Assignment # 3

Class and (Composition) Arrays of Objects

Submission Dead Line: Wednesday 26/5/2021

- PROVIDE PROPER INDENTATION AND COMMENTS WITH YOUR CODE
- YOU MUST DEALLOCATE ALL MEMORY PROPERLY, YOUR CODE SHOULD NOT HAVE ANY **MEMORY LEAKS** OR **DANGLING POINTERS**.
- NO ASSIGNMENT WILL BE ACCEPTED VIA EMAIL.

Question 1: TicTacToe

Write a program that allows two players to play the tic-tac-toe game. You will make a generic game for **N x N** board, where **N** will be taken as input from user and **N** can be any positive integer equal to or greater than three (N >= 3). So, make your logic generic.

You will implement a **class ticTacToe** for the game, which will contain a pointer and the size variable N as private data members. The pointer will be used for allocation and processing of dynamic array of the game board. If needed, you can include additional member variables, such as for tracking movement of players.

You have to include following member functions in class:

1. Default Constructor will create a basic **3 x 3** board.
2. Parametrize Constructor will create a board **N x N** of any size N.
3. Copy Constructor.
4. Destructor for proper deallocation.
5. Printing the current board **using stream output operator function**.
6. Getting a move. It's up to you. You can also ask row and column number from user or single cell number. Game board should update at every move.
7. Checking if a move is valid or not.
8. Determining the winner after each move.
9. Save and Load Game (Filing) by using **file stream operator functions**:
   User can save the game and exit at any time. Therefore, you have to save the state of game in a file **BasicGame.txt.** Your menu should display proper options to the players at start of game (load previously saved game or start new one) and should act accordingly.
10. Add additional operations as needed.

Playing on a 3x3 Board

- Players alternate placing Xs and Os on the board until either (a) one player has three in a row, horizontally, vertically or diagonally; or (b) all nine squares are filled.
- If a player is able to draw three Xs or three Os horizontally, vertically or diagonally; that player wins.
- If all nine squares are filled and neither player has three in a row, the game is a draw.

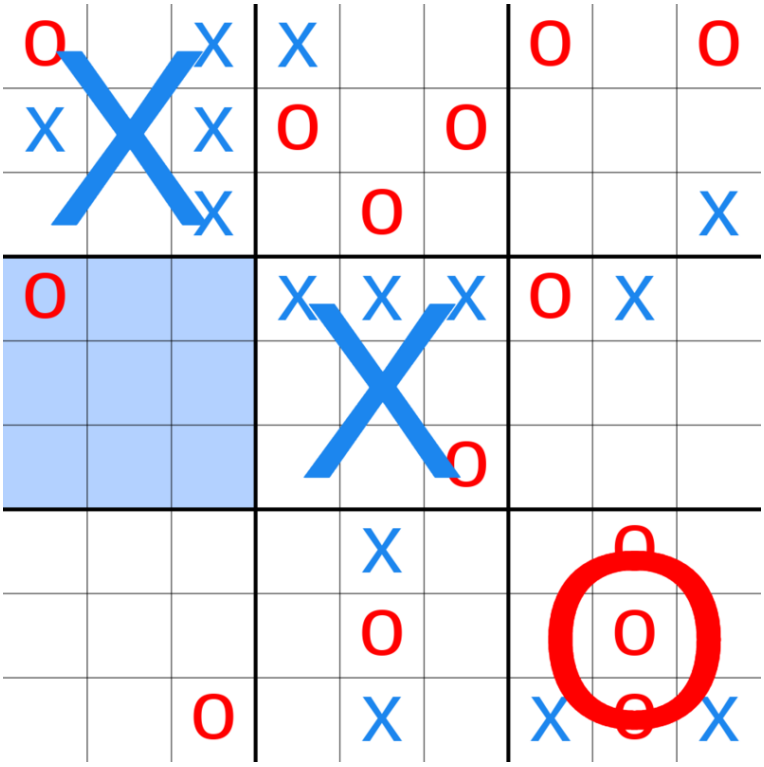
Playing on a 4x4 Board

- Players alternate placing Xs and Os on the board until either (a) one player has four in a row, horizontally, vertically or diagonally; or (b) all 16 squares are filled.
- If a player is able to draw four Xs or four Os horizontally, vertically or diagonally; that player wins.
- If all 16 squares are filled and neither player has four in a row, the game is a draw.

Question 2: Ultimate TicTacToe

Write a class **ultimate tic-tac-toe** that allows two players to play the **ultimate tic-tac-toe game**. You need to check the following links for complete understanding of game and its rules.

1. https://mathwithbaddrawings.com/2013/06/16/ultimate-tic-tac-toe/
2. https://en.wikipedia.org/wiki/Ultimate_tic-tac-toe



You will use an array of objects of **class ticTacToe** as data member for this game.
Some of the operations for the **ultimate tic-tac-toe** are listed below:

1. Constructor.
2. Copy Constructor.
3. Destructor for proper deallocation.
4. Printing the 9 boards **using stream output operator function**.
5. Getting a move, decision taken by considering last move of opponent.
6. Checking if a move is valid or not,
7. Determining the winner in small and large board after each move.
8. Save and Load Game (Filing) by **using file stream operator functions**:
   User can save the game and exit at any time. Therefore, you have to save the state of game in a file **UltimateGame.txt**. Your menu should display proper options to the players at start of game (load previously saved game or start new one) and should act accordingly.
9. Add additional operations if needed.

HAPPY PROGRAMMING