

Course : Programming Fundamental – ENSF 337

Lab # : Lab 7

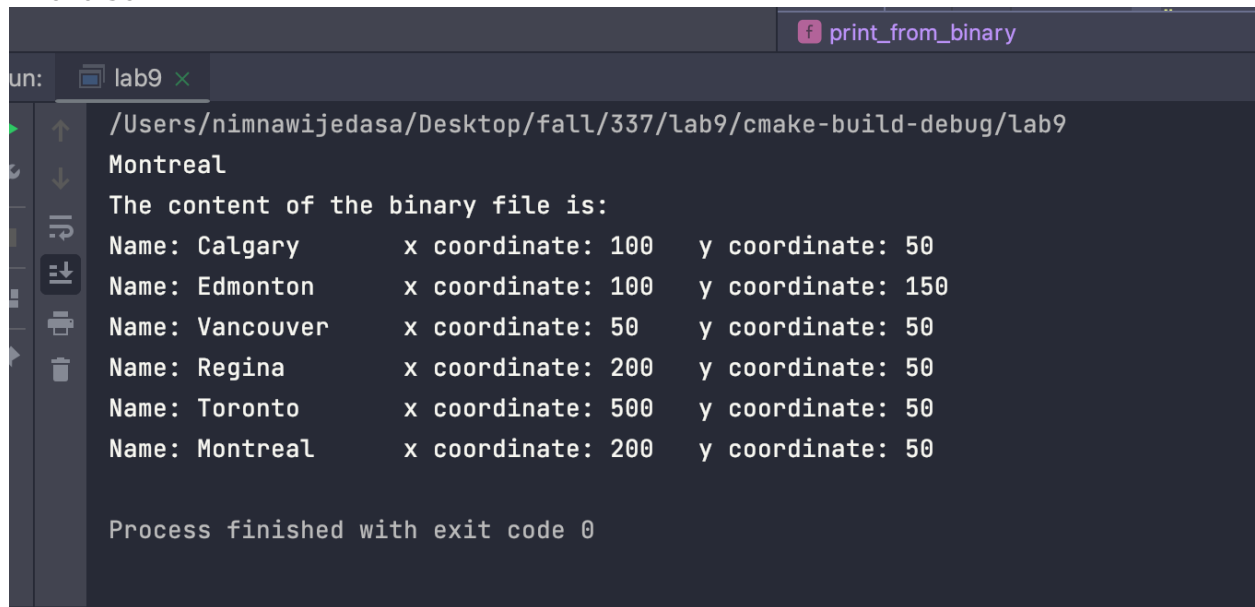
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Student Name : Nimna Wijedasa

