

Product User Manual

Team NASA

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1 Introduction

Chess is a strategic board game for two players. It is played on a square board consisting of 64 black and white tiles. Each player has a set of playing pieces:

- King (1)
- Queen (1)
- Knights (2)
- Bishops (2)
- Rooks (2)
- Pawns (8)

Each of these pieces have rules for how they can move. The end goal of the game is to “checkmate” the other players’ king. This happens when the king cannot escape capture. As in most board games the players take turns in moving their pieces. The first move is made by the player playing the white pieces. The game continues until either; a player resigns, a player gets checkmated or a draw situation occurs.

Target age: 4+

The game is played around the world by millions of people in all ages. The term “easy to learn, hard to master” fits perfectly for chess, and may be why it is so popular. The game is thought to have originated in India several hundred years ago. The fact that it is still so actively played to this day should be a clear indication of how inducing the game can be.

2 Rules of chess

2.1 Capturing pieces

Any chess piece may capture an opposing piece by moving (legally) into the square the other piece currently occupies. A captured piece is removed from the chessboard for the rest of the game.

2.2 The chess pieces

There are six different types of pieces in chess. They all move in specific ways, and they have unique properties.

- The pawn: There are eight pawns in a set. With two exceptions, each pawn may only move one square at a time, and only towards the far end of the board – toward the other player. The first exception is if it has not yet moved – in that case, it may move two squares ahead. The second is when a pawn captures another piece.

This can only happen by moving the pawn one square forward diagonally into a square occupied by an opposing piece. A pawn cannot move through other pieces. Pawns may partake in two special moves, namely promotion and en passant (see the “Special rules” section below).

- The rook: There are two rooks in a set. This piece can only move in straight lines, and cannot move through other pieces. A rook, along with the king, may partake in a special move called castling (see “Special rules” below).
- The knight: There are two knights in a set. A knight can only move in an L-shape: One square horizontally and two squares vertically, or two squares horizontally and one square vertically. It is the only piece with the ability to move through spaces occupied by other pieces.
- The bishop: There are two bishops in a set. A bishop can only move diagonally, and cannot move through other pieces.
- The queen: There is one queen in a set. A queen behaves like a combination of a rook and a bishop; it may move any number of squares in a straight or diagonal line. It cannot move through obstructions.
- The king: There is one king in a set. It may move one square at a time in any direction, and cannot move to an occupied space, except for when capturing an opposing piece. The king, along with a rook, may partake in a special move called castling (see the “Special rules” section below).
 - The king is the most important piece in the set, as the game ends when it is captured. It is in check when it is in danger of being captured – meaning an opposing piece could use the following move to attack directly. Letting the king stay in check is illegal; you must attempt to remove the king from danger as your next move. Checkmate occurs when there are no available legal moves to escape check.

2.3 Setup

The game is played on a chessboard: A checkered 8x8 square board with alternating light and dark colored tiles. The players are seated opposite to each other. From each player’s perspective, their non-pawn pieces are placed on the closest row in the following order: Rook, knight, bishop, queen or king, queen or king, bishop, knight, rook. The queen is placed on the tile between the bishops that is the same color as itself; for instance, a black queen is always initially placed on a dark tile. The king is placed on the remaining tile on the row. The pawns are placed on the row that is second-closest to the player whose set they belong to.

2.4 Special rules

- Promotion: If a pawn reaches the end of the board, it transforms into a queen.

- En passant: This move entails a pawn capture that can only happen immediately after a pawn moves two squares away from its starting point. It can only be performed by an opposing pawn that captures the first pawn “in passing”, meaning the opposing pawn would have been able to capture the first pawn had the latter only moved one square forward.
- Castling: Once every game, the player may move their king and one of their rooks at the same time. Castling entails moving the king two squares to the right or the left (toward the chosen rook), and moving the rook to the last square the king crossed. This move is only legal under the following conditions:
 - Neither piece has moved previously.
 - There are no pieces between the king and the rook.
 - The king is not in check, and will not pass through or end up on any square under attack by opposing pieces.

