

Build a CLI application which opens a session allowing users to play 2 player Tic-tac-toe games.

Requirements :

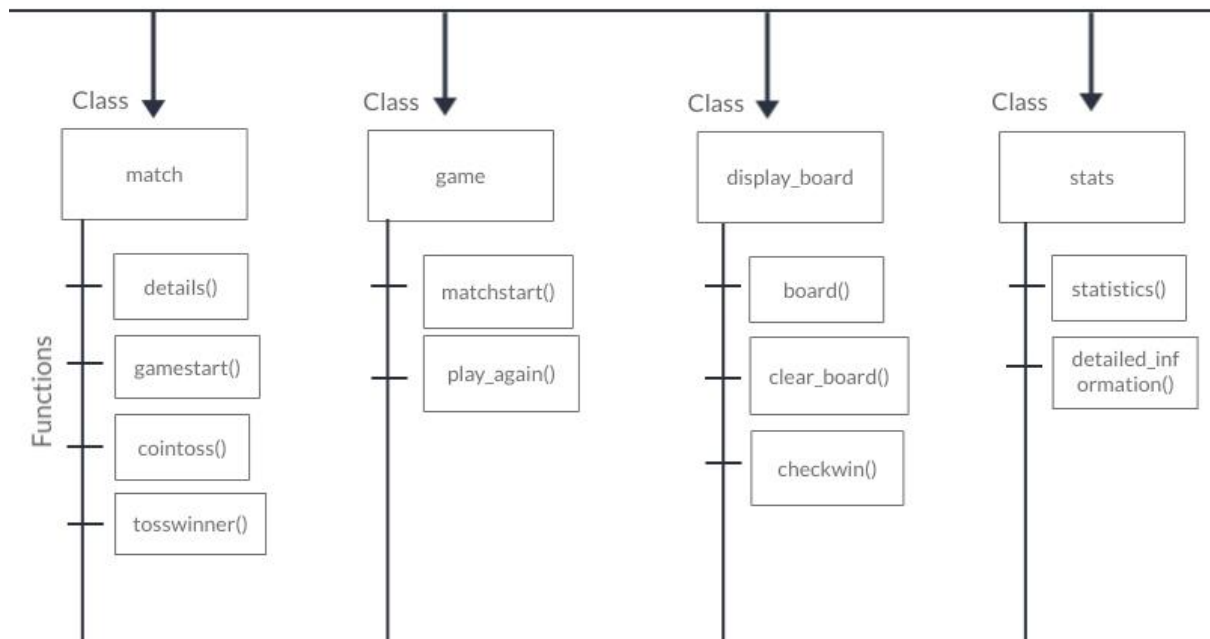
The application should (all inputs from command line).

- Ask for the user names at the start of session
- Toss coin to assign who takes the first turn.
- Ask user choice for each turn and print the game state after the turn.
- Once the game ends, should ask the users if they wish to play again.
- At the end of session, print the statistics of the games played with details like
 - Winner, total games, games won by each, total time of all games
 - Ask for detailed way which should print a table showing who won each game along with the game state when it ended and time for each table.

Make use of classes to separate out responsibility

FLOWCHART SHOWING ALL CLASSES AND THEIR FUNCTIONS

Tic-Tac-Toe



Brief description of each function

Class match -

- 1.)details() - to scan user names and welcome them in to session.
- 2.)gamestart()- to start the toss.
- 3.)cointoss()-to toss the coin and generate random Head or Tail.
- 4.)tosswinner()-declare the toss result and tells who will take the first turn.

Class game-

- 1.)matchstart()- to play the game and calculate time for each match and store it in vector pair for detailed information.
- 2.)play_again()-to display choices to play again , show stats or exit after one match is over.

Class display_board-

- 1.)board()-to display the tic-tac-toe board.
- 2.)clear_board()-to clear the board after one match is over.
- 3.)checkwin()-to check who won the game.

Class stats-

- 1.)statistics()-to show the stats after the game is over.
- 2.)detailed_information()-to display the detailed information like winner of each match , time taken in each match and the total time taken.

