CS 7A - Spring 2015 - Sam Lloyd's 14-15 Puzzle. Due 3/26/15

Background Theory

For a long time it was not clear when the first slide puzzle was invented or made. But it was thought to be a well-known fact that in 1878 Sam Lloyd, America's greatest puzzle-expert, "drove the whole world crazy" (his words) with his 14-15 puzzle. This was a variation on the "Puzzle of 15" which was made and sold by the Embossing Company from New York about 10 years earlier. This puzzle consisted of 15 numbered square pieces that could be slid around in a square box that was big enough to contain 16 pieces. The pieces should be placed at random in the box and you should sort the pieces in ascending order without taking the pieces out of the box (so the only thing that is allowed is to slide the pieces). Not every randomly placed pattern of pieces can be sorted by just shuffling and Sam Lloyd cleverly made use of this fact.

Your task is to write code to simulate play with the 15 puzzle. Write definitions for the functions in the following template to accomplish this.

1. Write code to meet these specifications:
   Precondition: A randomly shuffled 15 puzzle, which may be solvable or not and an interface for the user to make legal moves.
   Postcondition: A record of the sequence of moves the user made, the number of moves and the total time taken to solve the puzzle or declare it unsolvable. A list of best times for both solving and determining it unsolvable.

```
#include "std_lib_facilities.h" //include cstdlib, ctime and iomanip
// Prototype descriptions (enter a prototype that fits.)

// display() shows it on the console.  For example, if
// board = {1, 2, 3, 4, 5, 16, 7, 8, 9, 10, 11, 12, 13, 14, 15, 6}
// then display shows
//  1  2  3  4
//  5     7  8
```

```
//  9 10 11 12
// 13 14 15  6

//shuffle() Use the \href{http://en.wikipedia.org/wiki/Fisher Yates_shuffle}{Fi
//After shuffling the board, a call to the function disply will produce a
shuffled board like this:
/* 14  5  4 11
   12  9  6  7
      13  8 10
   15  1  3  2 */

//
//  1  2  3  4
//  5  6  7  8
//  9 10 11 12
// 13 14 15

class Board {
    public:
        int size = 4; // The dimension of the square board
        vector<int> tiles;
                void getMove(tiles);  // prompts the use to enter u, d, l, r
                                                        // (or some other schem
        void shuffle(tiles);
                void display(tiles);
                bool won(); //returns true if the game board is as below, otherwi
                Board(); //     constructor
        };
int main()
{
// Initialize board with blank tiles in the lower right corner:
    // create a Board, b
    //game loop
        while(!b.won())
        {
                // construct a board with size*size tiles
                getMove(board, size); // function calls     size is const int,
                display(board, size); // board is the address in memory of the
        }                             // first element of the array, board[]
}

//define display()

//define shuffle()

// define won()

// define getMove()
```

Submit the code using your initials in the usual format: say GH_fifteen.cpp