

# **Team 13 User Manual**

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EECS 22L**

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# Glossary of Chess Terms

## Pieces:

**King** - Can move one square in any direction. When the King is captured, the player loses the game. The King may never move into check

**Queen** - Can move in any number of squares in any direction (horizontal, vertical or diagonal) if path is not blocked by ally piece

**Rook** - Moves any number of squares vertically or horizontally if path is not blocked

**Bishop** - Moves any number of squares diagonally if path isn't blocked. Note Bishops on light-squares can only move to other light squares and black-square Bishops can only move to black-square spots

**Knight** - Moves two squares horizontally or vertically and makes a right-angle turn for one more square (think of an "L"). The Knight always lands on a square opposite of its color from its former square. The Knight can also jump over other pieces between its old and new squares.

**Pawn** - always moves straight ahead (never backwards). Captures diagonally and moves only one-square at a time. On its first move however, it has the option of moving one or two spaces forward. Only the pawn piece is applicable for En Passant and Promotion (see "Special Moves" section on pg. 8)

## **General Terms:**

**Capture** - a move by a piece that removes an opponent piece from the board. The capturing piece occupies the square of the captured piece (except by En Passant)

**Computer move** - a term to indicate a move played by a computer rather than a human player.

**Blocked Square** - a square where a player's piece is occupied and is restricting the player from placing other pieces in the same square

**White Square** - the 32 light-colored squares on the board such as b1 and d1.

**Black Square** - the 32 dark-colored squares on the chessboard such as a1 and c1.

**Diagonal** - line of squares of same color touching corner to corner. Squares that a queen or a bishop can move.

**Records**- refers to the record of games to indicate the number of times each player has won.

**Human Move** - a move a human would make and not a computer.

**Piece** - one of the chessmen or figures used to play the game. For example, king, queen, rook, bishop, knight or pawn.

**Space** - a square controlled by a player.

**Stalemate** - a position in a game where neither player has a legal move available. In which case the game results in an immediate draw.

**Develop** - a movement to another square by non-pawn pieces where they can be more active in clearing the objectives of the game.

**Kingside** - the side of the board where the king is on

**Queenside** - the side of the board where the queen is on

**Checkmate** - position in which a player's king is in check (see definition for "Check" below) and the player has no legal move

**Castling** - move in which the king and a rook are moved at the same time in the same turn. It moves the king from the center to a flank and develops the rook. Castling can be done by either the kingside or queenside. Castling cannot be done in response to a check or if either the king or rook has already moved.

**Promotion** - advancing a pawn to the end of the board, converting it to a queen, rook, bishop or knight.

**Check** - When a king is threatened with capture (but can protect himself or escape), it's called check. If a king is in check, then the player must make a move that eliminates the threat of capture and cannot leave the king in check.

**En Passant** - It is a special pawn capture that can only occur immediately after a pawn makes a move of two squares from its starting square, and it could have been captured by an enemy pawn had it advanced only one square

**Log** - an in game feature that records the history of moves made within the game

# Rules of Chess

White is always first to move and players take turns alternately moving one piece at a time.

Movement is required. If a player's turn is to move, he is not in check but has no legal moves, this situation is called “Stalemate” and it ends the game in a draw. Stalemate also occurs when a player makes the same move three times.

Each type of piece has its own method of movement. Go to the glossary to check the moves of each of the pieces. A piece may be moved to another position or may capture an opponent's piece, replacing on its square (en passant being the only exception, check special moves section). With the exception of the knight, a piece may not move over or through any of the other pieces.