PROGRAM CODE IN CPP

```
#include<bits/stdc++.h>
using namespace std;
```

```
//class to scan user names , enter choices and toss a coin.
```

```
class match{
    private:
        string player1,player2,winner_name;
        int winner;
    public:
        void details();
        void gamestart();
        int coinToss();
        void tosswinner();
    friend class game;
    friend class stats;
};
match m1;
```

```
//class to start the match , and asks for choice to play again or show the stats.
```

```
class game{
    private:
        int
        player1_wins=0,player2_wins=0,game_draw=0,player,i,choice;
    public:
        void matchstart();
        void play_again();
    friend class match;
    friend class stats;
    friend class display_board;
};
```

```
game g1;
```

//class to display the board , check for the winner and clear it once the match is over.

```
class display_board{  
    private:  
        char square[10] = {'o','1','2','3','4','5','6','7','8','9'};  
        vector<vector<char>> game_state;  
    public:  
        void board();  
        void clear_board();  
        int checkwin();  
friend class game;  
friend class stats;  
};  
display_board b1;
```

//class to show the statistics and print the detailed information.

```
class stats{  
    private:  
        vector<pair<string,double>> match_time;  
    public:  
        void statistics();  
        void detailed_information();  
friend class display_board;  
friend class game;  
};  
stats s1;
```

//function to scan the name of users.

```

void match::details(){
    cout<<"-----WELCOME TO
TIC-TAC-TOE WORLD!-----"<<endl<<endl;
    cout<<"Enter the name of player 1 : ";
    cin>>player1;
    cout<<"Enter the name of player 2: ";
    cin>>player2;
    cout<<endl;
    cout<<"WELCOME "<<player1<<" &
"<<player2<<"!"<<endl;
    gamestart();
}

```

//function to start the toss.

```

void match::gamestart(){
    cout<<endl<<"Let's have a toss on who will run
first!"<<endl;
    string toss;
    cout<<"Type 'TOSS' to get started : ";
    cin>>toss;
    if(toss=="TOSS"){
        tosswinner();
    }
    else{
        cout<<"Invalid Choice!"<<endl;
    }
}

```

```

int match::coinToss() {
    int randomNumber;
    randomNumber = 1 + rand() % 2;
    return randomNumber;
}

```

```
}
```

//function to cointoss and declaring the winner of toss.

```
void match::tosswinner(){
    cout<<"Enter your choice , " << player1 <<" (HEAD OR
TAIL) : ";
    string choice1,choice2;
    cin>>choice1;
    if(choice1=="HEAD") choice2=="TAIL";
    else choice2=="HEAD";
    string coin;
    cout<<endl<<"Tossing the coin ! "<<endl;
    int number = coinToss();
    if(number%2==0) coin="HEAD";
    else coin="TAIL";
    cout<<"And the coin results in "<<coin<<" !"<<endl;
    if(coin==choice1){
        winner=1;
        winner_name=player1;
    }
    else {
        winner=2;
        winner_name=player2;
    }
    cout<<endl<<"The winner is "<<winner_name<<" and will
go first . "<<endl;
    cout<<"Let's start the game ! "<<endl;
    string start;
    cout<<"Type 'START' to load the TIC-TAC-TOE board : ";
    cin>>start;
    if(start=="START"){
        g1.matchstart();
    }
}
```

```

    }
    else cout<<"Invalid Choice!";
}

```

//function to display the tic-tac-toe board.

```

void display_board::board(){
    cout << "   |   |   " << endl;
    cout << " " << square[1] << " | " << square[2] << " | " <<
square[3] << endl;

    cout << " _ _ _ | _ _ _ | _ _ _ " << endl;
    cout << "   |   |   " << endl;

    cout << " " << square[4] << " | " << square[5] << " | " <<
square[6] << endl;

    cout << " _ _ _ | _ _ _ | _ _ _ " << endl;
    cout << "   |   |   " << endl;

    cout << " " << square[7] << " | " << square[8] << " | " <<
square[9] << endl;

    cout << "   |   |   " << endl << endl;
}

```

//function to clear the board after one match is over.

```

void display_board::clear_board(){
    square[1]='1';
    square[2]='2';
    square[3]='3';
    square[4]='4';
}

```



```
    square[5]='5';  
    square[6]='6';  
    square[7]='7';  
    square[8]='8';  
    square[9]='9';  
    g1.matchstart();  
}
```

//function to check for the winner.

```
int display_board::checkwin()  
{  
    if (square[1] == square[2] && square[2] == square[3])  
  
        return 1;  
    else if (square[4] == square[5] && square[5] == square[6])  
  
        return 1;  
    else if (square[7] == square[8] && square[8] == square[9])  
  
        return 1;  
    else if (square[1] == square[4] && square[4] == square[7])  
  
        return 1;  
    else if (square[2] == square[5] && square[5] == square[8])  
  
        return 1;  
    else if (square[3] == square[6] && square[6] == square[9])  
  
        return 1;  
    else if (square[1] == square[5] && square[5] == square[9])  
  
        return 1;  
}
```

```

else if (square[3] == square[5] && square[5] == square[7])

    return 1;
else if (square[1] != '1' && square[2] != '2' && square[3] != '3'
        && square[4] != '4' && square[5] != '5' &&
square[6] != '6'
        && square[7] != '7' && square[8] != '8' && square[9]
!= '9')
    return 0;
else
    return -1;
}

