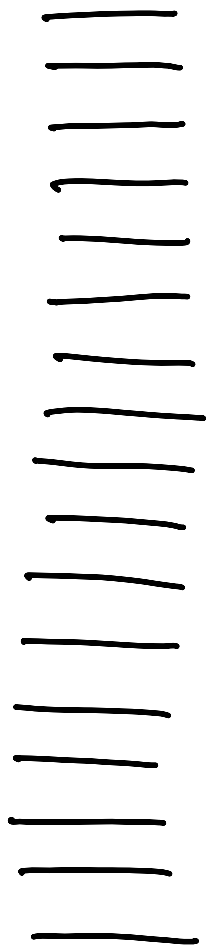
11\3\11

Two players A & B

Player A goes first.



17 chips

player A should win

In a move a player takes some chips.

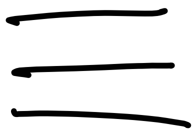
Suppose number of chips a player can take is 1, 2, 3 or 4

Player who removes last chip is the winner.

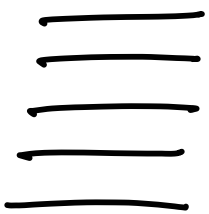
N position : winning position
Next player should win.

P position : losing position
Previous player should win.

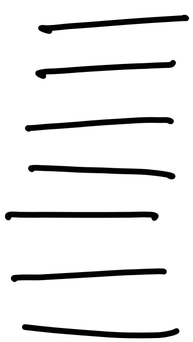
Part of the problem is to determine which positions are N & which are P.



