropriate functions. Test the functions in a suitably defined main program.

Exercise 6. Complex. Write a program, which contains the following functions working on some non-square matrix of integers with at most 20 rows and 20 columns:
(a) the functions "generate_array(A,n,m,p,q)" "display_array(A,n,m)" from Exercise 1 above,
(b) a function "swap_integers(a,b)" defined during the previous laboratory,
(c) a function that swaps two rows in a non-square matrix,
(d) a function that swaps two columns in a non-square matrix.
Test the functions in a suitably defined main program.