Context: Game theoretic models or fair division approaches often allow for provably better solutions (in the sense that everyone is content with the outcome) to combinatorial problems while still allowing opposed parties to act locally in their best interest. Two recent approaches to applying this logic to redistricting problems are discussed below. This could either serve as a jumping off point for exploring more traditional fair division or as a way to insert redistricting examples into a game theory class.

Goal(s): Explore some of the initial tradeoffs in redistricting and compare basic properties of feasible plans. Build intuition for redistricting tradeoffs. Play games!

Game Examples

- **'Cooperative War'** (Monte Carlo Introduction) There are lots of potential variants of this game, and a simulated version is available at this link.
  - Deal two cards to each player
  - The dealer plays their highest card
  - Play continues to the left with each player playing their highest card, if it is higher than the previously played card
  - Once every player has played a card, the dealer plays their remaining card and play continues to the left
  - If at any time the current player can't play a card (because their highest card is lower than the previously played card) the team loses.
  - Otherwise, everyone gets to play all of their cards, and the team wins!
- **I cut, you freeze** (motivated by: A partisan districting protocol with provably nonpartisan outcomes W. Pegden, A.D. Procaccia, and D. Yu)
  - Each player starts with a 6x6 (10x10) grid on a whiteboard or online interface, with each square filled with an R or a D and draws a districting plan with 6 (10) districts
  - After drawing your initial plan, switch maps with your partner. You choose one of their districts to keep and then draw 5 districts in the remaining space.
  - Keep alternating, preserving a single district from the previous map at each step until the whole map is filled in.
  - Which of the two maps is 'better'? How many seats does each party expect to win?
- **Define-Combine** (motivated by: A Partisan Solution to Partisan Gerrymandering: The Define-Combine Procedure M. Palmer, B. Schneer, and K. DeLuca)
  - Each player starts with a 6x6 (10x10) grid on a whiteboard or online interface, with each square filled with an R or a D and draws a districting plan with 6 (10) districts
  - After drawing your initial plan, switch maps with your partner. You choose a pairing of the districts (so create a total of 3 (5) districts) to maximize your party's representation.
  - Which of the two maps is 'better'? How many seats does each party expect to win?
  - You'll probably want to repeat this one several times to get a sense for it.