N position take all 3



P position



N position take 2

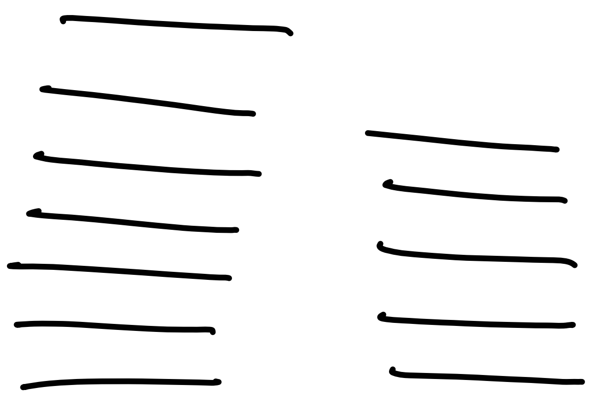
In general

n is a N-position if

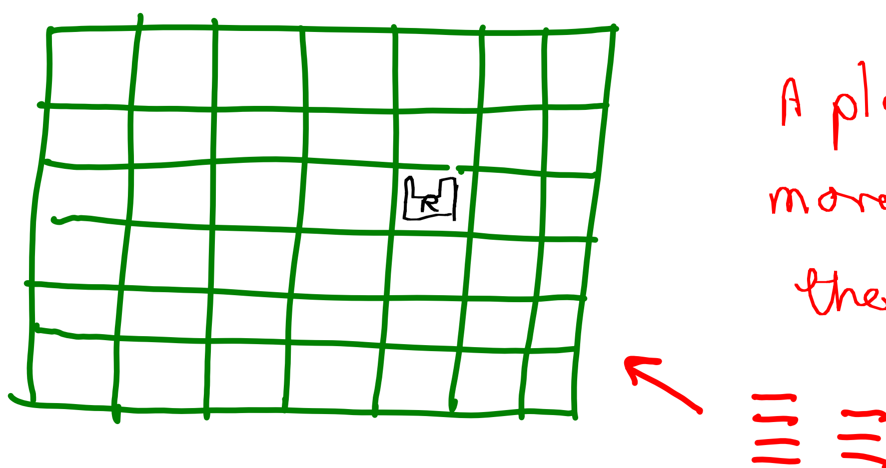
$$n \bmod 5 \neq 0$$

Nim

2-pile game

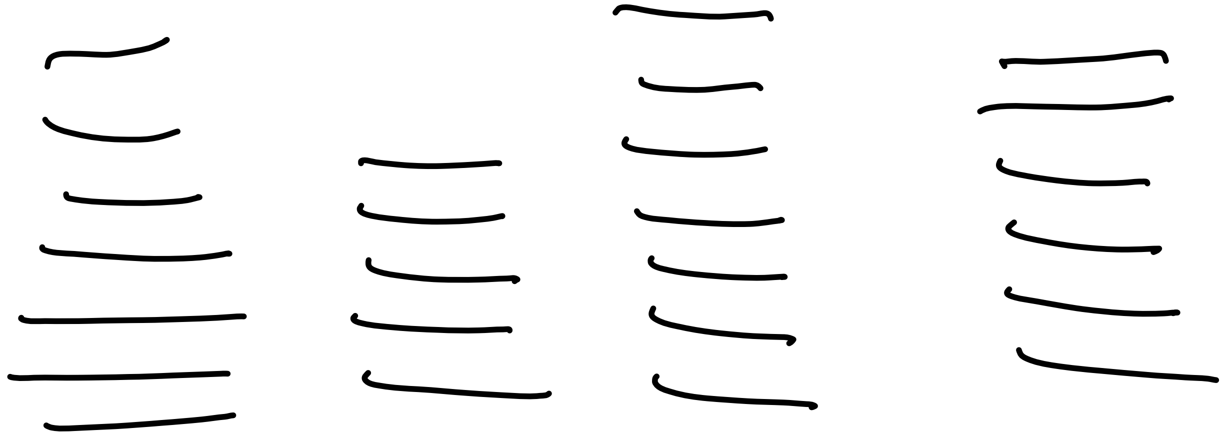


Player can take any number from any non-empty pile



A player can move down or to the left.

