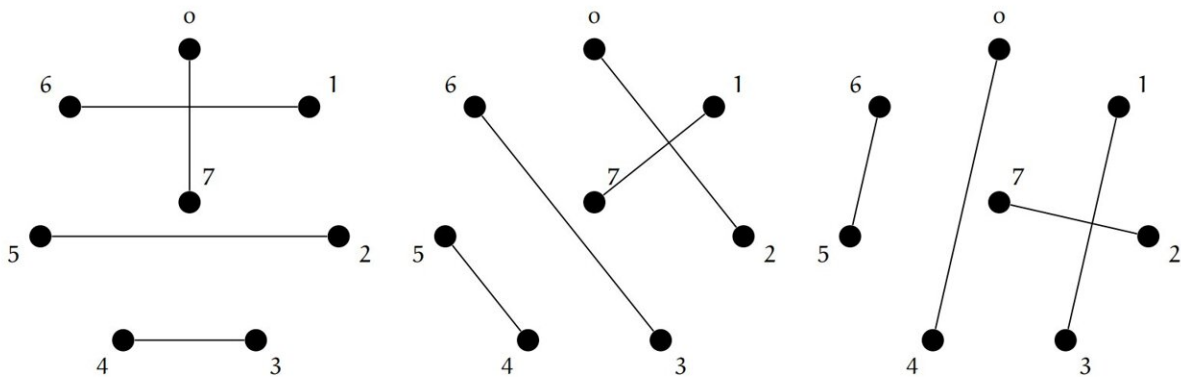


In search of the perfect match schedule

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Visualization of the circle method on 8 teams. Credit: *Fairness and Flexibility in Sport Scheduling* (2022).

Sports and competition are inextricably linked. But producing the optimal match schedule is a sport in itself. Mathematician Roel Lambers studied ways to ensure that darts players and teams playing either soccer or a Dutch regional sport called beugelen are matched up as fairly as possible. He defended his thesis on Friday November 11th at the Department of Mathematics and Computer Science.

Matches in a tournament among tennis friends can be organized fairly easily, but upscale to a sports federation event and the complexity involved in meeting the demands of the various parties involved is much greater. Not only are there the athletes to consider, but the spectators,

hall managers, and TV broadcasters also want to have a hand in designing the match [schedule](#), and all bring their own priorities. A sports federation represents [sports clubs](#), which in turn are a conglomeration of teams.

And it is precisely because there are so many teams that the array of possible match schedules is gigantic, explains doctoral candidate Roel Lambers. So which one is the right one? Over the past four years Lambers has studied how the optimum match schedule can be drawn up for various types of competition.

Schoolgirls

The origins of match scheduling can be traced to the middle of the nineteenth century, to an English mathematician named Thomas Kirkman and his schoolgirl problem. He posed this problem: fifteen young ladies in a school walk out three abreast for seven days in succession: it is required to arrange them daily so that no two shall walk twice abreast.

On the whiteboard behind him, Lambers draws a number of dots and connecting lines—since childhood he has enjoyed producing diagrams, a process he likens to solving a Sudoku puzzle: applying rules, spotting something, taking the next step. "Nice and straightforward." Meanwhile, on the board a diagram is forming in which everyone encounters everyone else just once, and this approach can be applied to the world of sport.

Single round robin

"This system is called a single round robin. When every player or team meets twice, perhaps because they are all playing both home and away

games, you have a double round robin. If there are no more than fifteen participants, I can produce a fixtures schedule by hand, but once extra constraints are added, even a computer will find it a challenge."

According to Lambers, the solution lies in improving the formulations, and a satisfying schedule can be achieved more quickly with new algorithms. "First, you can establish the home and away fixtures for each team. The art is to construct the sets in such a way that you give yourself maximum flexibility to meet the other constraints."

"This is essential given that the task of drawing up the right match schedule is enormously complex. You have multiple teams, for example, within a soccer or hockey club, and they can't all play at home at the same time. We demonstrate an elegant way of solving this problem by creating couples within the club, and we offer, among other things, constructions for spreading opponents equally throughout the season."

Not fair

While a match schedule provides clarity about who must play whom, it is also important that both parties start out with an equal chance of winning. As an enthusiastic follower of sport—he knows the results pages on Teletekst by heart—Lambers still too often finds himself shouting "Not fair!", and that needn't be the case. And so in his thesis he proposes a number of methods for organizing matches more fairly.

"In a recent chess tournament every opponent of the eventual tournament winner had played against the previous day's number one player. There's a lot of psychology going on there. How much influence does a difficult game, which you might have conceded, have on your next match? Any possible impact can be avoided with the right match scheduling."

Darts

"In darts too, we saw several instances where there was some kind of imbalance involved in how winners were being matched up to play one another. We approached the darts federation, suggested a fairer method, and ended up talking about how other constraints could also be taken into account. Sports scheduling involves constantly adapting and solving new problems."

There are numerous other examples. An international volleyball competition in which one team has cross more continents than another team; a hockey championship in which the pool winners may have to wait a week before their next match; or the psychological advantage of taking the first ball in a series of penalty strikes. For each and every case Lambers offers algorithms and methods that pave the way for better and fairer competition.

Practice

And do these recommendations work in practice? Absolutely, Lambers nods enthusiastically. He was already producing schedules for the competition run by the Netherlands Beugel Federation, an indoor sport popular in Brabant in which a ball has to be knocked through a hoop—a cross, as it were, between croquet and lawn bowls. Each team was keen to play on their preferred day. Perfection may still be an illusion, but the beugel players are more than satisfied with their match schedule.

This coming year Lambers still has some practical ideas he wants to work up in his current group. "As a sports enthusiast, I'm loving doing work that allows me to follow so many [sports](#) and at the same time having the opportunity to try and make sport fairer. I don't want to stop anytime soon."

More information: Thesis: [pure.tue.nl/ws/portalfiles/por ...
21111 Lambers hf.pdf](https://pure.tue.nl/ws/portalfiles/portal/record/21111/Lambers_hf.pdf)

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