

Mathematics 2084H – Recreational mathematics

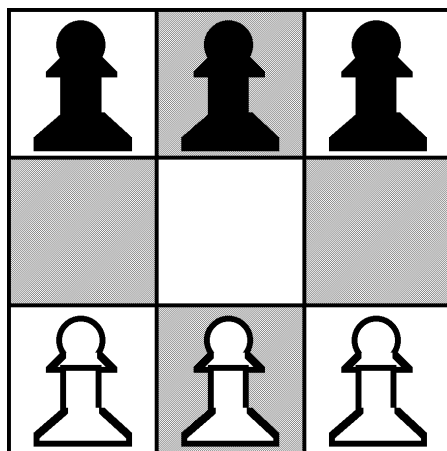
TRENT UNIVERSITY, Winter 2009

Assignment #1

Due on Friday, 16 January, 2009.

Pawn Shop

Consider the following highly simplified variation of chess, played with pawns only on a 3×3 board. The initial position is given in the following diagram:



White moves first, after which the players take turns. Pawns move and capture just as in normal chess, except that that pawns are *not* allowed to move forward two squares on their first move, and there are consequently no *en passant* captures. The game is won by the player who first gets a pawn into his or her last rank, *i.e.* the row nearest to his or her opponent. If a stalemate occurs – a position in which the player whose turn it is has no legal move – the game is drawn.

1. Assuming both players play as well as possible, who wins, white or black, or is the game drawn? Give your reasoning, making it as complete and correct as you can. [6]
2. Suppose we play the same game on a $3 \times n$ chess board, with n pawns on a side. What is the outcome for $n \neq 3$, assuming best play on both sides? Again, give your reasoning. [4]