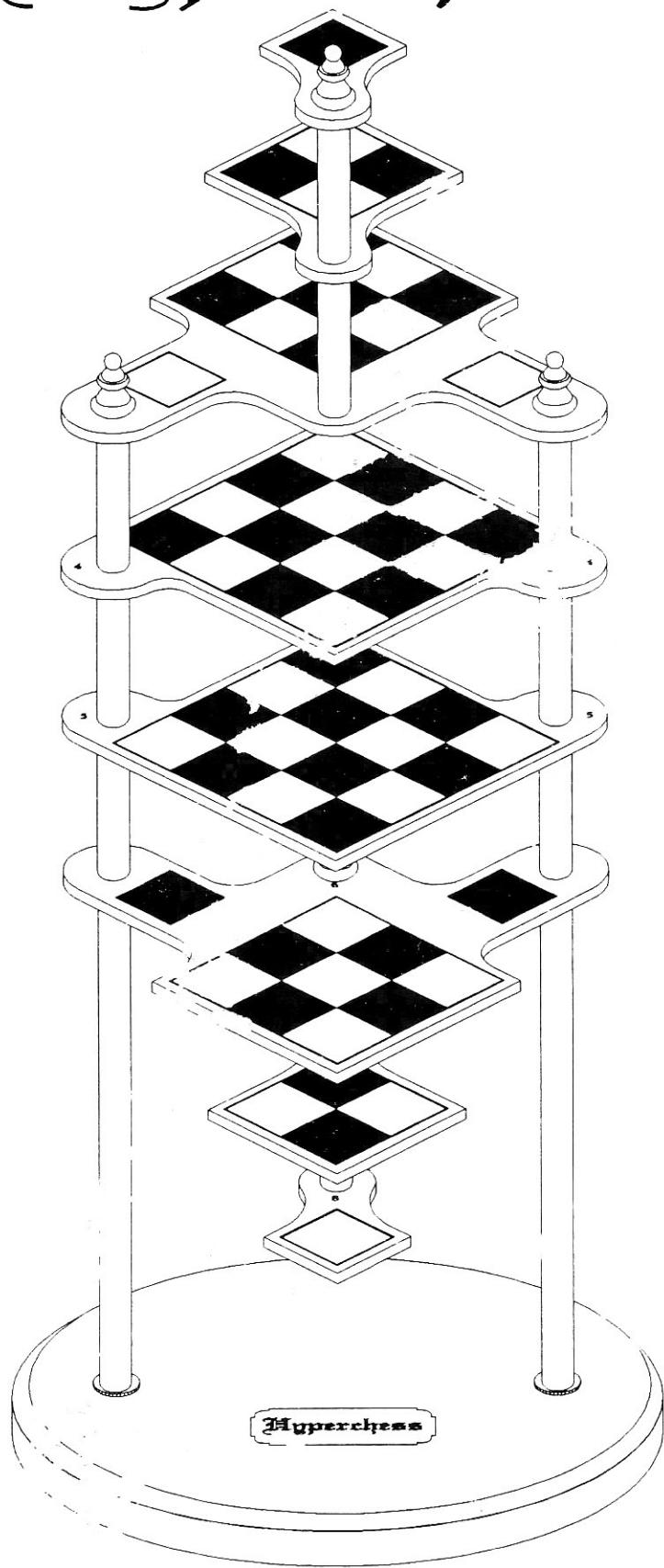
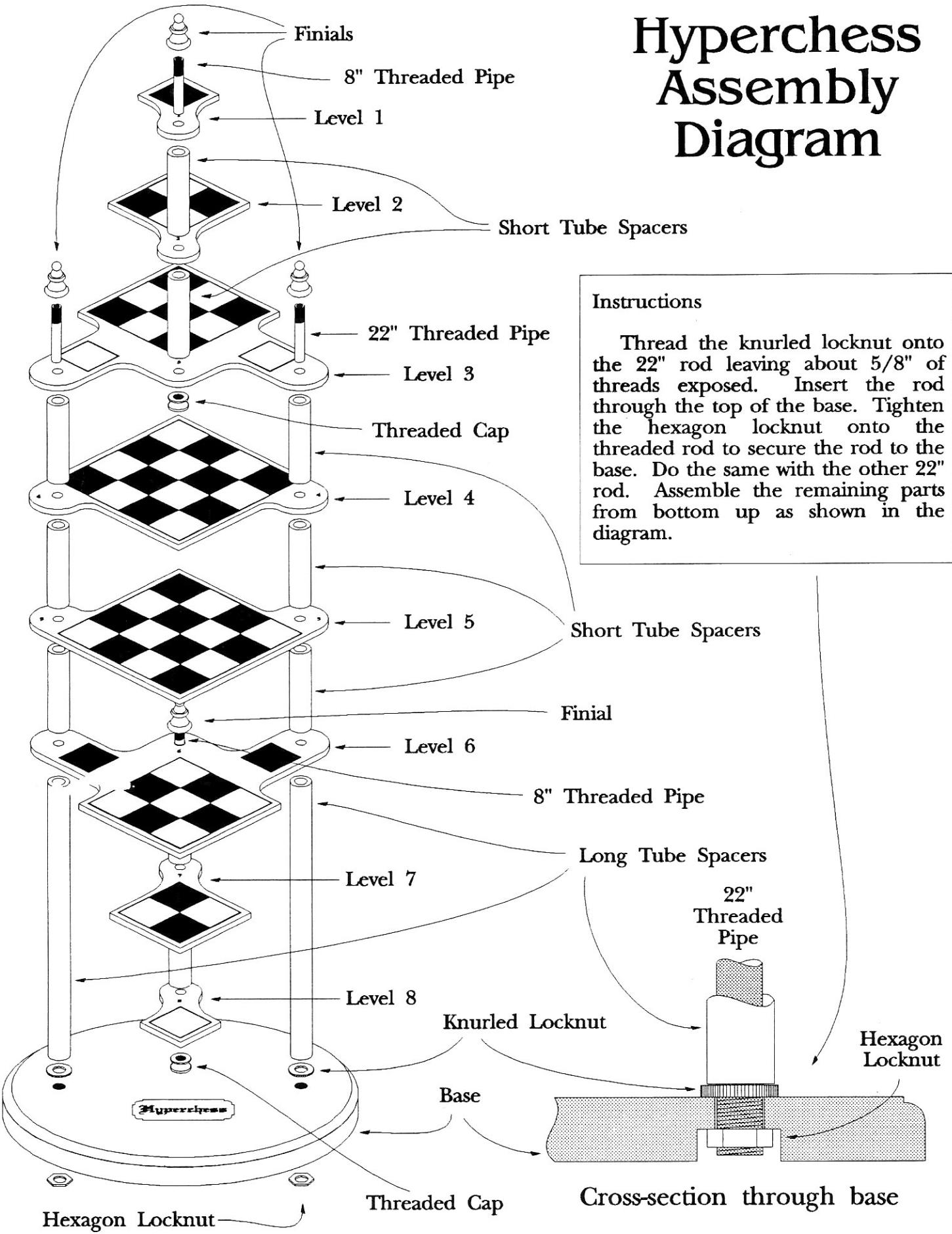


