

Extracurricular Maths Sports

by Fiona Yardley

The call for sports-related content in the November 2019 issue of *Mathematics in School* reminded me of when my Y5–6 maths club for able and keen students from feeder primary schools spent half a term with sport as our theme. I am always excited by the opportunity to go “off curriculum”, and so each half term had a theme which allowed broad and varied exploration of mathematics (other themes included mazes, art, time, optical illusions and maps). Here are some of the Sport activities that went down particularly well with both me and the young mathematicians:

Balls

Why is a football a truncated icosahedron? Starting from regular tilings, we used the patterns and generalisations we had noticed about angles in the plane to prove that there are only five regular solids. We built them and had some fun establishing that none of them were suitable for use as a football, which led us to see how the icosahedron can be adapted through truncation to a better approximation of a sphere. We discussed why we couldn't just have a sphere (because we needed a net constructed from 2-dimensional shapes) which led into a further session trying to construct nets for other sports balls (tennis balls, rugby balls, basketballs) and researching design and construction techniques for others. While we didn't go into the mechanics behind the dimples on a golf ball, there was no little excitement that it was mathematics which determined their existence and design.

Scoring

What final scores are impossible in rugby union? What final scores can be achieved in more than one way, and is there a pattern to this? Only two of the children knew anything about rugby before we started – another insisted that he had no interest in sport because he was a maths geek. Needless to say, by the time we had indulged in a little number theory exploring the different combinations of scores, he was a convert!

Subjective scoring created even more excitement. We started with the Salt Lake City skating scandal of 2002 and the consequent revamped scoring system which we

agreed was still not perfect and so set about designing and then testing our own scoring system against a range of scenarios. Yes, not only were we doing maths in the context of sport, but we got real and passionate debate raging too!

Tournaments

In a knock-out tournament with 120 entrants, how many matches are played? The simplicity of the solution (always $n - 1$, because everyone loses exactly one match except the winner) wowed the pupils, as much as the complexity of tournament design that we moved onto next. We modelled tournaments based on a knock-out, round robin or hybrid (round robin followed by knock-out, as the football world cup) structures before discussing the relative pros and cons. Again, there was excellent debate exploring how mathematical models influence ideas of fairness and entertainment value. We also explored league tables, including having a beetle drive to critique ladder leagues and the history of how the football league tables have been decided and why we have our current system.

Keywords: Extracurricular; Sport

Author Fiona Yardley, Senior Lecturer, Faculty of Education, Canterbury Christ Church University, North Holmes Road, Canterbury CT1 1QU
e-mail: fiona.yardley@canterbury.ac.uk