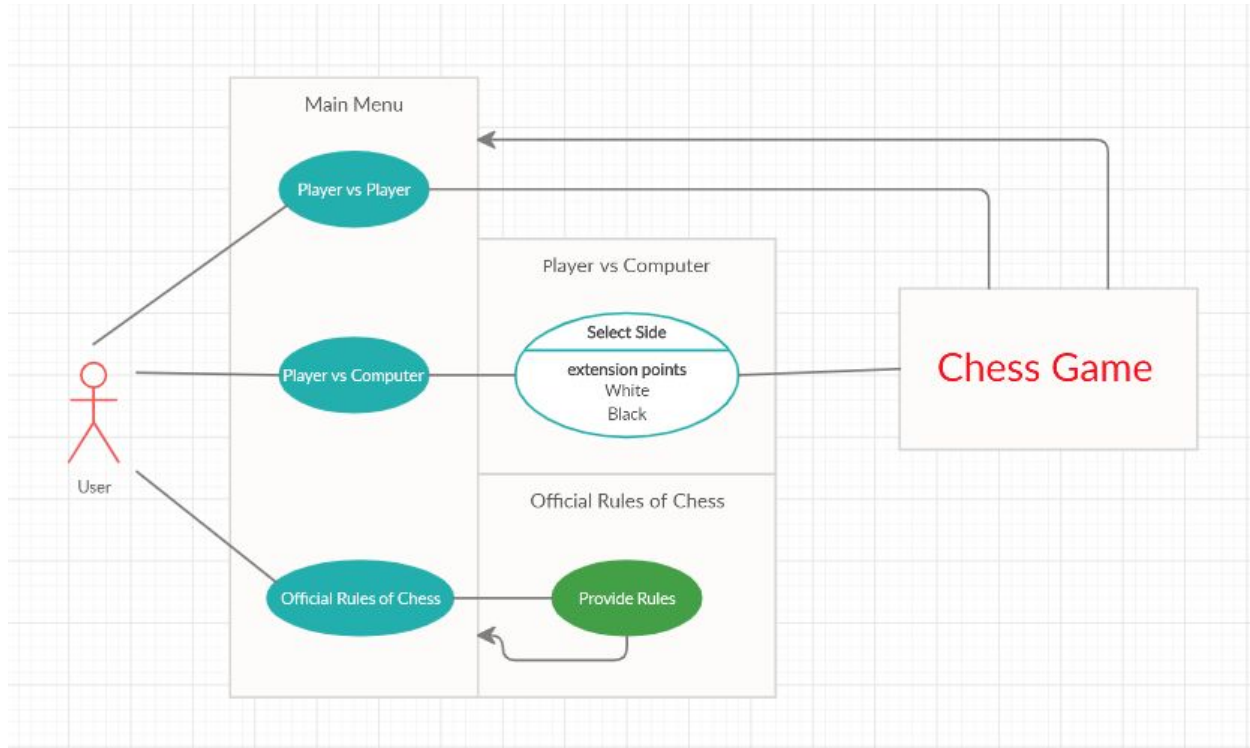
When a king is threatened with capture (but can protect himself or escape), it's called check. If a king is in check, then the player must make a move that eliminates the threat of capture and cannot leave the king in check.

Checkmate happens when a king is placed in check and there is no legal move to escape.

Checkmate ends the game and the side whose king was checkmated loses.

# Computer Chess

## Usage Scenario



Chess Program Use Cases drawn on *createely.com*

## Goal

The goal of this chess software is to play a chess game and understand the rule of chess.

## Features

### ❖ Main

- Player vs Computer - Support human user versus computer
- Player vs Player - Support human user versus human user
- Side Selection - Choose a side, either black or white, to play available for player vs computer gamemode.

❖ **In-Game**

- Official Rule - The game follows official rule while playing
- Readable Log - A log displays/prints for all the moves
- Computer Move - The computer makes its move properly less than a minute
- Official Algebraic Notation - display and input algebraic notation when making moves



# Installation

## System Requirements

- Any OS that allows you to SSH into the EECS linux servers
- Standard Library (C Programming)
- Math Library
- C programming compiler (e.g. gcc)

## Setup and Configuration

- Log into any of the uci eecs servers accessible
  - If you are at a remote location, you need to download cisco anyconnect and connect to the uci vpn
- Create a directory locally to keep the game file
- Type in the linux server:
  - > git pull
  - > make
  - > ./chess

**Note:** make sure you run the chess executable in the “bin” directory

## Uninstalling

- Login to the eecs server on an ssh client (putty, etc)
- Go to the directory with the project inside visible(will be in folder Team13)
- Then type
  - > make clean
  - > rm -rf Team13

# Chess Program Functions and Features

## Main Menu (Selection Interfaces)

- User input: choose an option
- Program output: pan to the next selection interface

```
***Main Menu***
(1)Player vs Player mode
(2)Player vs Computer mode
(3)Rules of Chess
Enter your option with the numbers provided:
```

- Player vs player
  - Enter 1 to select “player vs player” option and game will automatically start
  - A new board with an user interface will be displayed in algebraic notation will show up on the sides

```
Enter your option with the numbers provided: 1
PVP mode started
+---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 | wP | wP | wP | wP | wP | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h

*** WHITE'S TURN ***
Enter the position of the piece you want to move:  
```

- Player vs computer
  - Select Side (Program output: highlight selection)
    - Black
    - White

```

Enter your option with the numbers provided: 2
What color do you want to play as?
(1)White
(2)Black
Make your choice: 1

```

- Start Game (Program output: starts the game with the player's side on the bottom of the screen and computer side on top.

```

Player vs Computer mode started
+---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 | wP | wP | wP | wP | wP | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
Enter the x y coordinates of the piece you want to move(in the form " x y":

