

Krea - RAM Maths Circle - Session 2

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16/8/2026

1 Overview

Exploration of game theory and payoff matrices for more than 2 players and scaling of the method to obtain dominant strategies.

2 Payoff Matrices

1. Games for 3 players:

- How will you represent the payoff matrix?
- No single grid. Each player asks: What is best for me, for all the possible combination of the two other players' choices?
- Checking dominant strategies in every scenario of what the other two pick.

2. Unequal payoffs:

- If the three people get different payoffs as their highest payoffs in their SDSE, is it fair?
- Fairness doesn't matter for the analysis. An SDSE tells you what rational players will do, so that they earn the most among the options they have (and won't compare with what others get).

3. Games for n players:

- How many combinations of the other $n-1$ players would each player have to consider, assuming that each player has to choose among 2 options?
- Do some of your moves depend on what the other people play?

4. Playing optimally

- Doesn't guarantee the best outcome.
- Guarantees you couldn't do better given what everyone else is doing.

3 Challenge

Design a two-player game with each having two choices.

- Both players have a dominant strategy.
- The SDSE gives both players a worse payoff than some other outcome in the game.
- Is such a game possible? If so, design one. If not, give a reason for why it fails.