```

*//function to play the game and calculate time for each match
and store it in vector pair for detailed stats.*

```

void game::matchstart(){
    string curr_player,curr_winner;
    g1.player=m1.winner;
    char mark;
    time_t start,end;
    time(&start);
    do
    {
        cout<<"Here is your board!"<<endl;
        b1.board();
        g1.player=(g1.player%2)?1:2;
        if(g1.player==1){
            curr_player=m1.player1;
        }
        else {
            curr_player=m1.player2;
        }
    }
}

```

```
cout << "Player " << curr_player << ", enter a number:
";
cin >> choice;
mark=(g1.player == 1) ? 'X' : 'O';
if (choice == 1 && b1.square[1] == '1')
    b1.square[1] = mark;
else if (choice == 2 && b1.square[2] == '2')

    b1.square[2] = mark;
else if (choice == 3 && b1.square[3] == '3')

    b1.square[3] = mark;
else if (choice == 4 && b1.square[4] == '4')

    b1.square[4] = mark;
else if (choice == 5 && b1.square[5] == '5')

    b1.square[5] = mark;
else if (choice == 6 && b1.square[6] == '6')

    b1.square[6] = mark;
else if (choice == 7 && b1.square[7] == '7')

    b1.square[7] = mark;
else if (choice == 8 && b1.square[8] == '8')

    b1.square[8] = mark;
else if (choice == 9 && b1.square[9] == '9')

    b1.square[9] = mark;
else
{
    cout<<"Invalid move ";
```

```
        player--;  
        cin.ignore();  
        cin.get();  
    }  
    i=b1.checkwin();  
    player++;  
}while(i!=-1);  
b1.board();  
curr_winner=curr_player;
```

```
if(i==1){  
    cout<<"==>\aPlayer "<<curr_winner<<" wins!"<<endl;  
    if(curr_winner==m1.player1){  
        player1_wins++;  
    }  
    else if(curr_winner==m1.player2){  
        player2_wins++;  
    }  
}
```

```
else{  
    cout<<"==>\aGame draw"<<endl;  
    game_draw++;  
    curr_winner="DRAW";  
}
```

```
time(&end);
```

```
b1.game_state.push_back(vector<char>(b1.square,b1.square+  
sizeof(b1.square)/sizeof(b1.square[0])));  
double curr_time=double(end-start);
```

```

        cout<<"Time taken for this match is "<<curr_time<<"
seconds "<<endl;
        s1.match_time.push_back({curr_winner,curr_time});
        play_again();
    }

```

//function to display choices after one match is over.

```

void game::play_again(){
    cout<<endl<<"Press 1 , if you want to play again.
"<<endl<<"Press 2 , for game statistics. "<<endl<<"Press 3
, for exit. "<<endl;
    cout<<endl<<"Enter your choice : ";
    int choice;
    cin>>choice;
    switch(choice){
        case 1: b1.clear_board();
        case 2: s1.statistics();
        case 3: exit(0);
        default: cout<<"Invalid Choice!"<<endl;
    }
}

```

//function to show the stats after the game is over.

```

void stats::statistics(){
    cout<<endl<<"Game Statistics:"<<endl;
    cout<<endl<<"The total number of matches is
"<<g1.player1_wins+g1.player2_wins+g1.game_draw<<endl;
    cout<<"The match won by "<<m1.player1<<" is
"<<g1.player1_wins<<"."<<endl;
}

```

```

        cout<<"The match won by "<<m1.player2<<" is
"<<g1.player2_wins<<"."<<endl;
        cout<<"The match draw"<<" is
"<<g1.game_draw<<"."<<endl;
        cout<<endl<<"Press 1 for detailed information , 2 for
exit : ";
        int ch; cin>>ch;
        switch(ch){
            case 1: detailed_information();
            case 2: exit(0);
            default: cout<<"Invalid Choice!"<<endl;
        }
    }
}

```

//function to display the detailed information after the matches are over.

```

void stats::detailed_information(){
    cout<<endl<<"Detailed Information:"<<endl;
    int count=1;
    double total_time=0;
    cout<<endl;

    cout<<"-----
-----"<<endl;
    int m=b1.game_state.size();
    int n=b1.game_state[0].size();
    for(auto h: match_time){
        int i=0,p=0;
        for(int j=0;j<n;j++){
            b1.square[p++]=b1.game_state[i][j];
        }
    }
}