Hyperchess™



Hyperchess Assembly Diagram



The rules of *Hyperchess*TM

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Computer Graphics

Introduction

Hyperchess is designed to extend the traditional game of chess to three dimensions while retaining the essential features of the original game. Hyperchess uses the same playing pieces and the movement of the pieces remains the same. The unique feature is the rearrangement of the original 64 squares into eight vertically stacked levels.

Object

As in traditional chess, the object of the game is to place the opposing King in such a position that he could not escape capture if he were a capturable piece. When the King is in a position where he would be in danger of capture on the next move, his opponent declares "Check" and the King must be either moved out of check, or interpose a piece to shield the King, or capture the opposing piece. If the King cannot be protected from capture, then the player is "Checkmated" and he loses the game. If neither player is able to checkmate the other player, the game is a draw (Stalemate).

The strategy of the game hinges upon the attack and defense of the King. Each game piece has a move peculiar to itself and can capture any of the opponent's pieces that lie in its path of capture. When a piece captures an opposing piece, the opponent's piece is removed from the board, and the capturing piece occupies the position on the board of the captured piece. It is required to capture the attacking piece when there is no other way of getting out of check.

Three Dimensions

The concept of rows and columns on a two-dimensional playing board must now be redefined for three dimensions. Let a "row" be redefined to mean a sequence of alternating light and dark contiguous squares in a straight line. Therefore, a row can be in two horizontal directions and one vertical direction, hence three dimensions (Figure 1). A vertical row may also be called a column. Note that in the vertical direction the squares also alternate light and dark.

The black square marked with an X is part of two horizontal rows and one vertical row (or column).

Note that squares alternate in color from light to dark along a row.