Lab Section : B02

Date submitted : Nov 18, 2022

Exercise B



```
un: lab9 x
/Users/nimnawijedasa/Desktop/fall/337/lab9/cmake-build-debug/lab9
Montreal
The content of the binary file is:
Name: Calgary      x coordinate: 100   y coordinate: 50
Name: Edmonton     x coordinate: 100   y coordinate: 150
Name: Vancouver    x coordinate: 50    y coordinate: 50
Name: Regina       x coordinate: 200   y coordinate: 50
Name: Toronto      x coordinate: 500   y coordinate: 50
Name: Montreal     x coordinate: 200   y coordinate: 50

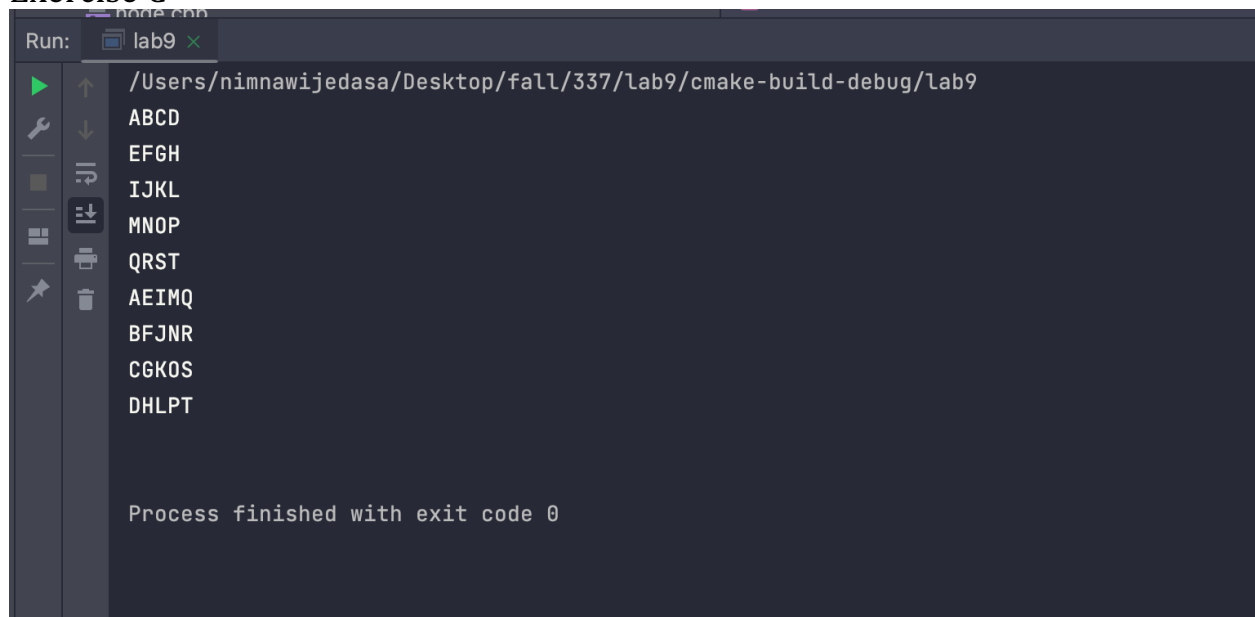
Process finished with exit code 0
```

```

64
65
66 void print_from_binary(char* filename)
67 {
68
69     ifstream city_file(filename, ios::in | ios::binary);
70     if(city_file.fail())
71     {
72         cerr<<"file failed to open";
73         exit(1);
74     }
75
76     while (true)
77     {
78         City city{};
79         city_file.read( (char *)&city, sizeof(City));
80         if( city_file.eof() ) break;
81         else if(city_file.fail())
82         {
83             cerr<<"invalid data";
84             exit(1);
85         }
86         cout<<"Name: "<< (city.name) <<"\t"<<"\t"
87             <<"x coordinate: "<<(city.x) <<"\t"
88             <<"y coordinate: "<<(city.y) <<"\t"<<endl ;
89     }
90     city_file.close();
91 }
92
93
94

```

Exercise C



```
Run: lab9 x
/Users/nimnawijedasa/Desktop/fall/337/lab9/cmake-build-debug/lab9
ABCD
EFGH
IJKL
MNOP
QRST
AEIMQ
BFJNR
CGKOS
DHLPT

Process finished with exit code 0
```

