

## Practice Exercise #38: Minesweeper

[http://www.comp.nus.edu.sg/~cs1010/4\\_misc/practice.html](http://www.comp.nus.edu.sg/~cs1010/4_misc/practice.html)

**Reference:** Weeks 6 and 9

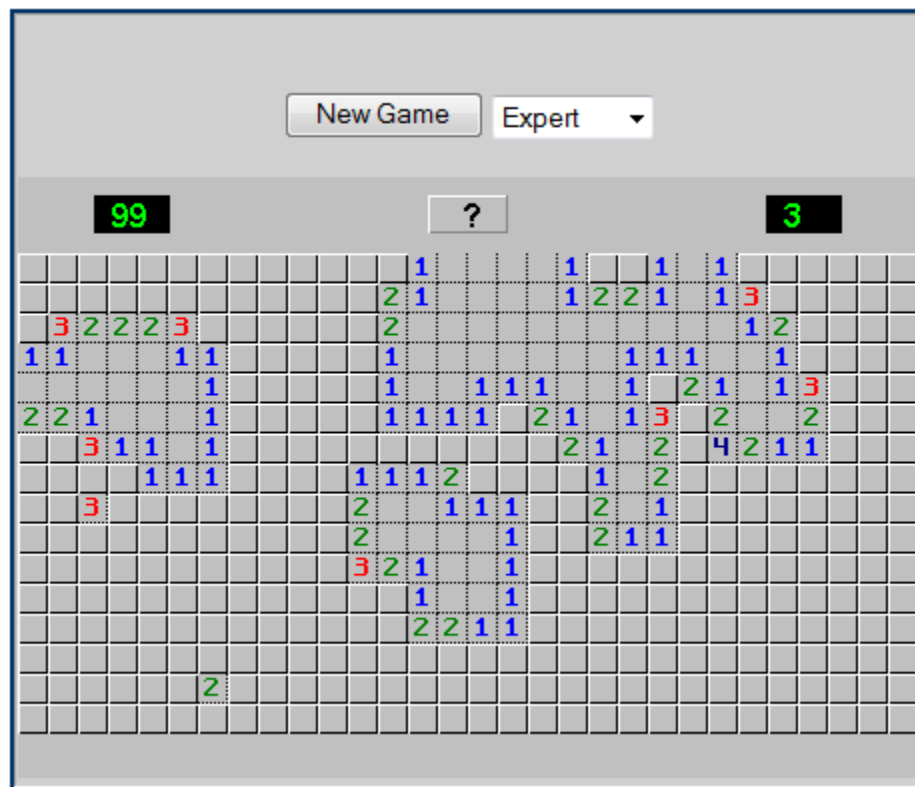
**Date of release:** 16 October 2014

**Objective:** 2D array, string

### Task statement:

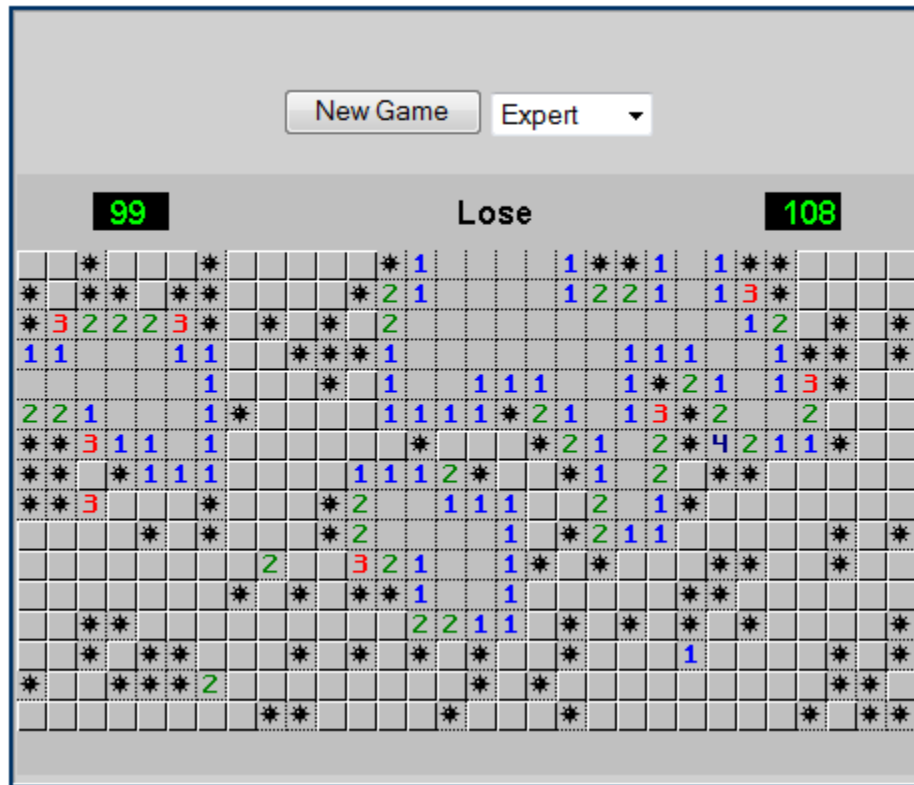
*Minesweeper* is a computer game whose objective for the player is to clear a minefield without detonating a mine. The player is presented with a grid of squares (Figure 1) under which some contain mines, and some do not.

