



MHS
MATH
CLUB
202~~3~~⁴-202~~4~~⁵

Our officers

Markus Hoehn: Co-President

Syoma Zharkov: Co-President

Andrei Mazin: Vice-President

Patrick Fu: Stuco Head

David Li: Honorable mention.



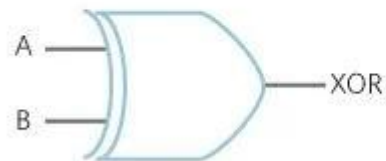


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Game of Nim

$$X = A \oplus B$$



A	B	XOR
0	0	0
0	1	1
1	0	1
1	1	0



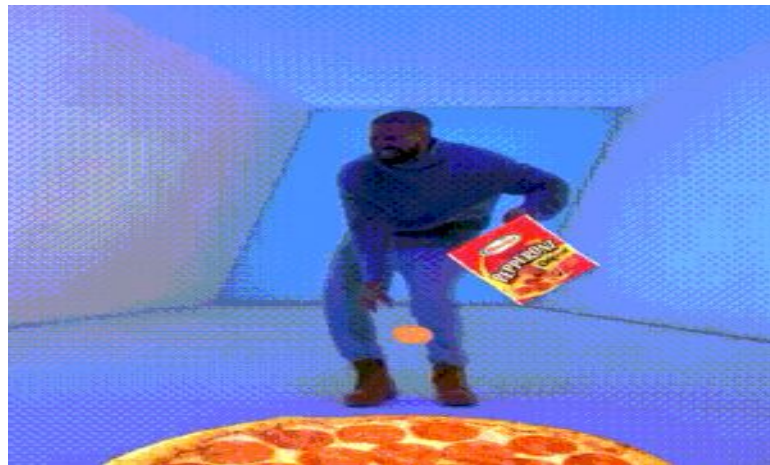
Rules

- 2 players
- On your turn pick a pile and take as many pieces from it as u want (at least one though)
- The player who removes the last piece(s) wins the game



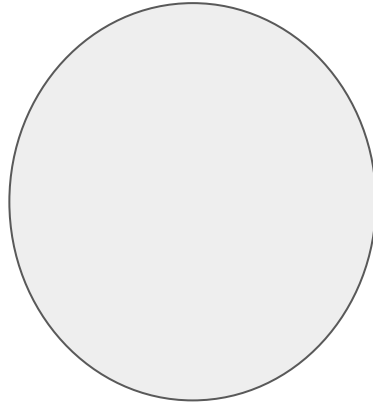
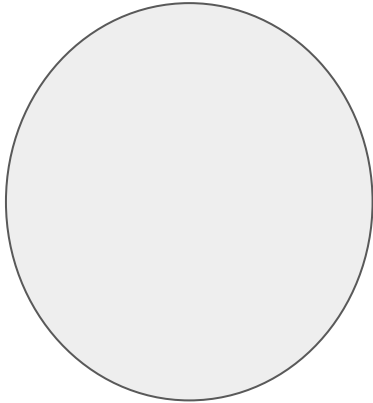
2 piles example

Winner gets pizza



2 pile strat

Copycat the opponent
(match pile sizes)



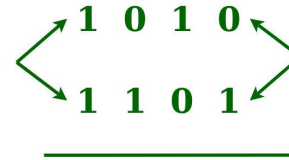
Multiple pile example

Binary and XOR addition

Decimal	Binary
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

XOR of two Binary Strings

Character matches,
So "0" is added to the
answer string



Character Mis-matches,
So "1" is added to the
answer string

0 1 1 1

Multiple pile strat

- If you're in a **winning position** (Nim-Sum $\neq 0$), your goal is to make a move that forces the Nim-Sum to become 0 after your turn.
- To do this, find a heap where reducing the number of stones will result in a new total Nim-Sum of 0.
- Once you identify that group, remove enough stones to make the Nim-Sum 0.