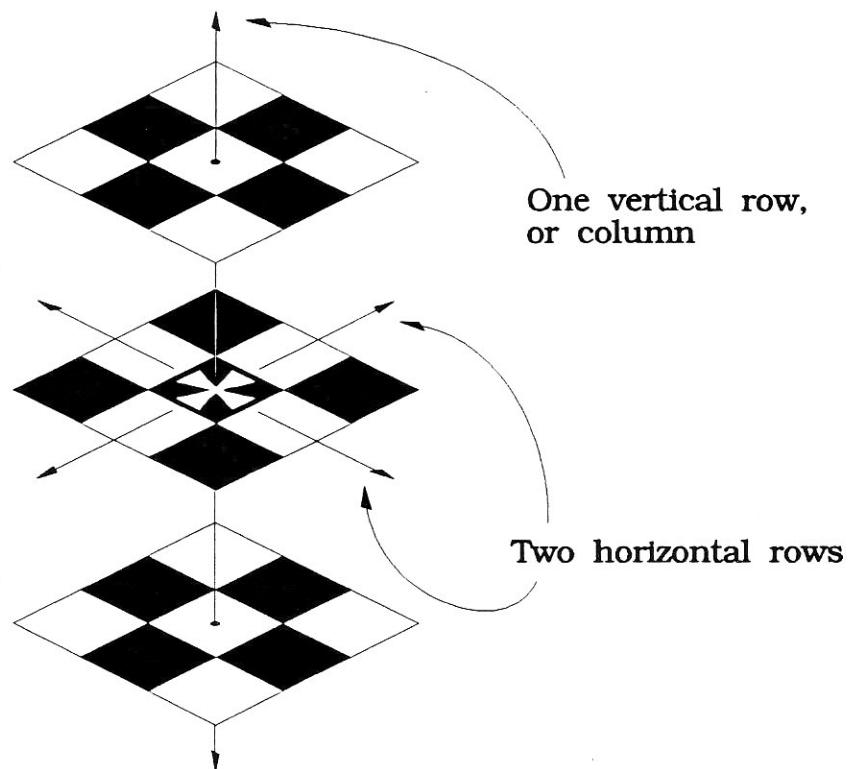


Figure 1. The definition of a row

A "diagonal" is defined as a sequence of adjoining squares of the same color along a straight line. For every pair of intersecting rows there is a pair of diagonals. There are a pair of diagonals in the horizontal plane, and two pairs of diagonals in the vertical planes for a total of six diagonals (Figure 2). Again, a diagonal move always stays on the same color. This is a key definition.

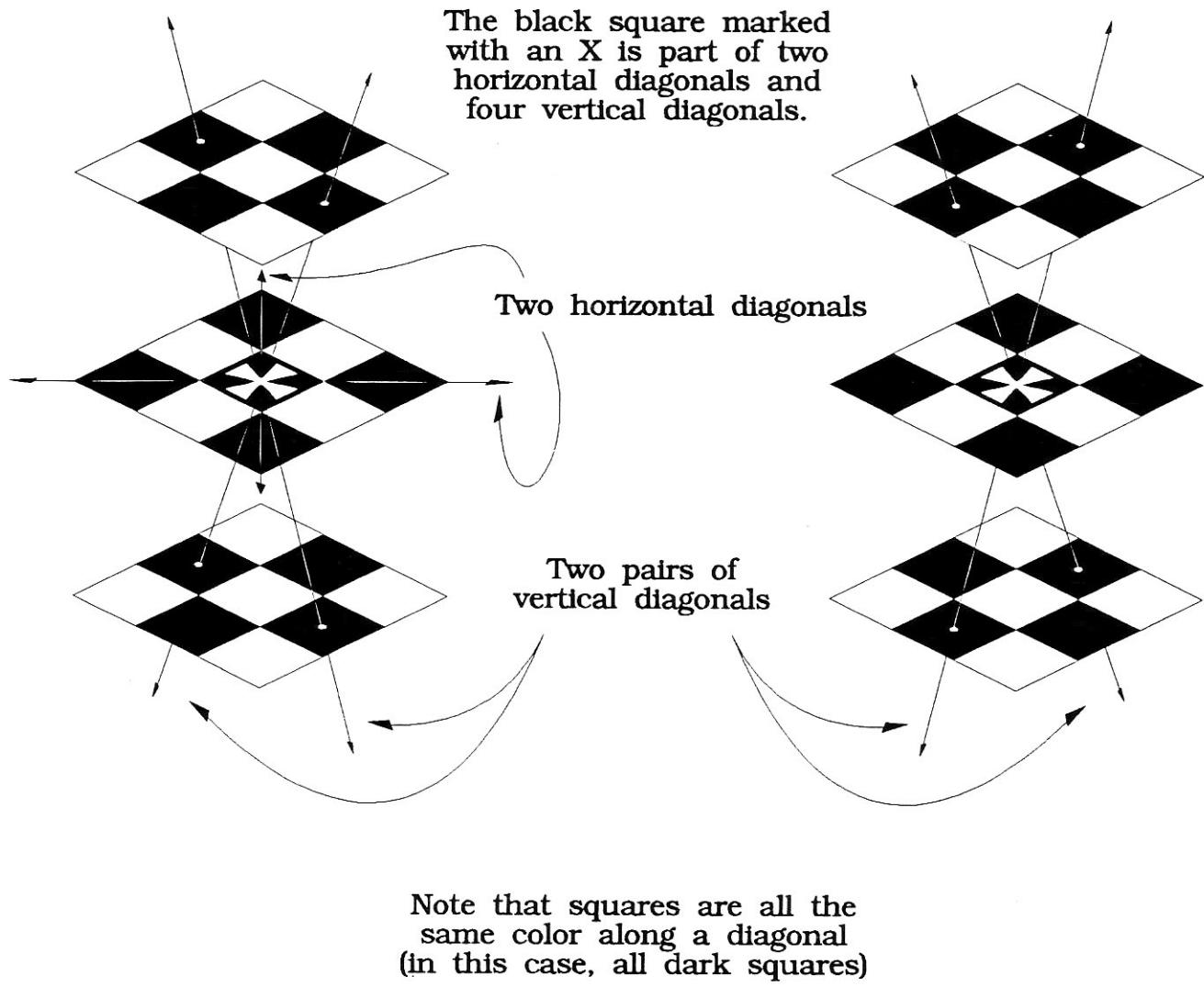
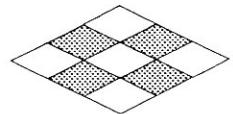
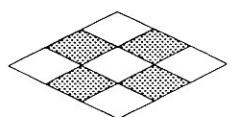


Figure 2. The definition of a diagonal

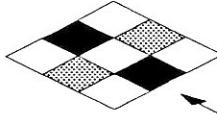
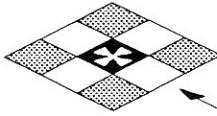
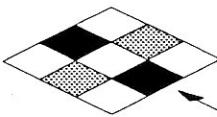
The three-dimensional playing field is restricted to the three mutually perpendicular planes defined by any pair of 3-D rows relative to the position of a playing piece. The three planes are: 1) the horizontal plane or level that the piece is currently on (Figure 3a), 2) the vertical plane that contains the vertical row and a horizontal row (Figure 3b), 3) the vertical plane that contains the vertical row and the other horizontal row (Figure 3c). Any squares outside of these three planes (relative to a playing piece) are not accessible.

