
Game of Nim for three players

P54581_en

Vint-i-unè Concurs de Programació de la UPC - Semifinal (2023-06-28)

Consider this variant of the game of Nim for three players: There are several heaps of stones. By turns, the current player must remove at least one stone from one of the heaps. The player that cannot play loses the game, and the other two players win.

Given a position, described with the number of stones of each heap, can you tell the outcome of the game? Assume that the three players take decisions rationally.

For instance, consider the position $\{1,2\}$. Removing 1 from 2, going to $\{1,1\}$, would be suicidal, because the current player would lose after two more turns. Removing 1 from 1, going to $\{2\}$, would be a better choice, because the next player could decide to remove 1 or 2 stones (he would win anyway), and therefore the current player could eventually win. However, removing 2 from 2, going to $\{1\}$, would guarantee a win. As a conclusion, $\{1,2\}$ is winning for the first and the second player, and losing for the third player.

Let us now consider $\{2,2\}$. Removing 1 from one 2, going to $\{1,2\}$, would be a bad decision, because we already know that $\{1,2\}$ is losing for the third player to play. By contrast, removing one 2, going to $\{2\}$, gives the current player some hope, depending on the decision of the second player, who will definitely win.

Input

Input consists of several positions, each with the number of heaps n , followed by the number of stones of each heap. No heap is empty, and the total sum of stones is at most 30.

Output

For each given position, print three characters with the result of the game. For each player, in order of play, print a 'W' if he will surely win, print an 'L' if he will surely lose, or print a 'D' if he could win or lose.

Sample input

```
1 1
1 30
2 1 2
2 2 1
2 2 2
2 3 2
3 2 2 2
3 11 9 10
15 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

Sample output

```
WLW
WDD
WWL
WWL
DWD
DDD
DDW
DDD
LWW
```

Problem information

Author : Salvador Roura

Generation : 2023-06-28 10:43:46

© Jutge.org, 2006–2023.

<https://jutge.org>