

Lab Exercise 03

Please write a program to implement the following tasks:

Task1: 1-D Array

Please compute the **average** (technically, the *arithmetic mean*) and **standard deviation** of a 1-D array with N elements, all of which are **double**.

The average is $avg = \sum_{i=1}^N A_i / N$. The **standard deviation**, stdDev, is the square root of the average of the squares of the differences of each A_i and the average avg ,

$$stdDev = \sqrt{\frac{\sum_{i=1}^N (A_i - avg)^2}{N}}$$

Sample output:

```
Task 1: .
The Average of this array: 17.50
The Standard Deviation of this array: 15.2115
```

Task 2 2-D Array

Given an $M \times M$ matrix A, please write a function to get the transpose matrix of matrix A.

Hint:

You may considering using 2-D array to represent matrix although 1-D array may work.

Sample output:

```
Before  transpose:
  1   2   3
  0  -1   2
  0   0   1
After transpose:
  1   0   0
  2  -1   0
  3   2   1
```

Bonus: Minesweeper (20 points)

Have you played the minesweeper game? In this task, you don't need to implement the minesweeper game. But you need to simulate it.



Please complete the following requirements:

- Randomly put 10 mines into the array of 9*9.
- Next, calculate the hint numbers.
- Last, print out the 2D array as a “9 rows x 9 columns” map with the following symbols:

Object	Symbol
Empty space	.
Mine	*
Hint numbers	1 - 8

- Output
 - The first map is the 9x9 map with 10 mines generated.
 - The second map is the 9x9 map with mines and all hint numbers calculated.

Sample output

The mine map without hints:

```
. . . . . . . . .
. . . . . . . . .
. . * . . . . . .
. * . . . . * . .
* . . . . . . . .
* * * . . . . . .
. . . . . * . . .
. . . . . . . * .
```

. * .

The mine map with hints:

.

. 1 1 1

1 2 * 1 . 1 1 1 .

2 * 2 1 . 1 * 1 .

* 4 3 2 1 1 1 1 .

* 3 * * 1 1 1 1 .

1 2 2 2 1 1 * 2 1

. 1 2 3 *

. 1 . 2

Hints:

Please use **srand()** and **rand()** to generate random numbers.

Write a program

1. Please complete the above task within the given program framework, which can be found at <http://moodle.must.edu.mo/> (see lab03.cpp).
2. Please have a careful look at the comments.

Submission method:

Submit your completed answers according to the following rules:

1. Go to: <http://moodle.must.edu.mo/>
2. Following the submission rules to submit your answer.