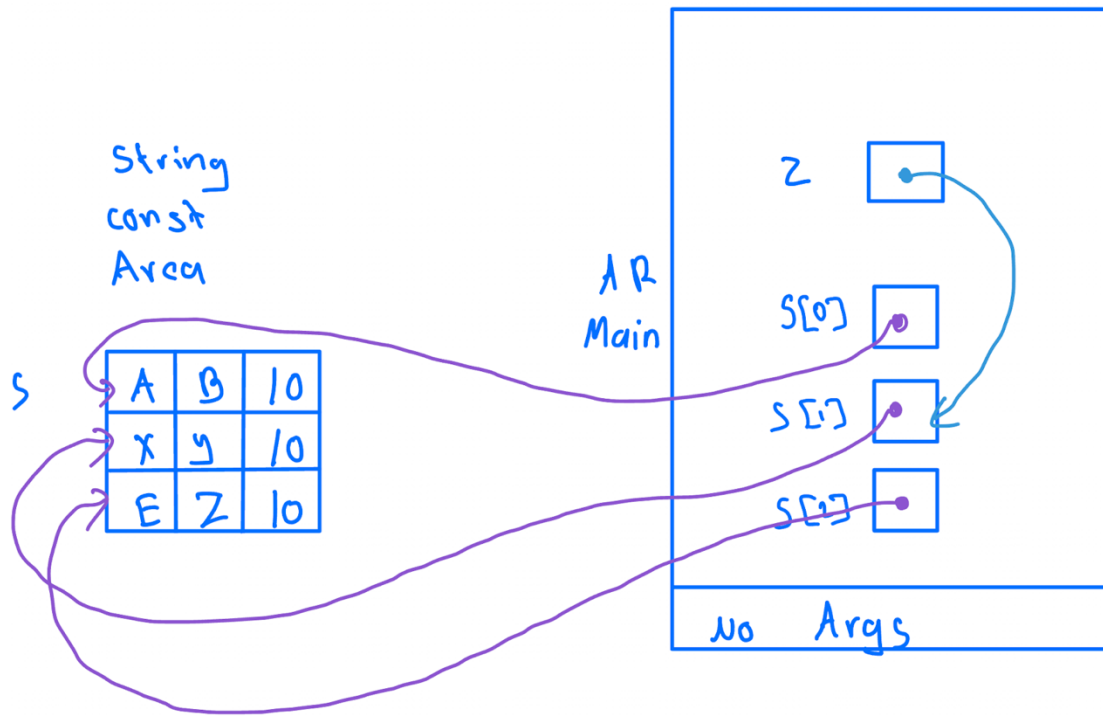
```
CMakeLists.txt x lab9ExC.cpp x
1 // ENSF 337 - Lab 9 - exercise C
2 // lab9ExC.cpp
3
4 #include<...
7 using std::cout;
8 using std::cerr;
9 using std::endl;
10 using std::vector;
11 using std::string;
12
13 typedef vector<string> String_Vector;
14
15 String_Vector transpose(const String_Vector& sv);
16 // REQUIRES:
17 //     sv.size() >= 1
18 //     All the strings in sv are the same length, and that length is >= 1.
19 // PROMISES:
20 //     Return value is the "transpose" of sv, as defined in the Exercise B
21 //     instructions.
22
23 int main() {
24
25     const int ROWS = 5;
26     const int COLS = 4;
27
28     char c = 'A';
29     String_Vector sv;
30     sv.resize(ROWS);
31
32     for(int i = 0; i < ROWS; i++)
33     {
34         for(int j = 0; j < COLS; j++) {
35             sv.at(i).push_back(c);
36             c++;
37             if(c == 'Z' + 1)
38                 c = 'a';
39             else if (c == 'z' + 1)
40                 c = 'A';
41         }
42     }
43 }
```

f main

```
CMakeLists.txt x lab9ExC.cpp x
35         c++;
36         if(c == 'Z' + 1)
37             c = 'a';
38         else if (c == 'z' + 1)
39             c = 'A';
40     }
41
42
43     for(int i = 0; i < ROWS; i++) {
44         cout<< sv.at(i);
45         cout << endl;
46     }
47
48     String_Vector vs = transpose(sv);
49     for(int i = 0; i < (int)vs.size(); i++)
50         cout << vs.at(i) << endl;
51
52     return 0;
53 }
54
55 String_Vector transpose (const String_Vector& sv)
56 {
57     int ROWS = 5;
58     int COLS = 4;
59     String_Vector trans_vec;
60     trans_vec.resize(ROWS);
61     for (int i = 0; i < sv.size(); i++)
62     {
63         for (int j = 0; j < sv[i].size(); j++)
64         {
65             trans_vec[j].push_back(sv[i][j]);
66         }
67     }
68
69     return trans_vec;
70 }
```

