Here we want to exploit planning in order to solve some simplified chess puzzles. Usually, the goal of chess puzzles is to checkmate the opponent, regardless of the move the opponents make. Here we assume that the opponent is actually not making any move, and our goal is to remove all of its pieces from the board. Specifically, the planner is controlling black pieces, and should remove all the white pieces from the board. White pieces do not move.
Quality of plans is measured in terms of number of moves needed to achieve the goal.

Domain model can be encoded in PDDL, using as features: STRIPS, negative preconditions and conditional effects.
We firstly provide a description of the (considered subset) chess rules, then move to an example of a problem that we would like to be solved, and finally describe 2 problems that have to be encoded --beside the main domain model-- by the participant.

CHESS GAME (relevant rules)

Chess is played on a square board of 8 rows (called ranks and denoted with numbers 1 to 8) and 8 columns (called files and denoted with letters a to h). The colours of the squares alternate and are referred to as "light" and "dark" squares. The board has a dark square in position a1, light in position a2, etc. In this version of chess only 4x4 boards will be considered. Board is always a square.

By convention, the game pieces are divided into white and black sets. In our configuration, the planner controls black pieces, while white pieces represent the opponent.

Pieces are moved to either an unoccupied square or one occupied by an opponent's piece, which is captured and removed from play. There must not be 2 pieces of the same colour on the same square, at the same time. The planner cannot decide to "pass"; at each turn it has to make a movement. It is not allowed to move two pieces in parallel: only one piece can be moved per turn. The game finishes, and the goal is achieved, when no more white pieces are still on the board.

Each chess piece has its own style of moving. Here we consider only the follows:

- The king moves one square in any direction.
- The knight moves to any of the closest squares that are not on the same rank, file, or diagonal, thus the move forms an "L"-shape: two squares vertically and one square horizontally, or two squares horizontally and one square vertically. The knight is the only piece that can leap over other pieces.
- The pawn may move forward (i.e., from bottom to top of the board) to the unoccupied square immediately in front of it on the same file. It moves only forward, i.e. the square the pawn is moved to has a higher rank value. The forward move cannot be done if the square immediately in front of the pawn is occupied. The pawn may capture a white piece on a square diagonally in front of it on an adjacent file, by moving to that square.
- In this version of chess, the rook can move only horizontally along files. It can be moved either to the end of the file or to the first position occupied by a white piece. In the latter case, the white piece is captured and removed. The rook cannot leap over pieces. If the closest piece to the rook in one direction of the file is a black piece, than the rook cannot be moved in that direction.

The white pieces are all of type pawn, even though they do not move at all.

EXAMPLE OF CHESS PUZZLE

In this example we are considering a smaller version of the chess board, of size 4x4. White pieces are in positions: a4, c4, a3, d1.
There are 4 black pieces: 1 pawn --initial position b3--, 1 king --initial position d2--, 1 knight --initial position b1--, and 1 rook --initial position d4.
One valid (and actually optimal) plan for solving this puzzle is:
1. move diagonally the pawn in a4.
2. move the knight in a3.
3. move the king backward to d1.
4. move the rook to c4.

PROBLEMS TO BE ENCODED

** problem A
Board 4x4. White pieces in positions: a4, b4, a1, b1.
2 black pieces:
- 1 rook in position d4
- 1 knight in position c4

** problem B

Board 4x4. White pieces: a2, b2, b3, b4, d1, c1

4 black pieces:
- 1 pawn in position a1
- 1 pawn in position b1
- 1 king in position d4.