The horizontal plane

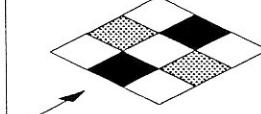
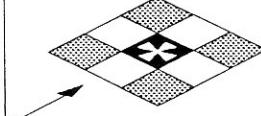
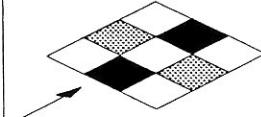


(a)

Two vertical planes



(b)



(c)

Figure 3. The allowed playing field

The Board

The playing board is a 64-square checkerboard broken up and re-arranged into three dimensions. The additional dimension is in the vertical direction. The Hyperchess board has eight levels, and these levels from top to bottom have the following number of squares: 1, 4, 11, 16, 16, 11, 4, 1. The eight levels are numbered 1 through 8. The shapes of the individual levels are shown in Figure 4.

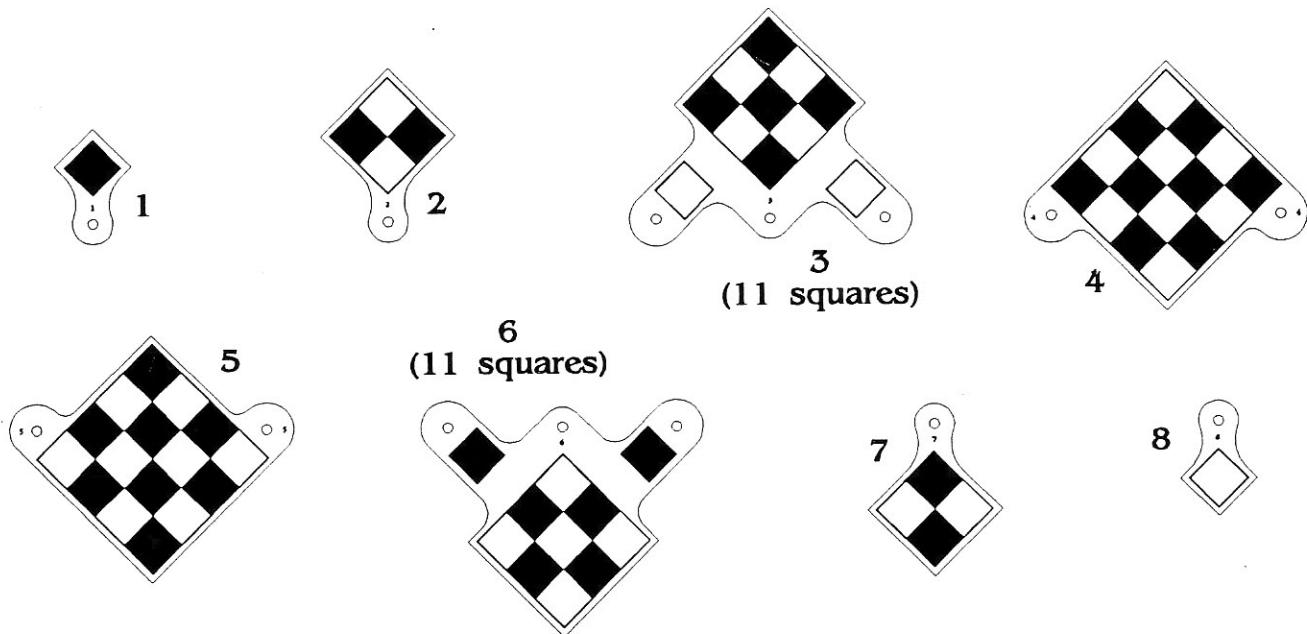


Figure 4. Hyperchess board layout

A piece may move only when it has a continuous path. A piece has a continuous path when there are no missing squares along its direction of movement. There are two isolated squares on each of the board levels 3 and 6. These squares are on the same level, but are inaccessible from other squares on the same level. The reason that these squares are inaccessible from the same level is because of the one-square gap, which interrupts the continuous path. However, these squares may be reached from or through the center levels (4 and 5).

The Start of the Game

At the start of the game the opposing pieces are placed on the upper and lower three levels as shown in Figure 5. Note that each Queen is on its own color, and each side has two Bishops, one on a light square and one on a dark square. In addition, the King and Rooks start on their own colors. The Knights start on their opposite color. White always goes first.