f transpose

Exercise D



```
Lab9_Wijedasa_BUZ.docx  Insertion_Sort
Run: lab9 x
/Users/nimnawijedasa/Desktop/fall/337/lab9/cmake-build-debug/lab9 3 4
The value of **z is: X
The value of *z is: XY
The value of **(z-1) is: A
The value of *(z-1) is: AB
The value of z[1][1] is: Z
The value of (*(z+1)+1) is: Z
Here is your array of integers before sorting:
413
282
660
171
308
537

Here is your array of ints after sorting:
171
282
308
413
537
660

Here is your array of strings before sorting:
Red
Blue
pink
apple
almond
white
nut
Law
cup

Process finished with exit code 139 (interrupted by signal 11: SIGSEGV)
```



```

79
80 void insertion_sort(int *a, int n)
81 {
82     int i;
83     int j;
84     int value_to_insert;
85
86     for (i = 1; i < n; i++) {
87         value_to_insert = a[i];
88
89         /* Shift values greater than value_to_insert. */
90         j = i;
91         while ( j > 0 && a[j - 1] > value_to_insert ) {
92             a[j] = a[j - 1];
93             j--;
94         }
95
96         a[j] = value_to_insert;
97     }
98 }
99
100 void insertion_sort(const char** str_array, int n)
101 {
102     for(int i = 0 ;i < n ;i++){
103         int j = i+1;
104         while((strcmp(str_array[i],str_array[j]) >0 ) && j > 0){
105             str_array[j] = str_array[j-1];
106             j--;
107         }
108         str_array[j] = str_array[i];
109     }
110 }

```

```
— CMakeLists.txt x lab9ExD.cpp x
41     int i;
42     int n_elements = sizeof(a) / sizeof(int);
43
44     cout << "Here is your array of integers before sorting: \n";
45     for(i = 0; i < n_elements; i++)
46     |     cout << a[i] << endl;
47     cout << endl;
48
49     insertion_sort(a, n_elements);
50
51     cout << "Here is your array of ints after sorting: \n" ;
52     for(i = 0; i < n_elements; i++)
53     |     cout << a[i] << endl;
54
55
56
57     #if 1
58     const char* strings[] = { "Red", "Blue", "pink","apple", "almond","white",
59     |                             "nut", "Law", "cup"};
60
61     n_elements = sizeof(strings) / sizeof(char*);
62
63     cout << "\nHere is your array of strings before sorting: \n";
64     for( i = 0; i < n_elements; i++)
65     |     cout << strings[i] << endl;
66     cout << endl;
67
68     insertion_sort(strings, 9);
69
70
71     cout << "Here is your array of strings after sorting: \n" ;
72     for( i = 0; i < n_elements; i++)
73     |     cout << strings[i] << endl;
74     cout << endl;
75
76     #endif
77
78     return 0;
79 }
80 void insertion_sort(int *a, int n)
81 {
82     int i;
```

```
CMakeLists.txt x lab9ExD.cpp x
1 // ...
2 using namespace std;
3
4 void insertion_sort(int *int_array, int n);
5 /* REQUIRES
6  *   n > 0.
7  *   Array elements int_array[0] ... int_array[n - 1] exist.
8  * PROMISES
9  *   Element values are rearranged in non-decreasing order.
10 */
11
12 void insertion_sort(const char** str_array, int n);
13
14 /* REQUIRES
15  *   n > 0.
16  *   Array elements str_array[0] ... str_array[n - 1] exist.
17  * PROMISES
18  *   pointers in str_array are rearranged so that strings:
19  *   str_array[0] points to a string with the smallest string (lexicographically) ,
20  *   str_array[1] points to the second smallest string, ..., str_array[n-2]
21  *   points to the second largest, and str_array[n-1] points to the largest string
22 */
23
24 int main()
25 {
26     const char* s[] = { "AB", "XY", "EZ"};
27     const char** z = s;
28     z += 1;
29
30
31     cout << "The value of **z is: " << **z << endl;
32     cout << "The value of *z is: " << *z << endl;
33     cout << "The value of **(z-1) is: " << **(z-1) << endl;
34     cout << "The value of *(z-1) is: " << *(z-1) << endl;
35     cout << "The value of z[1][1] is: " << z[1][1] << endl;
36     cout << "The value of (*(z+1)+1) is: " << (*(z+1)+1) << endl;
37
38     // point 1
39     int a[] = { 413, 282, 660, 171, 308, 537 };
40
41     int i;
42     int n_elements = sizeof(a) / sizeof(int);
43
44     insertion_sort
45 }
```

