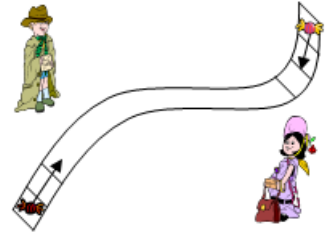# UW Math Circle - Homework 3

1. Two players take turns placing knights on the squares of a chessboard so that no knight can take another. The player who cannot make a move loses. Who has the winning strategy?

2. Chris and Kolya each have one candy and a gameboard that is 30 squares long. Kolya places his candy on one end of the board and Chris places his on the other. Each turn they are allowed to move their candy either 3 or 5 squares towards the other end, but they are never allowed to "skip over" the other player's candy. The player who cannot make a move loses. If Kolya moves first, who has a winning strategy?

3. Steve and Alex bought a box of 18 cookies. They split the cookies into two piles, one with 8 and one with 10, and are playing a game to decide who gets the last, most delicious cookie. In the game, each player is allowed to either eat the same number of cookies from both piles or any amount from a single pile. The player who eats the last cookie wins. Alex goes first. Does either of them have a winning strategy?

4. Newton and Leibniz are playing with matches. They have a matchbox with 300 matches, and they take turns burning at least one and no more than half of the remaining matches. The player who makes the box have only one match wins. Newton goes first. Who has a winning strategy?

5. The number 0 is written on a blackboard. Kolya and Alex take turns adding any integer between 1 and 9 to the number written on the board. The player who reaches 100 wins. If Kolya goes first, who has a winning strategy?