STRUCTURES

1. Game State – the **game state** refers to the current state of the game, containing the following:
   1. The name of the player
   2. The current board state
   3. The total number of errors made
      1. Errors include: uses of the ‘undo’ action, inputting an illegal move
2. Board State – the **board state** refers to the current board, containing the following:
   1. The 9x9 Sudoku board
   2. The number of moves made
   3. A list of all moves made, including errors
3. Move – a **move** refers to the action of placing a number down on the board, and must contain the following:
   1. The row location of the number
   2. The column location of the number
   3. The number placed

DISPLAYS

1. Main Screen – the main screen should contain the following options:
   1. Load Board from Input
   2. Load Board from File
   3. Play Loaded Sudoku Board
2. Game Screen – the game screen should always display the following:
   1. Details
      1. Board
      2. Last Move Made
      3. Number of Errors Made
   2. Actions
      1. Place Move
      2. Undo Last Move
      3. Save Board
      4. Reset

FEATURES

1. Load Board from Input
   1. The game must create an empty game state and ask the player to input the player name and initial board state according to the format found in **<format\_input>**.
   2. The number of errors, moves made, and completion rate must be initialized to 0.
   3. The list of last moves made should be initialized as an empty list.
2. Load Board from File
   1. The game must ask the player to input a player name. Player names may have a maximum of 32 characters and may only contain alphanumeric characters and underscores.
   2. The game must read a file named **<playername>.txt** containing a formatted game state following the format found in **<format\_save>**, and that must be saved into memory.
3. Save Board to File
   1. The game must save the current sudoku game to a text file named **<playername>.txt**, following the format found in **<format\_save>**.
4. Play Loaded Sudoku Board
   1. If there is no currently loaded sudoku board, this option should be invalid.
   2. The game must correctly display the sudoku board and show a menu with the following possible actions:
      1. Place move – Places a new move and updates the last moves made, if an illegal move is made, the input is ignored, an error message is displayed, and the player is asked for another action.
      2. Undo last move – Undoes the last move made. If no moves have been made so far, the input is ignored, an error message is displayed, and the player is asked for another action.
      3. Save Board – The game must save the current sudoku game to a text file named **<playername>.txt**, following the format found in **<format\_save>**.
      4. Reset (Undo all moves)
   3. If the sudoku board has no more empty spaces, the game should congratulate the player and display the end game state and wait for the user to press any key. Once the user presses any key, the game should return to the main screen.

The formatting for certain player inputs/files are given below:

For loading from input **<format\_input>** :

<playername>

123456789

456xxx123

789xxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

**Format notes:**

The first line of input should contain a string containing the player name, with a maximum of 32 characters. This line is followed with 9 lines containing 9 characters each, containing the initial board state of the sudoku game. Each line may only contain a number, or an ‘x’, which denotes an empty space.

For saving/loading from files **<format\_save>** :

Player Name: <playername>

Board State:

123456789

456xxx123

789xxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

xxxxxxxxx

Moves:

5

0 0 1

0 0 2

undo

1 0 2

2 1 6

**Format notes:**

The first line of the file should contain the text “Player Name: ”, followed by the inputted player name, followed by a blank line. The third line of the file should contain the text “Board State: “, followed by 9 lines of 9 characters each, and then by a blank line, denoting the current board state. The 13th line of the file should contain the text “Moves: “, followed by a line (14th) containing an integer *k* denoting the number of moves made so far. The next *k* lines should contain either a line of three integers each, following the format <row> <col > <number>, or a line with only the word ‘undo’. This should be followed by the end of the file.

If any input misformatting is encountered at any point through reading the files through a **load** action, or if the given sudoku board is not a legal configuration of sudoku, the load should fail and the player should be asked to load another file.