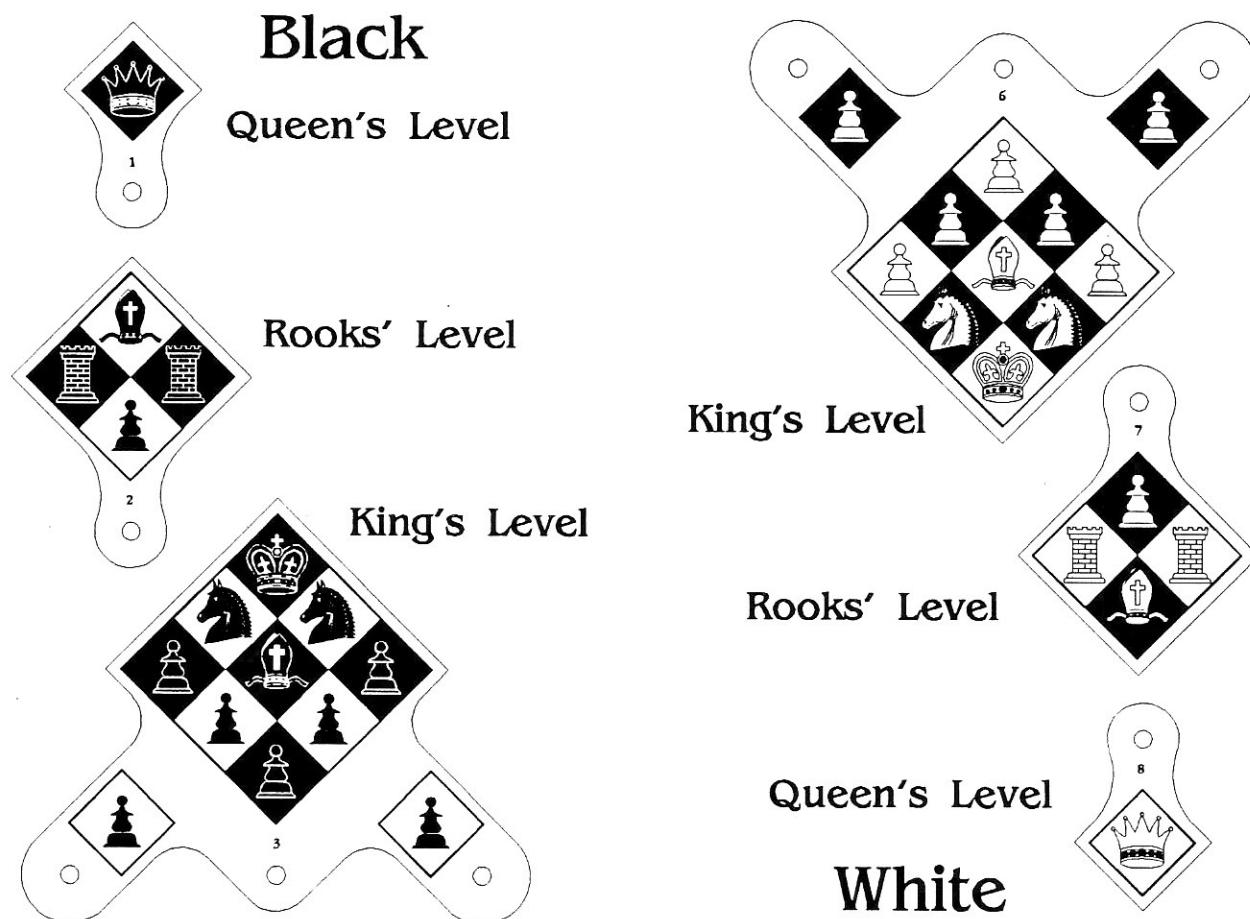
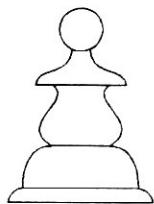


Figure 5. Starting Positions

The Moves

Pawn



A Pawn moves one square at a time and to a square of opposite color. If another piece is in its path, it may not move. While a Pawn remains on the same level, it may move in any direction horizontally along a row. If a Pawn changes levels, it may only advance to a level in the direction toward the opposing Queen's level. The Pawn is the only piece that has this "forward-motion" restriction.

There are three Pawns (per player) that have the option of moving two squares on their first move (provided that there is a clear path). The Pawn on the Rook's level may advance two levels straight down (or up) toward the opposing Queen's level (figure 6a). The other two Pawns that may move two squares are shown in figure 6b.