```

- Official Rules

- Enter 3 to see the official rules of chess printed out
- A list of rules will be displayed in text

```

***Main Menu***
(1)Player vs Player mode
(2)Player vs Computer mode
(3)Rules of Chess
Enter your option with the numbers provided: 3
* White is always first to move and players take turns alternately moving one piece at a time. Movement is required.
* If a player's turn is to move, he is not in check but has no legal moves, this situation is called Stalemate and it ends the game in a draw.
* Stalemate also occurs when a player makes the same move three times.
* Each type of piece has its own method of movement. Go to the glossary to check the moves of each of the pieces.
* A piece may be moved to another position or may capture an opponent's piece, replacing on its square (en passant being the only exception, check special moves section).
* With the exception of the knight, a piece may not move over or through any of the other pieces.
* When a king is threatened with capture but can protect himself or escape, it's called check. If a king is in check, then the player must make a move that eliminates the threat of capture and cannot leave the king in check.
* Checkmate happens when a king is placed in check and there is no legal move to escape. Checkmate ends the game and the side whose king was checkmated loses.

```

## In-game Mechanics

- Move a Piece - to move a piece you first enter the coordinates of the piece you want to select and then you enter the coordinates of where you want to move the selected piece. The coordinates must be as following: letter first, then number
  - User input: two coordinates inputs with a keyboard

```
*** WHITE'S TURN ***
Enter the position of the piece you want to move: e2
Enter the position you want to move to: e4
```

- Program output: Prints out a statement to determine whether the king is in check or not. Prints out the board with the moved chess piece. Prints out the following statement: “*Piece at **initial\_position** moved to **final\_position**.*” And then it prints out the which player’s turn it is.

```
Neither side is in check.
+---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   |   |   | wP |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 | wP | wP | wP | wP |   | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
*** Pawn at e2 moved to e4. ***

*** BLACK'S TURN ***
Enter the position of the piece you want to move: 
```

- Capture a Piece - if a piece is in the position to capture an opponent’s piece, enters coordinates the same way as you would move a piece
  - User input: two coordinates inputs with a keyboard
  - Program output: removes the captured piece and prints out the board with the capture piece removed.

```

+---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP |   | bP |   |   | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 | wP |   |   |   | bP |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   | bP |   | bP |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   | wP | wP |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 |   |   |   | wP | wP | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
Enter the x y coordinates of the piece you want to move(in the form " x y":
f8
The chess piece selected is at location f8
Enter the x y coordinates of the place you want the piece to end up( in the form " x y ": b4
+---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK |   | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP |   | bP |   |   | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 | wP |   |   |   | bP |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   | bP |   | bP |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   | bB | wP |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 |   |   |   | wP | wP | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
f8 moved to b4

```

## In-game Conditions

- Check - the user's king is in position to be captured. The user must make a move that puts the king in a safe position.
  - User input: none
  - Program output: Log will output: "Black is in check" or "White is in check" and will prompt the player to make a legal move in order to protect the king.

```

Enter the x y coordinates of the place you want the piece to end up( in the form " x y ": d2
Not able to move a piece.
Enter the x y coordinates of the piece you want to move(in the form " x y":
d4
The chess piece selected is at location d4
Enter the x y coordinates of the place you want the piece to end up( in the form " x y ": f3
White is in check.
+---+---+---+---+---+---+---+---+
8 | bR |   | bB | bQ | bK |   | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP |   | bP |   |   | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 | wP | wN |   |   | bP |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   | bP |   | bP |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   | bN |   |
+---+---+---+---+---+---+---+---+
2 |   |   |   |   | wP | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR |   | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
d4 moved to f3

```

- Checkmate - if there is no possibility for the user to get their king out of “check.” The user loses.
  - User input: none
  - Program output: Log will output text “Black Wins!” or “White Wins!”

```

*** WHITE'S TURN ***
Enter the position of the piece you want to move: a3
Enter the position you want to move to: a4
+---+---+---+---+---+---+---+---+
8 | bR | bN | bB |   | bK |   | bN | bR |
+---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP |   | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   |   | bB |   | bP |   |   |   |
+---+---+---+---+---+---+---+---+
4 | wP | wP |   |   |   |   |   | bQ |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   | wP |
+---+---+---+---+---+---+---+---+
2 |   |   | wP | wP | wP | wP | wP |   |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
*** Pawn at a3 moved to a4. ***

```



```

*** BLACK'S TURN ***
Enter the position of the piece you want to move: c5
Enter the position you want to move to: f2
White is in check.
Black Wins!
  +---+---+---+---+---+---+---+---+
8 | bR | bN | bB |   | bK |   | bN | bR |
  +---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP |   | bP | bP | bP |
  +---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
5 |   |   |   |   |   | bP |   |   |
  +---+---+---+---+---+---+---+---+
4 | wP | wP |   |   |   |   |   | bQ |
  +---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   | wP |
  +---+---+---+---+---+---+---+---+
2 |   |   | wP | wP | wP | bB | wP |   |
  +---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
  +---+---+---+---+---+---+---+---+
    a   b   c   d   e   f   g   h
*** Bishop at c5 moved to f2. ***
Black Wins!

