$15 to the first person who presents, in class, a solution to this problem:

Game: Surge or Purge (Kashyap & Erol, 2023)

Two teams start with populations a and b, positive integers. These teams play repeated matches against each other.

- For each match, the probability of team A winning is $\frac{a}{a+b}$, and team B winning is $\frac{b}{a+b}$) where a and b represent current populations.

- When a team wins, $\lceil 2/3 \rceil$ of its population dies!

- When a team loses, $\lceil 1/2 \rceil$ of its population dies!

- The game ends when either team has 0 population remaining, with the winner being the team with nonzero population. Note: there can be 0 winners :)

Problem

- find the expected value of each team winning
- find the expected number of matches before the game ends, in each end-scenario.

Bonus

- Repeat where $\frac{2}{3}$ and $\frac{1}{2}$ in the game are arbitrary values in $(0,1)$.

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