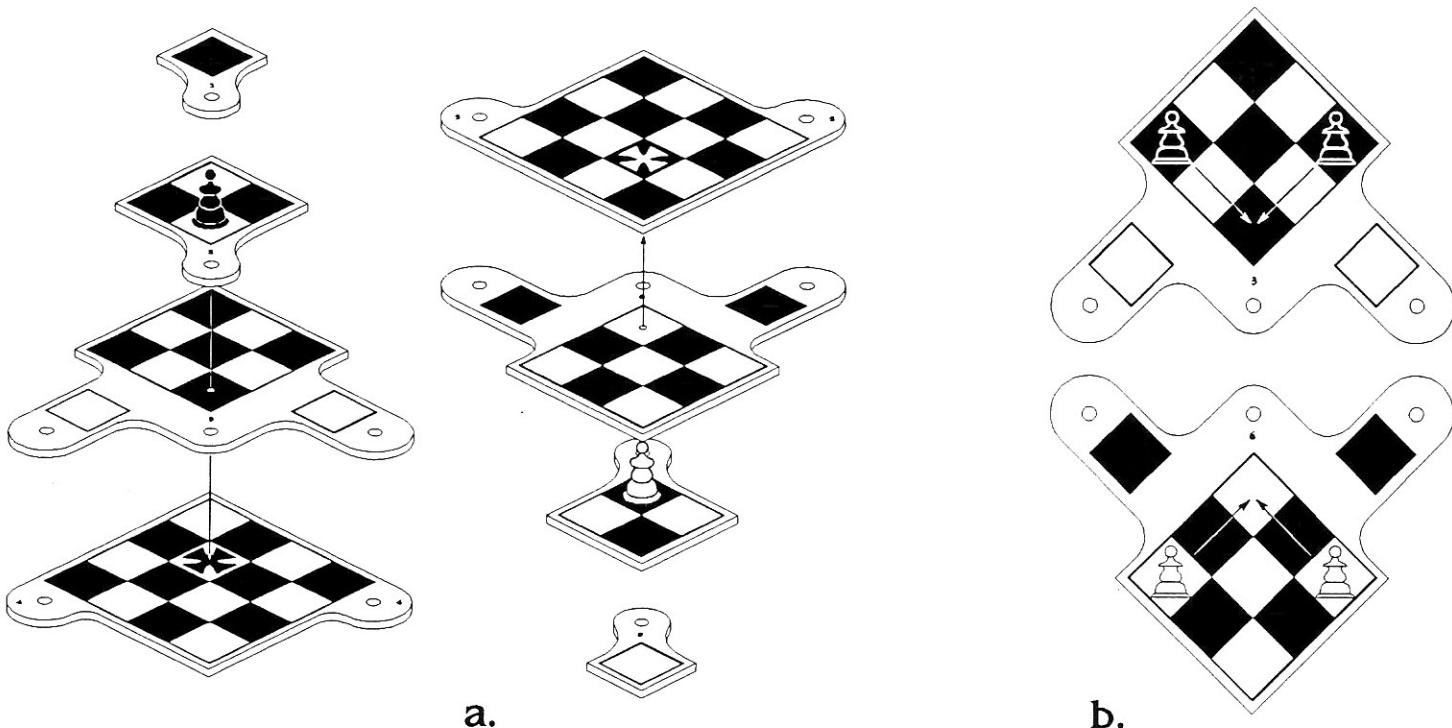
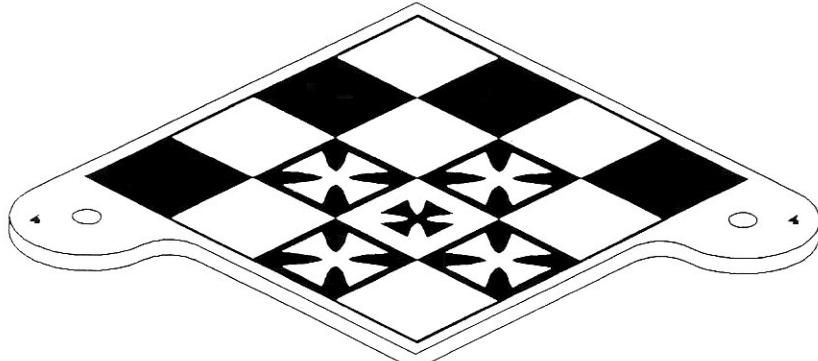
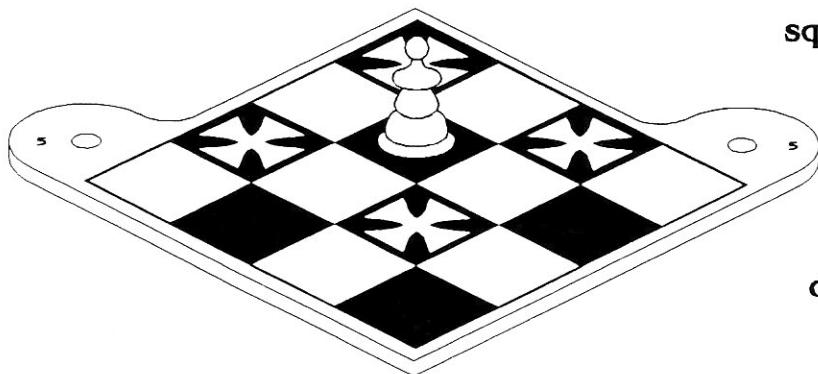


Figure 6. Special Pawn movement

The Pawn may capture an opponent's piece by moving one square in a diagonal direction, removing the opponent's piece and taking its place. There are a maximum of eight squares that a Pawn might move during a capture, four on its current level, and four on the next level as shown in figure 7.



The eight black squares marked by the white X's indicate the maximum of 8 positions of capture.



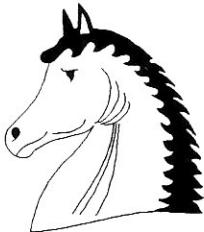
The white square marked with the black X is the square directly above the Pawn.

Upward is the "forward" direction for the white Pawn.

Figure 7. How the Pawn captures

If a pawn should reach the opponent's Queen's level, it may be exchanged for any piece except for the King, even if that piece is still on the board. Since the Queen is usually the piece that the Pawn is exchanged for, this is called "Queening the Pawn".