```

## Special Rules

- Castling - enter the coordinates of the king's position (e1 or e8) and then enter the coordinates of the final position where your king will be after the castling.
  - For instance, the white king will castle from e1 to g1 or from e1 to c1. In addition, these are the coordinates to input into the keyboard if the white player wants to perform castling.

```

  +---+---+---+---+---+---+---+---+
8 | bR |   | bB | bQ | bK | bB | bN | bR |
  +---+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
  +---+---+---+---+---+---+---+---+
6 | bN |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   | wN | wP |
  +---+---+---+---+---+---+---+---+
2 | wP | wP | wP | wP | wP | wP | wB | wP |
  +---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK |   |   | wR |
  +---+---+---+---+---+---+---+---+
    a   b   c   d   e   f   g   h
Enter the x y coordinates of the piece you want to move(in the form " x y":
e1
The chess piece selected is at location e1
Enter the x y coordinates of the place you want the piece to end up( in the form " x y ": g1

```

```

white king is not on the board.
King side castling for white is legal.
+---+---+---+---+---+---+---+
8 | bR |   | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+
7 | bP | bP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+
6 | bN |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   | wN | wP |   |
+---+---+---+---+---+---+---+
2 | wP | wP | wP | wP | wP | wP | wB | wP |
+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ |   | wR | wK |   |
+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
e1 moved to g1

```

- En Passant
  - User input: After an opposing team's pawn moves 2 spaces forward, enter the coordinates of the user's pawn that is capable of performing an en passant. Then enter the coordinates
  - Program output: the pawn will be captured and the event will be noted in the game log

```

*** WHITE'S TURN ***
Enter the position of the piece you want to move: b2
Enter the position you want to move to: b4
+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+
7 |   | bP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+
4 | bP | wP | wB |   | wP |   |   |   |
+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+
2 | wP |   | wP | wP |   | wP | wP | wP |
+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK |   | wN | wR |
+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
*** Pawn at b2 moved to b4. ***

```



```

*** BLACK'S TURN ***
Enter the position of the piece you want to move: a4
Enter the position you want to move to: b3
+---+---+---+---+---+---+---+---+
8 | bR | bN | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+---+
7 |   | bP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   | wB |   | wP |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   | bP |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 | wP |   | wP | wP |   | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK |   | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
*** Pawn at a4 moved to b3. ***

```

- Promotion - When a pawn reaches the opponent's last row, it can promote to either a queen, rook, bishop, or knight based on the user's choice.
  - User Input 1: A pawn moves to the last row of the opponent's side
  - User Input 2: User inputs which piece they want to replace the pawn with that was captured in previous moves
  - Program output: Pawn is replaced with chosen piece

```

*** WHITE'S TURN ***
Enter the position of the piece you want to move: b6
Enter the position you want to move to: b7
+---+---+---+---+---+---+---+---+
8 | bR |   | bB | bQ | bK | bB | bN | bR |
+---+---+---+---+---+---+---+---+
7 |   | wP | bP | bP | bP | bP | bP | bP |
+---+---+---+---+---+---+---+---+
6 |   |   | bN |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
5 | bP |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+
2 |   | wP | wP | wP | wP | wP | wP | wP |
+---+---+---+---+---+---+---+---+
1 | wR | wN | wB | wQ | wK | wB | wN | wR |
+---+---+---+---+---+---+---+---+
  a   b   c   d   e   f   g   h
*** Pawn at b6 moved to b7. ***

```

```

*** WHITE'S TURN ***
Enter the position of the piece you want to move: b7
Enter the position you want to move to: b8
*** White Pawn Promotion! ***
Select a piece to replace your Pawn at b8 (Q - queen, R - rook, B - bishop, N - knight): Q

```

8		wQ	bB	bQ	bK	bB	bN	bR
7			bP	bP	bP	bP	bP	bP
6	bR		bN					
5	bP							
4								
3								
2		wP	wP	wP	wP	wP	wP	wP
1	wR	wN	wB	wQ	wK	wB	wN	wR
	a	b	c	d	e	f	g	h

```

*** Queen at b7 moved to b8. ***

```

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# Error Messages

- all the error messages will be printed out in the main terminal where the ./chess executable is run (e.g. “not able to move a piece”).
- Each error will have a printed message following the error

## Example:

- If a player attempts to make an illegal move, then the following message will be printed:  
“That is an illegal move. Please make another move.”

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