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Hackenbush

Green Hackenbush

Stalk

A stalk of X nodes is same as a nim pile of X height.

Tree

All tree can be converted to a stalk using "Colon Principle". If two stalk meet at a node of size $S1$ and $S2$ (excluding the common point), then those two can be replaced by a single stalk of size $S1 \oplus S2$.

Problem: [HDU Circle Game](#)

Red and Blue Hackenbush

Stalk

Until the parity changes for the first time, each number is worth $+V$ or $-V$ (depending on whether it is Even or Odd, respectively). Once parity change occurs, each subsequent number (regardless of being Even or Odd), is worth half of the previous value, with a $+/-$ corresponding to the parity.

For example: `BBBRB = +V +V +V -V/2 -V/4`. Now sum them to get value of each stalk.

For multiple stalk, instead of using XOR, we add them normally. If positive then Blue wins and if negative Red wins.

Problem: [CC CHEFGM](#)

[Math Exchange](#)