Knight



The Knight is the only piece that may jump over other pieces. It moves in an L-shaped path to a square of opposite color. An L-shaped move involves three squares: a one square move and a two square move at right angles to each other. Figure 8a illustrates this move on a horizontal level, and figure 8b shows a multi-level move. Remember that for a piece to move it must have a continuous path.

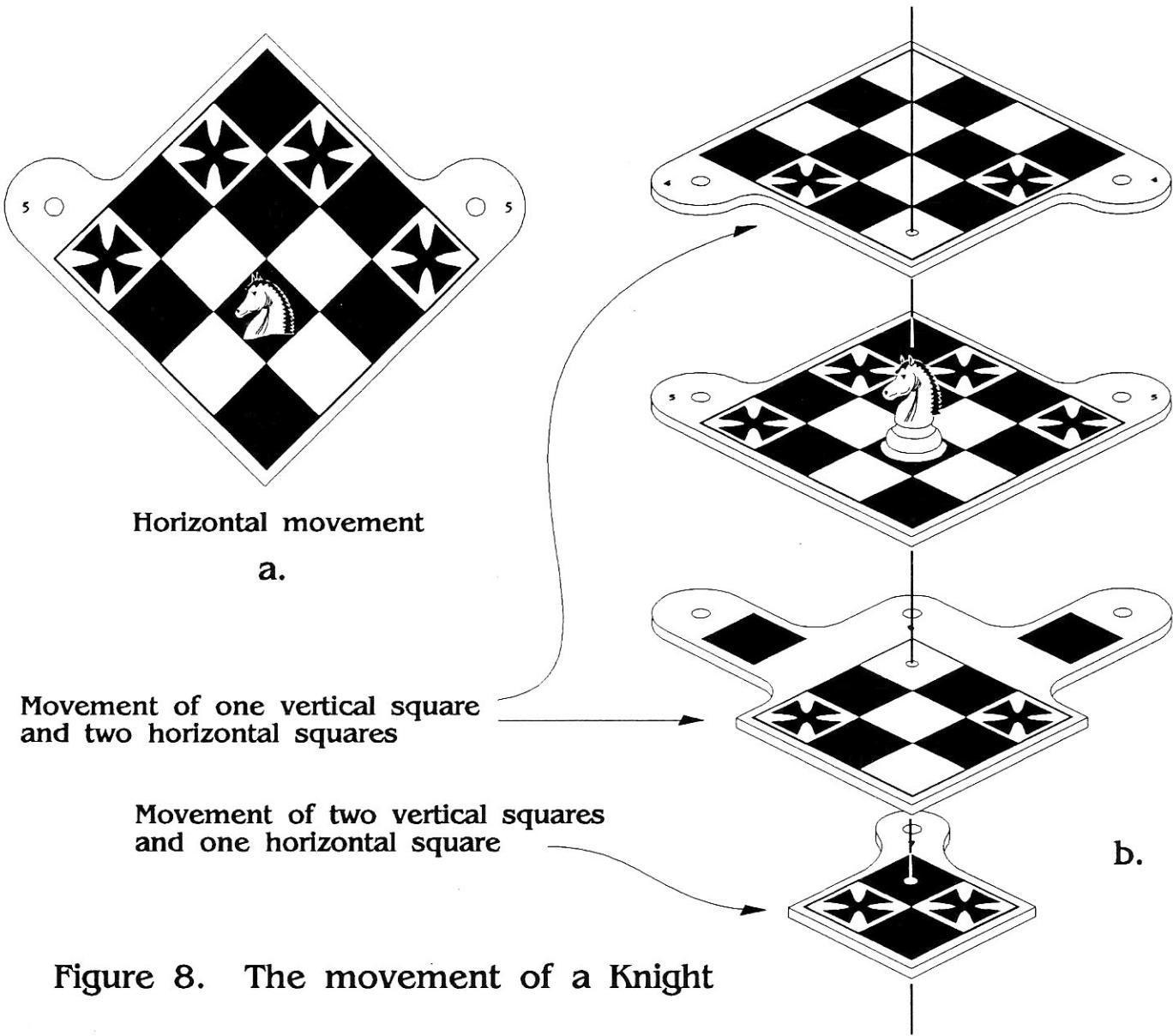
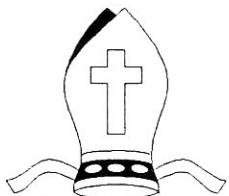


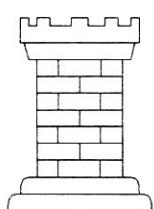
Figure 8. The movement of a Knight

Bishop



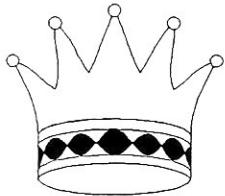
The Bishop can move any number of spaces at a time, along a diagonal. Remember that a diagonal path (as defined under the "Three Dimensions" section) is always a sequence of like-colored squares. Each side has a Bishop on a white square and one on a black square.

Rook



The Rook (or Castle) can move any number of squares along a clear path along a row or column (as defined earlier).

Queen



The Queen combines the moves of the Bishop and Rook. The Queen may move any number of squares along a clear path on a row or diagonal.

