Project: Tic-Tac-Toe

Collaboration: Pair or solo. Everyone must sign up to receive 100% for Quiz 8. That means if you are solo, complete the Google form http://goo.gl/forms/mRDRpaBTX8. If you have a partner, both you and your partner must complete the Google form entering your name before your partner's name.

Goals

- Use a two dimensional array instance variable
- Develop a well-tested type as a Java class
- Write your own tests to make sure the code works
- Write a program that plays a game at the console with a Scanner

1. Implement `class TicTacToe`

The characters of the tic-tac-toe board must always be one of these three:

- `'_'` Not selected (available)
- `'X'` Selected by the eX player
- `'O'` Selected by the Oh player (this must an upper case letter O, not zero)

At construction, your board will look like this (you must use `'_'` as an available location)

```
_ _ _
_ _ _
_ _ _
```

After the first move with the message `choose(1, 1)`, your board will look like this ('X' always goes first).

```
_ _ _
_ X _
_ _ _
```

Here is the beginning of class TicTacToe with a comment included to remind you that you must place your name and SOLO or both names if on a team of two at the beginning of the file.

```
/**
 * The model for a Tic Tac Toe game that can be played the console or with
 * the GUI http://www.cs.arizona.edu/~mercer/Projects/TicTacToeGUI.java
 *
 * YOUR NAME
 * YOUR PARTNERS NAME or SOLO
 */
public class TicTacToe {
```

Here are the required methods for `class TicTacToe`

```
// Construct a 3x3 array of char to store '_' for not used or
// an 'X' for the eX player or 'O' for the Oh player (do not use zero),
// Also set the first player to be 'X'
public TicTacToe()

// Let a player choose a move at the given row and col (if not taken)
// and return true.  Return false if the row or col are out of range
// of 0..2 or there is an attempt to take a spot that was already chosen.
// Note: Always have 'X' go first.
public boolean choose(int row, int column)
```

```
// Return the next player as 'X' or 'O'.
public char getNextPlayerChar()

// Return a textual version of the tic tac toe board like this:
//   O _ X
//   O X _
//   O _ X
//
@Override
public String toString()

// Get back the current state of the game with 'X' and 'O' if chosen.
// This is needed in the GUI to display a graphical view.
public char[][] getCharArray()

// Allow anyone to check if either the 'X' or 'O' player has won
public boolean didWin(char playerChar)

// Use this method to see if there is a tie or not.
// Return true if there are no places remaining and there is no win
public boolean didTie()

// Allow users to know if there are any more possible choices. Return true
// if neither player has won and there is at least one place to choose.
public boolean notDone()
```

The following code is included to show how to use all methods to generates the output in the box. You must write your own unit test with @Test methods that play entire games with these methods.

```
TicTacToe game = new TicTacToe();
System.out.println(game.getNextPlayerChar());
System.out.println(game.notDone());
game.choose(1, 1);
game.choose(0, 0);
System.out.println(game.getCharArray()[2][2]);
System.out.println(game.didWin('X'));
System.out.println(game.didWin('Y'));
System.out.println(game.didTie());
System.out.println(game.toString());
```

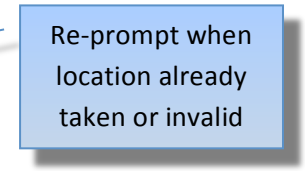
```
X
true

_
false
false
false
O _ _
_ X _
_ _ _
```

2. Implement a game in `TicTacToeMain`

Complete a console based game--use a `new Scanner(System.in)`--of tic-tac-toe that plays a game of tic-tac-toe by asking the user to enter the row and column of their choosing. You game must be in a class named **`TicTacToeMain`** . This class will have method `public static void main(String[] args)` so it can be run as a Java application. For each turn, show the current state of the game. Report a win or tie as soon as possible. Tell the user there was an incorrect input if the row or column is out of range until they enter a correct choice. The dialog begins like this (user input for a row and column shows as `1 1`):

```
Play a game of Tic Tac Toe

Row and column for X? 1 1

_ _ _
_ X _
_ _ _
```

```
Row and column for O? 2 2

_ _ _
_ X _
_ _ O

Row and column for X? 1 1
Row and column for X? 2 2
Row and column for X? 3 99
Row and column for X? 0 1
_ X _
_ X _
_ _ O

Row and column for O? 1 2
_ X _
_ X O
_ _ O

Row and column for X? 2 1
_ X _
_ X O
_ X O

=========
Game Over
X won
```



Optional GUI: When completely done with the console game, see how your code runs as an event-driven program with a graphical user interface (GUI). Put this file into your project and run it as a Java Application:

http://www.cs.arizona.edu/~mercer/Projects/TicTacToeGUI.java

Grading Criteria *Maximums 90..95 points on WebCat or 100..105 after the console game is graded.*

____/ 90pts WebCat turnin of TicTacToe.java and TicTacToeTest.java: code and problem coverage

____/ 10pts Console game, or a program with a `main` method in the same project
- +2 X goes first
- +2 Your dialog matches the sample given
- +2 Shows who wins or indicates a tie.
- +2 Reprompts if a choice is already taken
- +2 Handles out of range integers such as 3, -1, or 99