000

Here is your array of strings before sorting:

Red
Blue
pink
apple
almond
white
nut
Law
cup

Here is your array of strings after sorting:

Blue
Law
Red
almond
apple
cup
nut
pink
white

Process finished with exit code 0

Version Control ▶ Run ⚙ Debug 📦 Python Packages ☰ TODO ≡ Messages ⚠ CMake

Exercise E

```
Run: lab9 x
/Users/nimnawijedasa/Desktop/fall/337/lab9/cmake-build-debug/lab9 3 4

The values in matrix m1 are:

2.3  3.0  3.7  4.3
2.7  3.3  4.0  4.7
3.0  3.7  4.3  5.0

The values in matrix m2 are:

2.7  3.3  4.0  4.7  5.3  6.0
3.0  3.7  4.3  5.0  5.7  6.3
3.3  4.0  4.7  5.3  6.0  6.7
3.7  4.3  5.0  5.7  6.3  7.0

The new values in matrix m1 and sum of its rows and columns are

2.7  3.3  4.0  4.7  5.3  6.0 | 26.0
3.0  3.7  4.3  5.0  5.7  6.3 | 28.0
3.3  4.0  4.7  5.3  6.0  6.7 | 30.0
3.7  4.3  5.0  5.7  6.3  7.0 | 32.0
-----
12.7 15.3 18.0 20.7 23.3 26.0

The values in matrix m3 and sum of its rows and columns are:

5.0  3.3  4.0  4.7  5.3  6.0 | 28.3
3.0 15.0  4.3  5.0  5.7  6.3 | 39.3
3.3  4.0 25.0  5.3  6.0  6.7 | 50.3
3.7  4.3  5.0  5.7  6.3  7.0 | 32.0
-----
15.0 26.7 38.3 20.7 23.3 26.0
```

```
Run: lab9 x

The new values in matrix m1 and sum of its rows and columns are
2.7  3.3  4.0  4.7  5.3  6.0 | 26.0
3.0  3.7  4.3  5.0  5.7  6.3 | 28.0
3.3  4.0  4.7  5.3  6.0  6.7 | 30.0
3.7  4.3  5.0  5.7  6.3  7.0 | 32.0
-----
12.7 15.3 18.0 20.7 23.3 26.0

The values in matrix m3 and sum of its rows and columns are:
5.0  3.3  4.0  4.7  5.3  6.0 | 28.3
3.0 15.0  4.3  5.0  5.7  6.3 | 39.3
3.3  4.0 25.0  5.3  6.0  6.7 | 50.3
3.7  4.3  5.0  5.7  6.3  7.0 | 32.0
-----
15.0 26.7 38.3 20.7 23.3 26.0

The new values in matrix m2 are:
-5.0  3.3  4.0  4.7  5.3  6.0 | 18.3
3.0 -15.0  4.3  5.0  5.7  6.3 |  9.3
3.3  4.0 -25.0  5.3  6.0  6.7 |  0.3
3.7  4.3  5.0  5.7  6.3  7.0 | 32.0
-----
5.0  -3.3 -11.7 20.7 23.3 26.0

The values in matrix m3 and sum of it rows and columns are still the same:
5.0  3.3  4.0  4.7  5.3  6.0 | 28.3
3.0 15.0  4.3  5.0  5.7  6.3 | 39.3
3.3  4.0 25.0  5.3  6.0  6.7 | 50.3
3.7  4.3  5.0  5.7  6.3  7.0 | 32.0
-----
15.0 26.7 38.3 20.7 23.3 26.0

Process finished with exit code 0
```

lab9 | Debug

lab9 > matrix.cpp

Project

matrix.cpp

1 // matrix.cpp

2

3

4 #include "matrix.h"

