# **TIC TAC TOE PROGRAM REQUIREMENTS**

## **Primary actors:**

* Human
* Computer

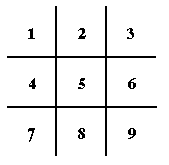
## **Preconditions:**

* One has PC with Windows OS

## **Basic flow of events:**

1. User starts the program and choses whether to play alone vs computer or versus another player
2. Options are available from command line with pressing 1 (human vs computer) or 2 (human vs human)

**Option [1] (human vs. computer):**

1. The program allows the human player to select its move via the console. Tiles are chosen based on given numbers:  
   
2. The program places the selected mark in the board and displays the board after doing so (refresh after every action)
3. The computer uses „random“ algorithm to select and place its mark
4. The human player must pick a mark (X or O) to be used by the computer when prompted. The human player must then use the other mark.
5. The program should ask human to choose the mark first

**Option [2] (human vs. human):**

1. The program allows both human players to alternately select their moves via the console
2. Human player 1 should pick its mark (X or O) first. The other mark goes to human player 2
3. Human player 1 always start firsts.

**General gameplay:**

1. Game must finish with win of a player or computer or eventually draw. Opposite player / computer will loose if player (1|2) wins.
2. After each game program will display statistics of recently played games (current session)
3. User will be asked if he wants to play again.

## **Alternative flows:**

1a. Option to let computer play with computer will be added later ☺

2a. Option 3 = exit and close program

3a. Numbers of tiles are displayed only at start of the game.  
3a1. Numbers are displayed every move (taken tiles are marked with Xs or Os)

4a. If the tile is already taken, program will display a message and ask user to chose again.

5a. AI will be implemented as random algorithm chechking whether pool is taken or not and placing a mark on random basis

7a. Implementation of „randomize“ your choice (Xs or Os will be randomized beetwen 2 players)?

9a. Implementation of „randomize“ your choice (Xs or Os will be randomized beetwen 2 players)?

13a. Computer will never want to play again

## Possible AI moves to implement:

*Consider a board with the nine positions numbered as follows:*

*1 2 3*

*4 5 6*

*7 8 9*

*When X plays 1 as their opening move, then O should take 5. Then X takes 9 (in this situation, O should not take 3 or 7, O should take 2, 4, 6 or 8):*

*X1 → O5 → X9 → O2 → X8 → O7 → X3 → O6 → X4, this game will be a draw.*

*or 6 (in this situation, O should not take 4 or 7, O should take 2, 3, 8 or 9. In fact, taking 9 is the best move, since a non-perfect player X may take 4, then O can take 7 to win).*

*X1 → O5 → X6 → O2 → X8, then O should not take 3, or X can take 7 to win, and O should not take 4, or X can take 9 to win, O should take 7 or 9.*

*X1 → O5 → X6 → O2 → X8 → O7 → X3 → O9 → X4, this game will be a draw.*

*X1 → O5 → X6 → O2 → X8 → O9 → X4 (7) → O7 (4) → X3, this game will be a draw.*

*X1 → O5 → X6 → O3 → X7 → O4 → X8 (9) → O9 (8) → X2, this game will be a draw.*

*X1 → O5 → X6 → O8 → X2 → O3 → X7 → O4 → X9, this game will be a draw.*

*X1 → O5 → X6 → O9, then X should not take 4, or O can take 7 to win, X should take 2, 3, 7 or 8.*

*X1 → O5 → X6 → O9 → X2 → O3 → X7 → O4 → X8, this game will be a draw.*

*X1 → O5 → X6 → O9 → X3 → O2 → X8 → O4 (7) → X7 (4), this game will be a draw.*

*X1 → O5 → X6 → O9 → X7 → O4 → X2 (3) → O3 (2) → X8, this game will be a draw*

*X1 → O5 → X6 → O9 → X8 → O2 (3, 4, 7) → X4/7 (4/7, 2/3, 2/3) → O7/4 (7/4, 3/2, 3/2) → X3 (2, 7, 4), this game will be a draw.*

*In both of these situations (X takes 9 or 6 as second move), X has a 1/3 property to win.*

*If X is not a perfect player, X may take 2 or 3 as second move. Then this game will be a draw, X cannot win.*

*X1 → O5 → X2 → O3 → X7 → O4 → X6 → O8 (9) → X9 (8), this game will be a draw.*

*X1 → O5 → X3 → O2 → X8 → O4 (6) → X6 (4) → O9 (7) → X7 (9), this game will be a draw.*

*If X plays 1 opening move, and O is not a perfect player, the following may happen:*

*Although O takes the only good position (5) as first move, but O takes a bad position as second move:*

*X1 → O5 → X9 → O3 → X7, then X can take 4 or 8 to win.*

*X1 → O5 → X6 → O4 → X3, then X can take 2 or 9 to win.*

*X1 → O5 → X6 → O7 → X3, then X can take 2 or 9 to win.*

*Although O takes good positions as the first two moves, but O takes a bad position as third move:*

*X1 → O5 → X6 → O2 → X8 → O3 → X7, then X can take 4 or 9 to win.*

*X1 → O5 → X6 → O2 → X8 → O4 → X9, then X can take 3 or 7 to win.*

*O takes a bad position as first move (except of 5, all other positions are bad):*

*X1 → O3 → X7 → O4 → X9, then X can take 5 or 8 to win.*

*X1 → O9 → X3 → O2 → X7, then X can take 4 or 5 to win.*

*X1 → O2 → X5 → O9 → X7, then X can take 3 or 4 to win.*

*X1 → O6 → X5 → O9 → X3, then X can take 2 or 7 to win.*