```

```

        cout << setw(5) << " MATCH" << setw(15) << "WINNER "
<< setw(22) << "TIME TAKEN " << endl;
        cout << setw(5) << count << setw(15) << h.first <<
setw(15) << h.second << " seconds " << endl;
        cout << endl;
        cout << "GAME BOARD STATE" << endl;
        b1.board();
        cout << endl;

cout << "-----
-----" << endl;
        total_time += h.second;
        count++;
        i++;
    }
    cout << "The total time taken for all the matches is
"<< total_time << " seconds." << endl;

}

int main()
{
    m1.details();
    return 0;
}

```

PROGRAM OUTPUT

Opens up the session and ask for user names and toss choice

```
C:\Users\DELL\Downloads\desis-ascend-asmnt1.exe
-----WELCOME TO TIC-TAC-TOE WORLD!-----
Enter the name of player 1 : SEJAL
Enter the name of player 2: MUSKAN
WELCOME SEJAL & MUSKAN!
Let's have a toss on who will run first!
Type 'TOSS' to get started : TOSS
Enter your choice , SEJAL (HEAD OR TAIL) : TAIL
```

Toss the coin , declare the result and load the game board

```
Tossing the coin !
And the coin results in HEAD !

The winner is MUSKAN and will go first .
Let's start the game !
Type 'START' to load the TIC-TAC-TOE board : START

Here is your board!
 1 | 2 | 3
--|---|
 4 | 5 | 6
--|---|
 7 | 8 | 9
```

Starts the match and ask for choice from each player one by one , and checks for the winner after every turn.

```
C:\Users\DELL\Downloads\desis-ascend-asmnt1.exe
Player MUSKAN, enter a number: 3
Here is your board!
 1 | 0 | 0
--|---|
 X | 5 | 6
--|---|
 7 | 8 | 9

Player SEJAL, enter a number: 6
Here is your board!
 1 | 0 | 0
--|---|
 X | 5 | X
--|---|
 7 | 8 | 9

Player MUSKAN, enter a number: 1
 0 | 0 | 0
--|---|
 X | 5 | X
--|---|
 7 | 8 | 9
```

If a player wins , displays the result and time of match and ask for three choices

```
==>Player MUSKAN wins!
Time taken for this match is 14 seconds

Press 1 , if you want to play again.
Press 2 , for game statistics.
Press 3 , for exit.
Enter your choice :
```


Display the game stats

```
Enter your choice : 2
Game Statistics:
The total number of matches is 3
The match won by SEJAL is 0.
The match won by MUSKAN is 3.
The match draw is 0.
Press 1 for detailed information , 2 for exit : _
```

Display the detailed information with winner for each match , time taken in each match and game board state and total time of all the matches.

```
C:\Users\DELL\Downloads\desis-ascend-asmnt1.exe
The match won by MUSKAN is 3.
The match draw is 0.
Press 1 for detailed information , 2 for exit : 1
Detailed Information:
-----
MATCH      WINNER      TIME TAKEN
  1         MUSKAN        14 seconds
-----
GAME BOARD STATE
0 | 0 | 0
--|---
X | 5 | X
--|---
7 | 8 | 9
-----
MATCH      WINNER      TIME TAKEN
  2         MUSKAN        63 seconds
-----
GAME BOARD STATE
0 | 0 | 0
--|---
X | 5 | X
--|---
7 | 8 | 9
-----
MATCH      WINNER      TIME TAKEN
  3         MUSKAN        25 seconds
-----
GAME BOARD STATE
0 | 0 | 0
--|---
X | 5 | X
--|---
7 | 8 | 9
-----
```

```
C:\Users\DELL\Downloads\desis-ascend-asmnt1.exe
GAME BOARD STATE
0 | 0 | 0
--|---
X | 5 | X
--|---
7 | 8 | 9
-----
MATCH      WINNER      TIME TAKEN
  3         MUSKAN        25 seconds
-----
GAME BOARD STATE
0 | 0 | 0
--|---
X | 5 | X
--|---
7 | 8 | 9
-----
The total time taken for all the matches is 102 seconds.
-----
Process exited after 278.7 seconds with return value 0
Press any key to continue . . . _
```

Displays invalid choice if choice made by the user is not listed.

```
C:\Users\DELL\Downloads\desis-ascend-asmnt1.exe
-----WELCOME TO TIC-TAC-TOE WORLD!-----

Enter the name of player 1 : SEJAL
Enter the name of player 2: MUSKAN

WELCOME SEJAL & MUSKAN!

Let's have a toss on who will run first!
Type 'TOSS' to get started : TOSS
Enter your choice , SEJAL (HEAD OR TAIL) : HEAD

Tossing the coin !
And the coin results in HEAD !

The winner is SEJAL and will go first .
Let's start the game !
Type 'START' to load the TIC-TAC-TOE board : ST
Invalid Choice!
-----
Process exited after 33.32 seconds with return value 0
Press any key to continue . . .
```