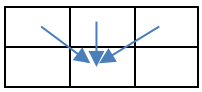
T.C.
ESKIŞEHIR OSMANGAZI UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
DEPARTMENT OF COMPUTER ENGINEERING
152111011 INTRODUCTION TO PROGRAMMING LAB
FINAL PROJECT

		Grade
TOTAL	**:**	**100 pts**

PROBLEM

In this project, a matrix of integers is given where each cell represents a weight. You are asked to write a program that finds a continuous path that combines any element of the first row with any element of the last row in the matrix. Thus, the sum of items along the way is minimized. When the matrix is drawn in the usual way, the path goes absolutely down. As shown in the table below, it's legal to switch from each cell directly to one of the three cells below it.

For example,



Take a look the following matrix;

	0	**1**	**2**	**3**	**4**
0	9	9	7	6	7
1	0	6	1	3	8
2	8	6	4	2	3
3	2	4	1	1	4
4	0	0	1	1	1

The green backcolored cells are the minimum weight path. Sum of weights on this path is 10. For this particular matrix, the function should return array [4, 3, 4, 3, 2], because the path consists of elements in locations (0, 3), (1, 2), (2, 3), (3, 2) and (4, 1).

We can approach this problem gradually. What if the matrix had only one row? In this case, the minimum weight path will be the minimum weight item from the first row. What if we added one more line? In this case, we can find the minimum path to a particular item in the second row by finding the lowest value in the first row and then moving from that item to the second row. And so the analysis continues, adding more rows to the matrix until the matrix is fully populated. The result of this process is another matrix completely filled with minimum path weights to each item.

Cell Weigths	0	1	2	3	4
0	3	6	2	7	5
1	2	1	4	3	0
2	1	2	0	6	5
3	9	4	3	9	1
4	1	0	8	5	9

Path Weigths	0	1	2	3	4
0	3	6	2	7	5
1	5	3	6	5	5
2	4	5	3	11	10
3	13	7	6	12	11
4	8	6	14	11	20

Weight calculation for index (1,1)
Min((3+1), (6+1), (2+1))
Min(4,7,3) = 3

After the path weights matrix is created, we can find the minimum value in the last row. In the example above this value is 6. it will show the weight of the winning path. Green colored cells is the shortest path.

Another Example

Cell Weigths	0	1	2	3	4
0	9	9	7	6	7
1	0	6	1	3	8
2	8	6	4	2	3
3	2	4	1	1	4
4	0	0	1	1	2

Path Weigths	0	1	2	3	4
0	9	9	7	6	7
1	9	13	7	9	14
2	17	13	11	9	12
3	15	15	10	10	13
4	15	10	11	11	12

In this example, we can look at the items directly above the winning item and see which item we can reach the winner to reach its weight. In the example above, this is another element with a 10 track weight. We keep moving the matrix up and finding the predecessors for each item until the first row is reached. At this point we will rebuild the full road.

Use only C programming language. Use maximum 10x10 matrix dimension and generate numbers between 0-9 randomly.
Some screenshots of the program output.

```
Enter number of columns: 5

  9    7    8   [3]   8
  8    6   [1]   2    3
  4    7    5   [0]   8

Sum of weights: 4
```

```
Enter number of rows (0 to exit): 5
Enter number of columns: 7

  6    4    8    9    1   [0]   3
  3    0    5    9   [3]   4    2
  3    0    8    1   [1]   3    3
  4    2    0    7   [0]   9    3
  7    5    9    9    3   [0]   3

Sum of weights: 4
```

```
Enter number of rows (0 to exit): 5
Enter number of columns: 10

  5    1    6    4    9    8   [0]   3    0    1
  8    4    7    2    8    4   [2]   5    3    7
  6    7    7    2    9    6    6   [0]   8    4
  3    2    2    6    1    9    4   [2]   6    7
  2    8    0    7    6    6    6   [1]   2    9

Sum of weights: 5
```

```
Enter number of rows (0 to exit): 10
Enter number of columns: 10

  1    8    1    7    6   [1]   2    5    8    6
  9    6    6    4    8   [2]   7    1    4    0
  1    1    9    5   [0]   7    8    6    9    7
  8    5    5    8   [1]   3    7    3    3    8
  1    8    9    3   [2]   6    4    0    5    6
  7    0    9    3    0   [0]   9    5    7    8
  2    5    6    0    7    3   [0]   8    3    4
  5    4    7    6    9    3   [1]   5    3    4
  2    8    1    2    9    8    5   [2]   7    1
  4    1    6    4    6    5   [1]   9    5    8

Sum of weights: 10
```

Attention!!
You have to do the program yourself and it will be controlled and received by instructor.
If it is understood that you did not do the program yourself, your grade will be evaluated as ZERO!!!!!

Report Contents

- Your report have to be max 10 pages with given format in next pages.

Report Topics

- What is the problem (s) that you will deal with? (Explain each problem)
- What model/method/algorithm that you will apply the problem (s).
- Detail of the algorithm flow diagram (s).
- Application: some print screen of your program (s) etc.

SHORTEST PATH PROJECT

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152111011 Introduction to Programming Lab

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CHAPTER 1

This homework.....