2.5 How to win

A player wins by capturing the other player’s king in a checkmate. It is also possible for a player to win if the opponent resigns.

However, a game of chess can end without a victory – it may end in a draw. For instance, a stalemate occurs when a player is not in check, yet cannot make a legal move. A game could also end in a draw by agreement, where the two players mutually agree to a draw.

3 Key features of the game

- The user can choose to play against another human player or a machine player with three possible levels of intelligence.
- The program keeps track of the results of each game, and provide an overview of the ranking of players based on how many matches they have won.
- The program lets the user play against a bot, and choose between three levels of intelligence to match the user.
- The program has a 2D chessboard with visually appealing pieces and board layouts that follow standard rules of chess.

4 Illustrations

4.1 The chessboard

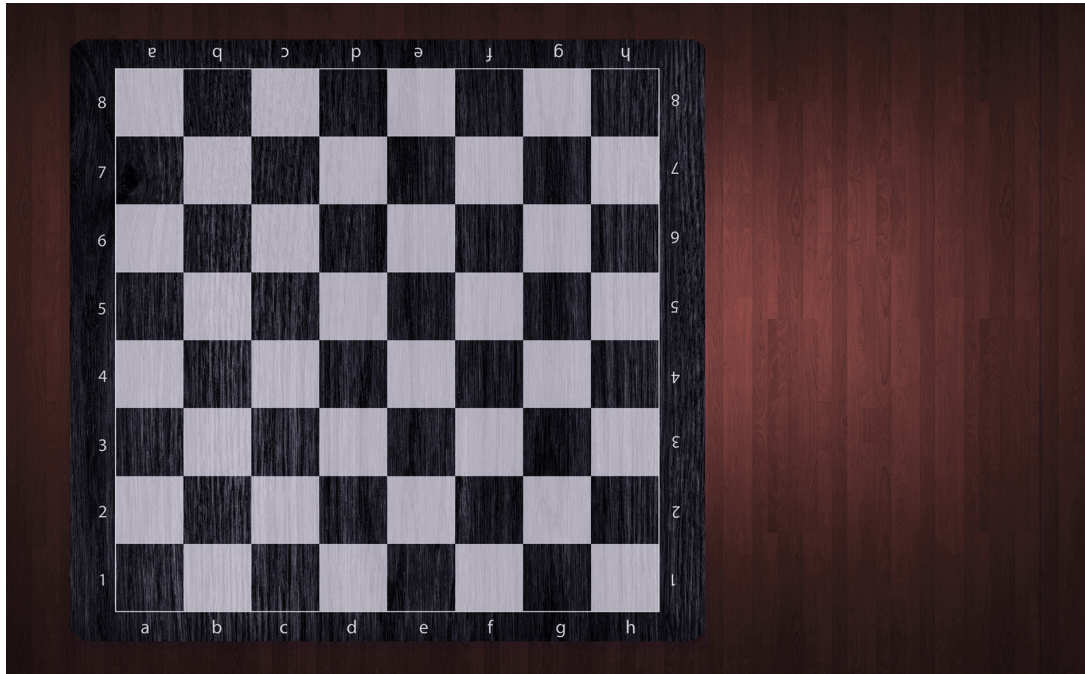


Figure 1: The chessboard.



Figure 2: The game setup.

4.2 The pieces



Figure 3: White pawn.



Figure 4: Black pawn.



Figure 5: White rook.



Figure 6: Black rook.



Figure 7: White knight.



Figure 8: Black knight.



Figure 9: White bishop.



Figure 10: Black bishop.



Figure 11: White queen.



Figure 12: Black queen.



Figure 13: White king.



Figure 14: Black king.

4.3 Implementations



Figure 15: Direct interaction.



Figure 16: Written move.