

## Scoring tournaments

- round robin: everybody meets everybody else once
- scoring table determines the tournament winner
  - players are rewarded with scoring points
  - winner and tie
- matches are independent from one another



## Reduction to a graph

- $n$  players
- clique  $K_n$
- players as vertices, matches as edges
- how to organize the rounds?
  - a player has at most one match in a round
  - a round has as many matches as possible



## Reduction to a graph (cont'd)

- if  $n$  is odd, partition the edges of the clique to  $(n - 1) / 2$  disjoint sets
  - in each turn, one player is resting
  - player  $p_i$  rests in the round  $i$
- if  $n$  is even, reduce the problem
  - player  $p_{n-1}$  is taken out from the clique
  - solve the pairings for  $n - 1$  players as above
  - for each round, pair the resting player  $p_i$  with player  $p_{n-1}$

## Round robin with seven players

round	matches			resting
0	1 - 6	2 - 5	3 - 4	0
1	2 - 0	3 - 6	4 - 5	1
2	3 - 1	4 - 0	5 - 6	2
3	4 - 2	5 - 1	6 - 0	3
4	5 - 3	6 - 2	0 - 1	4
5	6 - 4	0 - 3	1 - 2	5
6	0 - 5	1 - 4	2 - 3	6

## Normalized round robin

- who is the resting player in a given round?
  - answered
- given two players, in which round they will face one another?
  - no simple rule?
- change the selection of the resting player
  - resting player:  $r \cdot \lfloor (n + 1) / 2 \rfloor \bmod n$
  - if  $n$  is odd,  $p_i$  and  $p_j$  will face in the round  $i + j \bmod (\text{number of rounds})$

## Real-world tournament examples

- boxing
  - reigning champion and challengers
- sport wrestling
  - double elimination: consolation bracket
- professional wrestling
  - royal rumble
- World Cup
- ice hockey championship
- snooker

## Practical considerations

- home matches
- venue bookings
- travelling times
- risk management
- other costs