King



The King may move in any direction that a Queen can move, except that he may move only one square each turn (except for castling). The King may capture any piece in his path, but cannot himself be captured. Therefore, the King cannot move into a position that would expose himself to attack from an opponent's piece. For the same reason, opposing Kings cannot approach within one square of each other.

Castling

Castling involves the movement of the King and a Rook during one turn. The conditions for castling are as follows.

- 1) Neither the King nor the Rook may have previously moved.
- 2) The row on which the King will move must be clear of pieces.
- 3) The space on the King's level below (or above) the Rook is open.
- 4) The Rook in question is on the same side as the King's empty row.
- 5) The King may not move across a square which is under attack by an opponent's piece.
- 6) The King is not currently under Check.

The player castles by moving the King two squares along the empty row, and moves the Rook straight down (or straight up) to the King's level to a position next to the King (Figure 9).

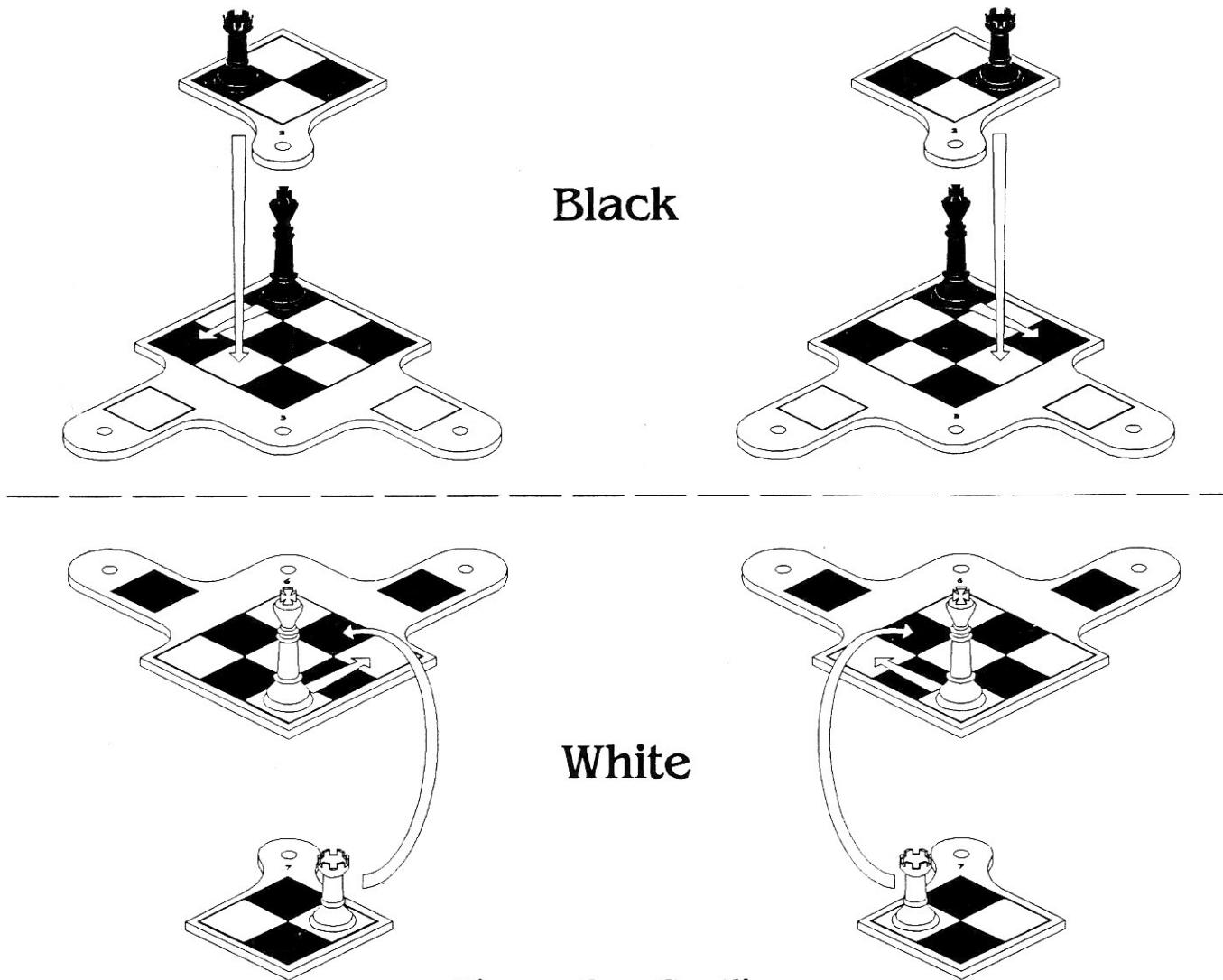


Figure 9. Castling

Other Rules

Stalemate in Hyperchess is defined the same as for the standard chess game. There is no "en passant" move for pawns in Hyperchess. Any other rules of chess may be applied to Hyperchess if desired.

Maintenance

Levels may be dusted with a damp, lint-free, soft cloth. Avoid using solvents or household cleaning agents that may harm acrylic plastic. Protect Hyperchess from heat and direct sunlight . For storage, remove the chessmen.