For a square that is safe (mine-free), it contains an integer value (0 to 8) indicating the number of mines surrounding it.



**Figure 1.** A Minesweeper game in progress.

A player clicks on a square to turn it over. If it contains a mine, the game ends and all the mines revealed (Figure 2). The game also ends when the player turned over all safe squares. Usually, a square that contains 0 (no mine around it) is simply displayed as a blank square.

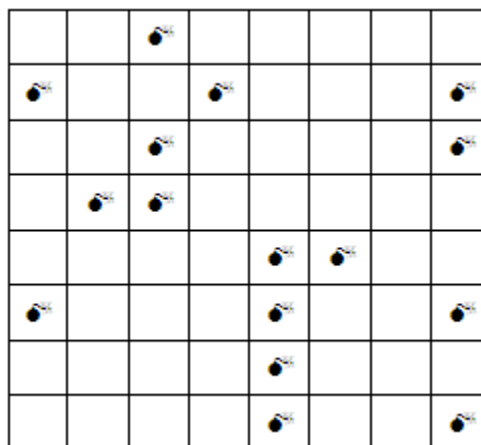


**Figure 2.** The Minesweeper game ends when player clicks on a square containing a mine.

















You may try the game on [GamesWizard.com](http://GamesWizard.com) and many other websites on the Internet.

For this exercise, you are only required to prepare the grid before the start of the game. Given the positions of all the mines in the grid, you are to fill in the numbers 0 to 9 in each of the safe squares.

For example, Figure 3 shows the positions of the mines in a minefield. You are to compute the values of the safe squares, as shown in Figure 4.



**Figure 3.** Positions of mines.

1	2		2	1	0	1	1
	3	3		1	0	2	
2	4		3	1	0	2	
1			3	2	2	2	1
2	3	2	3			2	1
	1	0	3		4	2	
1	1	0	3		3	2	2
0	0	0	2		2	1	

**Figure 4.** Values in safe squares.

Write a program **minesweeper.c** to read in a minefield containing the mines, and compute the values of the safe squares in a numeric 2-dimensional array.

There are 3 game levels, with each having the following grid dimension:

- Level 1:  $8 \times 8$  grid
- Level 2:  $12 \times 16$  grid
- Level 3:  $16 \times 30$  grid

Your program is to read the game level, and then the grid containing characters comprising either – (mine-free) or \* (a mine). Your program then outputs a 2-dimensional integer array showing the number of mines surrounding each square. If the square in the grid contains a mine, then its corresponding value in the integer array is 9.

**Sample run #1** (The input is shown in blue, output in magenta):

```

1
--*-----
*--*---*
--*-----
-**------
-----**--
*--*---*
-----*---
-----*---*

1 2 9 2 1 0 1 1
9 3 3 9 1 0 2 9
2 4 9 3 1 0 2 9
1 9 9 3 2 2 2 1
2 3 2 3 9 9 2 1
9 1 0 3 9 4 2 9
1 1 0 3 9 3 2 2
0 0 0 2 9 2 1 9

```

**Sample run #2** (The input is shown in blue, output in magenta):

2

```
--*-----*--*-----*
--*-----*--**-----
-----**--*-----*--*
-----*-----*--*
**-----*-----***--
*-----*-----*-----
*--**-----**
--*--*--*-----**
-----***-----
---*--*-----***--
*-----*-----*
---*-----*-----*
```

```
0 2 9 2 0 0 1 2 9 3 3 9 1 0 1 9
0 2 9 3 2 2 2 9 4 9 9 3 2 1 2 2
0 1 1 3 9 9 2 2 9 3 2 3 9 2 2 9
2 2 1 2 9 3 2 2 2 1 1 4 9 4 3 9
9 9 1 1 2 2 2 9 1 1 2 9 9 9 3 2
9 4 2 2 3 9 2 1 1 1 9 3 3 4 9 3
9 3 2 9 9 3 3 1 1 1 1 1 0 3 9 9
1 2 9 3 3 9 4 9 3 1 0 0 0 2 9 9
0 1 2 2 3 3 9 9 9 1 1 2 3 3 3 2
1 1 1 9 3 9 3 3 2 1 1 9 9 9 2 1
9 1 2 3 9 2 1 0 1 1 2 2 3 2 3 9
1 1 1 9 2 1 0 0 1 9 1 0 0 0 2 9
```