5

6 Matrix::Matrix(int r, int c):rowsM(r), colsM(c)

7 {

8 matrixM = new double* [rowsM];

9 assert(matrixM != NULL);

10

11 for(int i=0; i < rowsM; i++){

12 matrixM[i] = new double[colsM];

13 assert(matrixM[i] != NULL);

14 }

15 sum_rowsM = new double[rowsM];

16 assert(sum_rowsM != NULL);

17

18 sum_colsM = new double[colsM];

19 assert(sum_colsM != NULL);

20 }

21

22

23 Matrix::~Matrix()

24 {

25 destroy();

26 }

27

28 Matrix::Matrix(const Matrix& source)

29 {

30 copy(source);

31 }

32

33 Matrix& Matrix::operator= (const Matrix& rhs)

34 {

35 if(&rhs != this){

36 destroy();

37 copy(rhs);

38 }

39

40 return *this;

Bookmarks

Matrix::copy

Run: lab9

lab9 | Debug

lab9 > matrix.cpp

Project

39
40 return *this;
41
42
43 double Matrix::get_sum_col(int i) const
44 {
45 assert(i >= 0 && i < colsM);
46 return sum_colsM[i];
47
48
49 double Matrix::get_sum_row(int i) const
50 {
51 assert(i >= 0 && i < rowsM);
52 return sum_rowsM[i];
53
54
55
56 void Matrix::sum_of_rows()const
57 {
58
59 // COMMENT OUT THE FOLLOWING LINE AND COMPLETE THE DEFINITION OF THIS FUNCTION
60 //cout << "\nSorry I don't know how to calculate sum of rowsM in a matrix. ";
61 for (int i = 0; i < rowsM; i++)
62 {
63 sum_rowsM[i] = 0;
64 }
65 for (int i = 0; i < rowsM; i++)
66 {
67 for (int j = 0; j < colsM; j++)
68 {
69 sum_rowsM[i] += matrixM[i][j] ;
70 }
71 }
72
73
74
75 void Matrix::sum_of_cols()const
76 {
77 // COMMENT OUT THE FOLLOWING LINE AND COMPLETE THE DEFINITION OF THIS FUNCTION
78 //cout << "\nSorry I don't know how to calculate sum of columns in a matrix. ";
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Run: lab9

Process finished with exit code 0

Version Control Run Debug Python Packages TODO Messages CMake Problems Terminal Services

The image shows a C++ IDE with a project named 'lab9'. The active file is 'matrix.cpp'. The code defines a 'Matrix' class with a 'copy' method. The 'copy' method is intended to copy the state of a 'source' matrix but contains several errors: it sets pointers to null instead of allocating new memory, it doesn't copy the 'matrixM' data, and it has a typo in a comment. The IDE interface includes a toolbar at the top, a file explorer on the left, and a run/debug console at the bottom.

```
76 {
77     // COMMENT OUT THE FOLLOWING LINE AND COMPLETE THE DEFINITION OF THIS FUNCTION
78     //cout << "\nSorry I don't know how to calculate sum of columns in a matrix. ";
79     for (int i = 0; i < colsM; i++)
80     {
81         sum_colsM[i] = 0;
82     }
83     for (int i = 0; i < rowsM; i++)
84     {
85         for (int j = 0; j < colsM; j++)
86         {
87             sum_colsM[j] += matrixM[i][j] ;
88         }
89     }
90 }
91
92 void Matrix::copy(const Matrix& source)
93 {
94     // THIS FUNCTION IS DEFECTIVE AND DOESN'T PROPERLY MAKE THE COPY OF SOURCE
95     if(source.matrixM == nullptr){
96         matrixM = nullptr;
97         sum_rowsM = nullptr;
98         sum_colsM = nullptr;
99         rowsM = 0;
100        colsM = 0;
101        return;
102    }
103
104    rowsM = source.rowsM;
105    colsM = source.colsM;
106
107    sum_rowsM = new double[rowsM];
108    assert(sum_rowsM != nullptr);
109
110    sum_colsM = new double[colsM];
111    assert(sum_colsM != nullptr);
112
113    matrixM = new double*[rowsM];
114    assert(matrixM != nullptr);
115}
```

