



Who Wants a Spot?

Calculating your odds.

Handicapping and calculating the odds at billiards is older than cue tips — literally. **Figure 1** is a section of a book by E. White from 1807 called *A Practical Treatise on the Game of Billiards*. While he does mention chalk, leather tips were unknown to him, so he recommends roughing the wood of the point of the cue with a file before trying to apply spin such as draw.

White devotes a large part of the book to tables of the correct odds at billiards. Evidently the onlookers were fond of betting on the side, as the rules include a clause which forbids proposing a bet not in line with the accepted odds.

In White's day, the standard game was a sort of pocket billiards to 12 points. The odds reproduced are just for the case when someone is giving up 4 points on 12, and the weaker player has nine or 10 points. For example, if the better player is ahead 10-9, the correct odds are 7-2 in his favor, according to White. The odds are complicated because most shots score multiple points in that game.

White goes on through many tables of specific odds on all possible scores with all possible handicaps in games to 12 points. He supports this with pages of calculations of fractions and powers and finite series. In one example, he calculates — using fractions with seventh and ninth powers — the odds as 71828 to 28172 or "very near to 23 to 9" for one possible situation.

I suspect that the modern billiard audience is just as interested in that level of detail as White's readers were in 1807, so I'll keep the arithmetic in the following to a minimum. What I'll outline is a system that allows you to do many things: estimate the relative strengths of two players who have played a match; calculate a fair game between two players if they have both played a third player but not each other; figure a fair handicap between players who have been

rated; and figure the odds in a handicapped match when the spot is not quite right.

The underlying idea is that players of different abilities will score balls, points, or games at certain rates or ratios, and these can describe the relative abilities of

This means that if we play a race-to-eight games of 9-ball, I can expect to win about 2, or 1/4 of Efren's score.

How should Efren match up with someone rated 60 points below me? In theory, he would win 16 games for each game they won — 120 points difference is four times 30, or four factors of 2. Theory and practice might diverge for this case, as any hung 9-ball would be a very costly mistake on Efren's part, relative to the same mistake in a scratch game.

Using math, which I won't go into here, you can calculate fair match-ups for any particular rating difference. **Figure 2** shows a tiny part of a complete chart. The left column is the difference in skill rating (RD for Rating Difference) of two players and the right column is the correct spot. This could be at one-pocket, and the spot would be the balls needed for game, or it could be 9-ball and the spot would be games needed for the match.

Note that the RD for an 8-6 pairing is different from the RD for a 4-3 pairing. This is the same ratio of games/points/balls, so you would expect the same rating difference, but the detailed math says that the longer match favors the better player. Similarly, a 2-1 match has an RD of 38 because in such a short match, chance plays a larger part and gives the weaker player the edge. For a 2:1 ratio, the simple explanation of the system gives an RD of 30 as mentioned above, but this really applies only to very long matches.

You could use a table like Figure 2 to establish your own player-ranking system. Suppose Earl beats you in a tournament by a score of 9-5. From the table, this means that you're 27 points below him. Of course, one match does not a career make, and you would have to average a bunch of matches together to get an accurate estimate of relative strengths.

If someone had a lot of data about

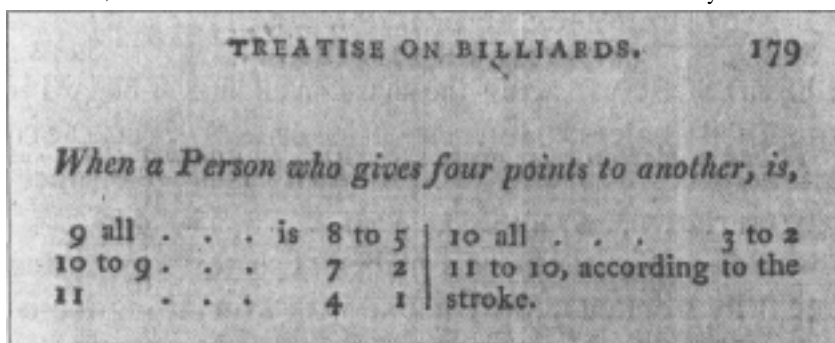


Fig. 1. White's odds from his *A Practical Treatise on the Game of Billiards*.

those players with a single number. You may not agree with this idea. You might imagine a "paper, scissors, rock" situation: A beats B with better shot-making, B beats C with better safety play, and C beats A by better position and long runs. The game is multi-dimensional, but the assumption here is that players can be placed in a pecking order on a single line. I think that most of the time that assumption works pretty well.

The first thing to do is set up the ability rating scale. A simple way to state it is that if you beat me by 2:1 on score, you're 30 rating points better than I am. Suppose in turn, that Efren and Earl both beat you by a 2:1 margin. This makes them 30 points above you. We could say that they are at the top, rated at 100. That would make you a 70 and me a 40. The problem with this is that there are players whom I can beat 2:1 who beat others 2:1 who beat others 2:1 ... and the lowest player on the totem pole is rated at -70. Some players would take offense at being told that they have a negative ability rating. Fortunately, we can fix this by adding 100 to everyone's rating and everyone is back in positive territory, and the differences don't change.

How would Efren and I match up? We would be 60 rating points apart (100-40 or 200-140 after inflation), which means two steps of a 2:1 ratio of games won.

Fig. 2. Rating Difference Match

RD	Odds	RD	Odds
5.3	9-8	26.8	9-5
6.0	8-7	33.9	4-2
10.4	5-4	37.2	9-4
11.3	9-7	38.1	2-1
13.1	8-6	44.3	5-2
13.7	4-3	50.9	9-3
18.4	9-6	58.3	3-1
20.1	3-2	71.0	9-2
21.5	8-5	72.1	4-1
24.1	5-3	82.5	5-1

Fig. 3. Chances With a 9-7 Spot

RD	Chances
0	30%:70%
5	39%:61%
10	48%:52%
15	57%:43%
20	65%:35%
25	73%:27%
30	60%:40%

matches, a lot of spare time, and plenty of energy, they could establish player rankings based on long-term tournament performance using this RD technique. I think there would be considerable interest in such rankings.

Figure 2 can also suggest how to change a spot that doesn't seem quite right. Suppose you are giving someone 9-7 at one-pocket — they need to make seven balls before you make nine. You're winning consistently, so a change of spot seems in order. 8-6 is a minor adjust-

ment, as the RD change is less than two points, while 9-6 is a seven-point change and about four times as much adjustment.

In fact, the math allows you to estimate how much change would be fair based on the percentage of wins you're recording. In **Figure 3** is a table of the expected winning percentages in a 9-7 match for various rating differences. For example, if you are winning 65% of the games even giving up that spot, your real superiority is 20 RD points, rather than the 11.3 the spot implies. Checking the table in Figure 2, you could give up 9-6 and retain a small edge, assuming the calculations have been perfect.

As long as people have struck balls with cues, they have been interested in the odds of winning. These ideas and techniques may answer some of your questions. For more details on how this system works or for more complete tables of probabilities, contact me at Jewett@sfbilliards.com.

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