The Game of Nim

If you want to know some more...

Fibonacci Nim

When Nim was very old, he found out that a very wise man, called Fibonacci, had invented a game similar to his. It was also about 2 players who, in turns, retire objects from a pile, but the rules were different: In his turn, **'the player can retire 1 object at least, and at the most the double of the objects that his mate has retired in the previous play'**. Of course, in the first play all the objects cannot be retired, since there would not be game then. Like in the game of Nim, **'the winner is the player who retires the last object from the pile'.**

Nim and the gnomes still go on trying to discover the **winning strategy** in the Fibonacci Nim but, as far as I know, they still have not discovered the way to win when they begin with more than 10 objects.

If you are able to discover it, don´t you dare to say it to any gnome: its favorite fun would finish and, when talking about games, gnomes are very serious and dangerous.

If you try to discover the winning strategy, you will have to act in a similar way to a mathematician would do, following 3 simple but important principles of performance, whose application makes the difficult thing easy and, therefore, allow to solve dozens of apparently very complex mathematical problems successfully:

- **Go from the simplest to the most complex**: begining with the smallest number of objects and go increasing it when I discover its solution.
- **Get the support of what I already know,** to get the solution of what I do not know; if I can leave to the opposite a number of objects that he cannot retire in its totality and with which I know by my study that the one who plays with that number loses, then mine is the winning number; if I cannot, I will be the loser.
- **Make a suitable record of the already done,** to be able to analyze it and go ahead.

So that you can follow these principles, complete the missing data in the following board.

Finally, **analize** orderly the initial number of objects whereupon you can loose, trying to relate it and establishing a general rule. Verify the rule that you think that follows the series of losing numbers

'When I play with this number of objects...'

YOU WILL NEED:

A pile of objects and the board of the analysis of the game.

Board of analysis of the game- Fibonacci Nim

# objects	*# of objects I can retire without the opposite can take the rest/# of objects left to him*	*I win (W) or I loose (L)*	*Winning Play(s)*	*Why do I loose? Why do I win?*
3		L		
4	1/3	W	1	I leave him 3 and with 3 he looses.
5	1/4	L		I cannot leave him 3, and with 4 he wins.
6	1/5	W	1	I leave him5 and with 5 he looses.
7	1/6 ó 2/5	W	2	I leave him5 and with 5 he looses.
23				

24				
25				