Run: lab9 x
Process finished with exit code 0

```
lab9 | Debug
CMakeLists.txt x matrix.h x lab9ExE.cpp x matrix.cpp x
Project
106
107     sum_rowsM = new double[rowsM];
108     assert(sum_rowsM != nullptr);
109
110     sum_colsM = new double[colsM];
111     assert(sum_colsM != nullptr);
112
113     matrixM = new double*[rowsM];
114     assert(matrixM != nullptr);
115
116     for(int i = 0; i < rowsM; i++){
117         matrixM[i] = new double[colsM];
118         assert(matrixM[i] != nullptr);
119     }
120     // STUDENTS MUST COMMENT OUT THE FOLLOWING LINE AND FIX THE FUNCTION'S PROBLEM
121     //cout << "\nSorry copy function is defective. ";
122     for(int i = 0; i < rowsM; i++)
123     {
124         for(int j = 0; j < colsM; j++)
125         {
126             matrixM[i][j] = source.matrixM[i][j];
127             sum_colsM[j] = source.sum_colsM[j];
128         }
129         sum_rowsM[i] = source.sum_rowsM[i];
130     }
131 }
132
133 void Matrix::destroy()
134 {
135     // COMMENT OUT THE FOLLOWING LINE AND COMPLETE THE DEFINITION OF THIS FUNCTION
136     //cout << "\nProgram ended without destroying matrices.\n";
137     for (int i = 0; i < rowsM; i++)
138     {
139         delete[] matrixM[i];
140     }
141     delete[] matrixM;
142     delete[] sum_rowsM;
143     delete[] sum_colsM;
144
145     Matrix::copy
```

```
lab9 | Debug
lab9 matrix.cpp
CMakeLists.txt x matrix.h x lab9ExE.cpp x matrix.cpp x
Project
113 matrixM = new double*[rowsM];
114 assert(matrixM != nullptr);
115
116 for(int i=0; i < rowsM; i++){
117     matrixM[i] = new double[colsM];
118     assert(matrixM[i] != nullptr);
119 }
120 // STUDENTS MUST COMMENT OUT THE FOLLOWING LINE AND FIX THE FUNCTION'S PROBLEM
121 //cout << "\nSorry copy fucntion is defective. ";
122 for(int i=0; i < rowsM; i++)
123 {
124     for(int j =0; j < colsM; j++)
125     {
126         matrixM[i][j] = source.matrixM[i][j];
127         sum_colsM[j] = source.sum_colsM[j];
128     }
129     sum_rowsM[i] =source.sum_rowsM[i];
130 }
131 }
132
133 void Matrix::destroy()
134 {
135     // COMMENT OUT THE FOLLOWING LINE AND COMPLETE THE DEFINITION OF THIS FUNCTION
136     //cout << "\nProgram ended without destroying matrices.\n";
137     for (int i = 0; i < rowsM; i++)
138     {
139         delete[]matrixM[i];
140     }
141     delete[]matrixM;
142     delete[] sum_rowsM;
143     delete[] sum_colsM;
144 }
145
146 }
147
Bookmarks
```