Sums of Games -- Perfect Play

The same concept that we used to play three (or more) games of Nim applies equally to any sum of games in which each game has a Nim-value (i.e. a Nimber) attached. In this handout I'll assume we are playing games with "piles". But the same principle applies to other games such as White Knight.

The first thing to remember is that it is the Nim-value of the pile that is important **NOT** the size of the pile.

The second thing to remember is that you want to put your opponent in a position such that the Nimber sum of the Nim-values is 0.

Naturally none of this is useful unless you know the Nim-values of each pile. But you know how to find the Nim-values: You start with simple positions and use Mex to compile a list of all positions.

Here's a table for Take-1,2,3 (the first game we studied):

Size of pile	0	1	2	3	4	5	6	7	8	9	10	11
Nimber value	0	1	2	3	0	1	2	3	0	1	2	3

Suppose you're playing a game of Take-1,2,3 plus one pile of Nim

I.e.You have two piles. From the first (left) you can take only 1 or 2 or 3 but from the second you can take any number.

Here's the position: 7 10

How do you win if it's your turn to move?