4.   Minesweeper is a type of single-player puzzle game in which the player continuously selects a cell in a square grid. Each cell contains either a bomb or a value showing the number of bombs in the neighbouring cell. (Neighbouring cells are those adjacent horizontally, vertically or diagonally.)

If the player selects a cell that is a bomb, it 'explodes' and he loses the game. The number of cells the player has selected without exploding a bomb will be the player's score.

You are required to write a program code to generate a minesweeper grid, randomly position the bombs and populate all the other cells with the values indicating the number of bombs in the neighbouring cells. Without revealing the minesweeper grid to the player, the program should prompt the player to select the cells one by one. His score will be the number of cells opened before hitting a bomb.

```
X  2  1  1
1  3  X  2
0  2  X  3
0  1  2  X
```

Task 4.1:

Write a program code to generate and display an empty square grid of size n, ie n rows by n columns. The minesweeper grid for $n = 5$ is as shown below:

```
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0
```

Your code should use a suitable data structure and fixed loop(s) to display the grid.

Evidence 4.1:

Your program code and screenshot of an empty grid of size 5.   [3]

Task 4.2:

Write a program code to randomly place a bomb, represented by "X", within the grid. Populate all the neighbouring cells by increasing their values to 1 to indicate the presence of this one bomb in the neighbourhood.

Evidence 4.2:

Your program code and two different screenshots of the grid ($n=5$).   [5]

Task 4.3:

Modify the code written in Task 4.2 to randomly place two bombs within the grid. Populate all the neighbouring cells with the correct values to indicate the presence of the bombs in the neighbourhood.

Evidence 4.3:

Your program code and the screenshot of the grid ($n=5$) with 2 bombs.   [4]

Task 4.4:

Modify the code written in Task 4.3 to generate k numbers of bombs within a grid of size n and correctly display all the values in the neighbouring cells surrounding the bombs.

Evidence 4.4:

Your program code and the screenshots of the minesweeper grids for the following levels of difficulty.

- Beginner (grid size $n=5$; no. of bombs $k=3$)
- Intermediate (grid size $n=6$; no. of bombs $k=8$)
- Expert (grid size $n=8$; no. of bombs $k=20$)   [8]

Task 4.5:

Write a program code to play the minesweeper game. Your code will:

- prompt the player to select the level of difficulty
- generate the Minesweeper grid
- display a "blank" grid with '–' for each of the cell
- prompt the player to input the coordinates of a cell he wishes to open
    - If the opened cell is a bomb ("X"), declare "Game Over!", show the grid and display the player's score.
    - If the opened cell is not a bomb, show the updated grid with the opened cell, increase the player's score by 1 and continue with the game.
- declare "You have Won!" when the player has opened all the possible cells and display the player's score.

[Sample screenshot of a typical game]:

```
Enter your cell you want to open :        Enter your cell you want to open :
X (1 to 5) : 2                            X (1 to 5) : 2
Y (1 to 5) : 3                            Y (1 to 5) : 4

- - - - -                                 X 1 1 1 1

- - 1 - -                                 1 1 1 X 1

0 - - - -                                 0 0 1 1 1

- - 1 - -                                 0 1 1 1 0

- - - - -                                 0 1 X 1 0

Your score is :  3                        Game Over! You've hit the bomb at : (2,4).
                                          Your score is :  3
                                          Do you want to try again?
```

Evidence 4.5:

Your program code and a screenshot of a game.   [10]