

NIM game : SOLUTION

Rule : This is a game for two players. You put a certain number of matches in front of you. Two players alternately pick 1 ; 2 or 3 matches. The one, who takes the last match, loses.

Solution : You have to let 1 or 5, 9, 13, 17,.... matches to your opponent.

In this situation, you have to apply the following strategy :

- if your opponent removes 1 match, then you remove 3 matches.
- if he removes 2 matches, then you remove 2 matches.
- if he removes 1 matches, then you remove 3 matches.

Finally you and your opponent always remove altogether 4 matches and you remain in a good situation to win. Notice that $4 = 1+3 = 2+2 = 3+1$.

The numbers 1, 5, 9, 13, 17... are a sequence of numbers which can be written as $4n + 1$. This sequence of number is an example of arithmetic sequence.