Math 2001: Homework P1

1. Analyze tic-tac-toe.

   (a) Is there always a winner?

   (b) What is an optimal strategy?

   (c) Does the optimal strategy depend on whether you go first or second?

   Justify your answers as well as possible.

2. How many ways are there of placing 4 non-attacking rooks on an 4×4 chess-board? What about 5 non-attacking rooks on a 5×5 chessboard. Example: there are 2 ways of placing 2 non-attacking rooks on a 2×2 chessboard,
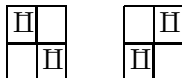
   Can you formulate a guess for how many ways there are to place n non-attacking rooks on an $n \times n$ chessboard?

3. If we assume that

   "There is always sun when the wind is in the East,"

   then which of the following statements are true:

   (a) If it's sunny, then the wind must be in the East,

   (b) If the wind isn't in the East, then it must be overcast,

   (c) If it's overcast, then the wind must not be in the East.

   Give an explanation of your answers.

4. There's a party with 7 guests. If each guest shakes the hand of every other guest, how many handshakes are there?

5. Suppose you are flipping a fair coin. If your first 2 flips ended up "heads," then what is the likelihood that the next flip will be "heads?" What is the likelihood of getting 3 "heads" in a row?