P: on diagonal

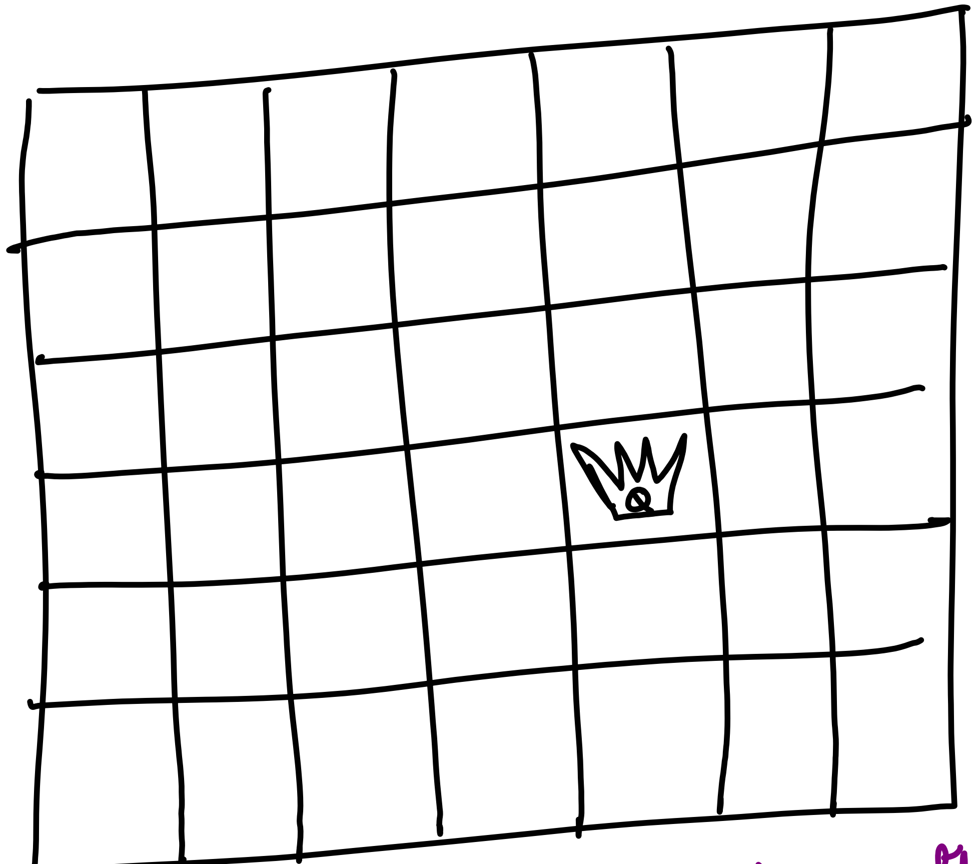


More complicated

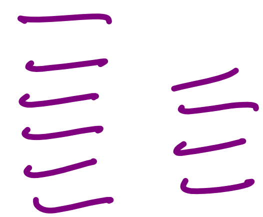
We will do this later

NIM

Wythoff's Nim

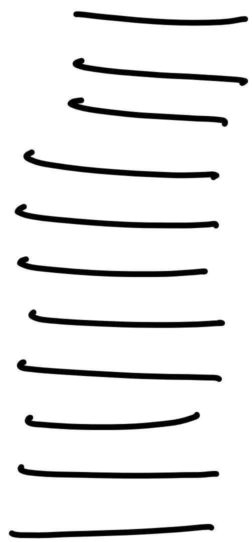


Move, down and to the left.



Take anything from 1 pile or same from both piles

Another take away game



Rule: if last person took x, you can only take $y \leq x$.

Geography (2-player)

A: USA: U.... of ---a

B: Albania:

A: Austria:

B: Argentina.

A: Australia

B: Azherbaijan:

A: Netherlands

A: Switzerland

B: Denmark

A: Khazakstan

B: Nigeria

A: Afghanistan

B: Norway

A : Yemen

B : Nicaragua

A : Angola

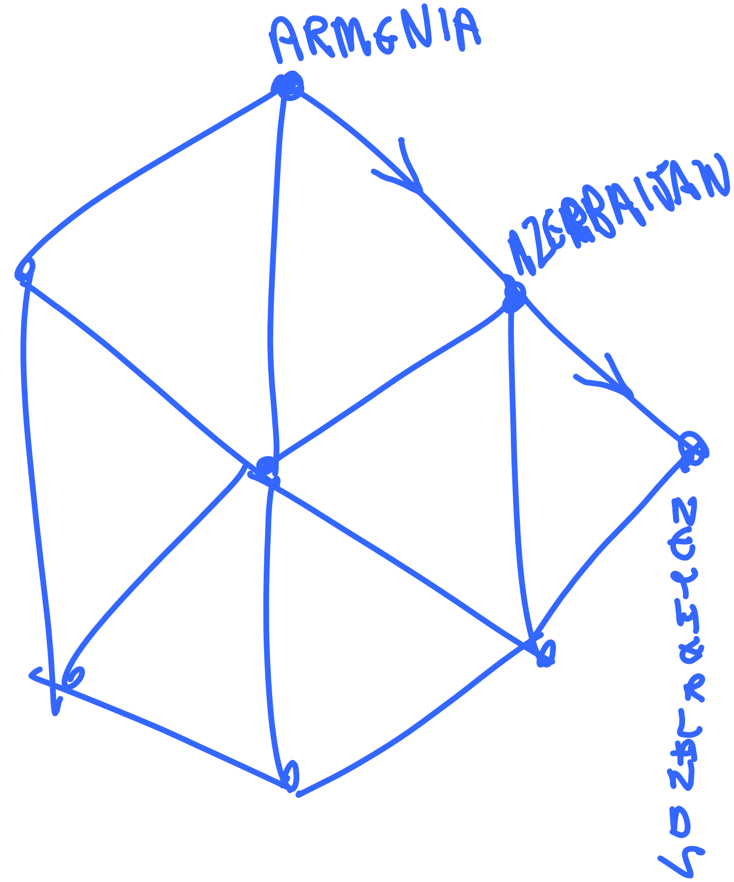
B : Armenia

A : Algeria

B : Andorra

A : Antigua

⋮



Move: traverse an edge; delete a vertex

1	2	3
4	5	6
7	8	9

Abstraction:

Lines: $\{1,2,3\}$, $\{4,5,6\}$, $\{7,8,9\}$

$\{1,4,7\}$. - - - . $\{1,5,9\}$

2 players

X colors numbers Red

O colors numbers Blue

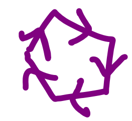
A player wins if they can mono-color a set.

Generalisation: Take any collection of sets.

Abstraction of all these games:

Digraph $D := (V, A)$

no directed cycle



In a move, push token along an edge.