HW4, task 3

Our reasoning is based on the sum of the 4 numbers: the player can win only if the sum is not a multiple of 3. When the player decides a move there will be one base against the remaining 3: it makes no difference from which of the 3 to pick from. With this in mind we built a matrix (10 x 10) showing all the possible moves.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | a | a | a | a | a | a | a | a | a | a |
| 2 | a | b | b | b | b | b | b | b | b | b |
| 3 | a | b | X | A | B | x | A | B | x | A |
| 4 | a | b | A | c | x | A | B | x | A | B |
| 5 | a | b | B | x | A | B | x | A | B | x |
| 6 | a | b | x | A | B | x | A | B | x | A |
| 7 | a | b | A | B | x | A | B | x | A | B |
| 8 | a | b | B | x | A | B | x | A | B | x |
| 9 | a | b | x | A | B | x | A | B | x | A |
| 10 | a | b | A | B | x | A | B | x | A | B |

Moves:

A -> pick 1 from the base with biggest number

a -> pick 1 from the base with smallest number

B -> pick 2 of the same base from the base with biggest number

b -> pick 2 of the same base from the base with smallest number

c -> pick 2: one from one base, one from one of the remaining three

x -> no way to win

Conclusions:

* If one of the number is 1 or 2: pick respectively 1 or 2 from that base, eliminating the base (moves a or b)
* If the sum of all bases is: A multiple of 3: the player can’t win

A multiple of 3 + 1: pick 1 from the base with biggest number (move A)

A multiple of 3 + 2: pick 2 of the same base from the base with biggest number (move B)

* The only exception is if one of the 4 numbers is 4 and the remaining 3 sum up to 4: in that case pick 2: one from one base, one from one of the remaining three (move c)