$(MC)^2$, **UT Arlington**
Games
April 13, May 6, 2022

Problem 1. Initially there are 2022 coins on the table. Two players take turns removing 1, 2, 3, or 4 coins. The winner is the one who removes the last coin. Who has a winning strategy? (solved)

Problem 2. On a chessboard a rook is placed on square $a1$. Players take turns moving the rook as many squares as they want, either horizontally to the right or vertically upward. The player who can place the rook on square $h8$ wins. (solved)

Problem 3. There are two decks of 10 cards each. Two players take turns by removing two cards from one deck and one card from the other deck. The player who cannot make a move loses. Which player has a winning strategy? (solved)

Problem 4. On a table there are 20 coins. Two players take turns removing coins from the table. In each turn they can remove $2, 5$ or 6 coins. The first one that cannot make a move loses. Who has a winning strategy? (solved)

Problem 5. A king is placed at the upper left corner of a 2022×2022 chessboard. Players A and B move the king alternately, but the king may not move to a square occupied earlier. The loser is the one who cannot move. Who has a winning strategy?

Problem 6. Players A and B alternately color squares of a 4×4 chessboard. The loser is the one who first completes a colored 2×2 subsquare. Who can force a win?

Problem 7. Players A and B take turns in the following game on an 8×8 board. A marks any free cell of the board, and then B places a 1×2 domino on the board so that it covers 2 free cells, one of which is the one previously marked by A. A wins if it is possible to cover the whole board by dominos, otherwise B wins. Who wins?

Problem 8. Players A and alternately place $+$, $-$, $\cdot$ into the free places between the numbers 1 2 3 ... 99 100. Show that A can make the result

(a) odd.

(b) even.

Problem 9. A and B alternately put white and black knights on the squares of a chessboard, which are unoccupied. In addition a knight may not be placed on a square threatened by an enemy knight (of the other color). The loser is the one who cannot move any more. Who wins?

Problem 10. Can a 6×6 board be covered with 9 T-tetrominoes? If yes - find a way to do the tiling; if no - prove that it cannot be done. What about 8×8 board?

Problem 11. There are two piles of 11 matches each. In one turn, a player must take two matches from one pile and one match from the other. The player who cannot move loses.

Problem 12. There are two piles of matches:

(a) a pile of 101 matches and a pile of 201 matches;

(b) a pile of 100 matches and a pile of 201 matches.

Players take turns removing a number of matches from one pile which is equal to one of the divisors of the number of matches in the other pile. The player removing the last match wins.