

Why the dartboard looks like it does, and how bad players can do better

January 8 2016, by Graham Kendall



Credit: AI-generated image ([disclaimer](#))

There are many variants of the game of darts, but by far the most common sees players [start with a score of 501](#) and take turns to reduce this score using three darts at a time until one of the players reaches a score of exactly zero.

The layout of a darts board is a circle cut into 20 equal arcs, with an inner and outer bullseye at the centre, and two rings, one halfway and one on the outer rim of the circle, representing treble and double scores respectively. The board was designed by Brian Gamlin in 1896, and his idea was that by placing [large numbers](#) next to small numbers mistakes are heavily penalised. As an example, if you are aiming for 20 and are slightly off target you will score five or one. Similarly, 19 is penalised by scoring three or seven if your darts are inaccurate. The difficulty is increased by the fact that the rules of the 501-down [game](#) require that the last dart thrown must hit a double.

In trying to reduce their score from 501 as quickly as possible, players will try to hit treble 20 as often as possible – the highest score on the board – which if struck with all three darts results in the caller's classic cry of "One hundred and EIGHTYYY":

The best strategy for amateurs

A perfect game of darts, getting from 501 to zero and ending on a double, can be [achieved in nine darts](#). Studies have considered whether aiming for the obvious targets is a good strategy. Ryan Tibshirani, in his article [Don't try for triple 20: where to aim if you are bad at darts](#), suggests that excellent players – those who throw with an accuracy within 5mm – should aim for the treble 20. But less good players should take alternative strategies.

Those accurate to within 25mm should aim at treble 19. Those accurate to only 60mm should aim "somewhat lower than, and to the left of the board's centre". A poor player aiming for treble 20 would average 10.2 points per throw, worse than the 12.8 points from just throwing randomly.

As far back as 1982 David Kohler [studied optimal darts strategies](#). Those

he developed are probably not of use to most players in the form they're presented, but many of the strategies will be intuitive to darts players. For example, try to leave a power of two (2, 4, 8, 16, 32) as this score gives more alternatives should you miss the final double. For example, if trying to finish the game on a score of 32 you will aim for double 16. If you hit 16, then your next shot is to aim for double 8. This is better than leaving, say, 38 but hitting 19, so now there's an odd number remaining which requires at least two darts to finish the game.

Another approach to the dartboard

Given that the dartboard is over 100 years old, perhaps there is a better design that might improve on the original.

[Eiselt and Laporte](#) suggested a better sequence for the arcs on a dartboard (20, 1, 19, 3, 17, 5, 15, 7, 13, 9, 11, 10, 12, 8, 14, 6, 16, 4, 18, 2). This solution maximises the penalties to non-perfect [players](#) – those likely to hit adjacent arcs – rather than those being aimed at. But credit to Gamlin, his layout from 1896 is actually nearly optimal.

Others have changed the criteria slightly. David Percy, professor of mathematics at Salford University, arranged the numbers of a dartboard so that the risk is maximised, but in addition odd and even numbers are alternated, with different sectors [offering similar risks and rewards](#). At the time, a leading manufacturer of dartboards, [Winmau](#), announced it would produce a version of this dartboard, although it has not been widely adopted.

So while maths researchers have examined [score](#) and penalty maximisation for the game and suggestions have been made for other designs, it seems that Gamlin's dartboard from 1896 will continue to stand the test of time.

This article was originally published on [The Conversation](#). Read the [original article](#)

Source: The Conversation

Citation: Why the dartboard looks like it does, and how bad players can do better (2016, January 8) retrieved 19 April 2024 from <https://phys.org/news/2016-01-dartboard-bad-players.html>

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