Game Theory (STAT 155) Worksheet #2, 02/01/2021

1. Consider the following game: there are two piles of chips, two players make moves in turns. At each turn the player can take some chips from one of the piles: either from 1 to 2 chips from the first pile, or from 1 to 3 chips from the second one. Denote the number of chips in the first pile as m, and in the second — as n. For every pair (m, n) s.t. $m \leq 6, n \leq 6$ determine, is this position in P or in N.

2. For each of the following positions in Nim determine if that is a P- or N-position. If it is a N-position, find all the winning first moves.

   (a) (1, 2, 3);

   (b) (5, 3, 2);

   (c) (7, 12, 13, 11);

3. **Northott's Game**. A position in Northcott's game is a checkerboard with one black and one white checker on each row. "White" moves the white checkers and "Black" moves the black checkers. A checker may move any number of squares along its (horizontal) row, but may not jump over or onto the other checker. Players move alternately and the last to move wins. Determine who wins if the game starts from the position below and "White" moves first.

   Hint: This game can be reduced to Nim