A Note on the Structure of Canadian Curling Playoffs

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Starting in the mid-1990s, the Canadian curling championships has used a playoff format known as the *Page Playoffs*. The same system is also used in some softball and cricket tournaments. The system originated in Australia in 1931, where it was first used in Australian Rules Football under the name *Page-McIntyre System* [1].

The playoff involves four teams, which are ranked 1–4 after a result of a preliminary round of play. Here is how it works:

round	match	name	teams
1	A	3-4 game	3 vs. 4
1	B	1-2 game	1 vs. 2
2	C	semifinal	winner A vs. loser B
3	D	final	winner B vs. winner C

Observe that matches A, C and D are *elimination matches* since the loser does not play any more games. Match B is not an elimination game.

One interesting aspect of this system is the very large advantage it provides to the two top-ranked teams as compared to the third- and fourth-ranked teams. For purposes of illustration, let's suppose that the probability that any team wins any particular game is 1/2.

Here is a quick way to compute the probabilities (the computations I discuss in this paper remind me of the various examples in Peter Winkler's article "Probability in your head" [3]). The probability that team 3 wins the tournament is 1/8 since they must win three consecutive games. Similarly, team 4's winning probability is 1/8. Team 1 and 2 both have the same probability p of winning. Since the four probabilities must sum to 1, we have $p = 3/8$. Thus teams 1 and 2 are each three times more likely to win than teams 3 or 4.

Evidently one goal of this system is to reward the top two teams by giving them a higher chance of winning the playoffs. But I think it is reasonable to ask if such a large advantage is desirable.

Very recently, the Canadian curling championships have changed their playoff system to include six teams. There are now four preliminary games to determine seedings for a four-game Page Playoff (so there are a total of eight games played!). The teams are designated 1–6; they are actually the top three teams from each of two groups. Let's denote the top three teams from the first group (in order) by $1, 3$ and 5; the top three teams from the second group are denoted (in order) $2, 4$ and 6.

round	match	name	teams
1	A		1 vs. 4
1	B		2 vs. 3
2	C		loser A vs. 5
2	D		loser B vs. 6
3	E	3-4 game	winner C vs. winner D
3	F	1-2 game	winner A vs. winner B
4	G	semifinal	winner E vs. loser F
5	H	final	winner F vs. winner G

In this system, matches C, D, E, G and H are the elimination matches.

Again, let's suppose that the probability that any team wins any particular game is $1/2$. We analyze the probabilities as follows. It is clear that teams $1, 2, 3$ and 4 each have the same probability, say p, of winning. Teams 5 and 6 also have the same probability of winning. Teams 5 and 6 must win four consecutive games to win the tournament, so each of their winning probabilities is $1/16$. Since the probabilities sum to 1, we have $4p + 1/8 = 1$, so $p = 7/32$.

We conclude that teams 1–4 are each 3.5 times more likely to win the tournament than teams 5–6. This is a very skewed distribution, and, in addition, one might ask why teams 1 and 2 receive no advantage over teams 3 and 4.

Is there a better alternative? Wikipedia [2] describes the *McIntyre final six system* which we discuss now. (There are actually two versions of this system; we describe the first version.) As was the case for the previous system, the last four matches comprise a Page Playoff. Here there are seven rather than eight matches; the elimination matches are A, B, D, F and G.

round	match	name	teams
1	A		5 vs. 6
1	B		3 vs. 4
1	C		1 vs. 2
2	D	3-4 game	loser C vs. winner A
2	E	1-2 game	winner C vs. winner B
3	F	semifinal	loser E vs. winner D
4	G	final	winner E vs. winner F

As before, let's suppose that the probability that any team wins any particular game is $1/2$. It is now the case that teams 1 and 2 have probability p of winning and teams 3 and 4 have a different probability, say q of winning. First, we observe that teams 5 and 6 must win four consecutive games to win the tournament, so each of their winning probabilities is $1/16$. Teams 3 and 4 can win in two possible ways: (1) by consecutive wins in matches B, E, and G, or (2) by a win in match B, a loss in match E, and wins in matches F and G. So $q = 1/8 + 1/16 = 3/16$. We can compute p by using the fact that the probabilities sum to 1. Hence $2p + 3/8 + 1/8 = 1$ and $p = 1/4$. Summarizing, teams 1 and 2 each have probability $1/4$ of winning, teams 3 and 4 each have probability $3/16$ of winning, and teams 5 and 6 each have probability $1/16$ of winning.

This seems somewhat more equitable to me. It seems appropriate that teams 1 and 2 have the best chance of winning. There is a fairly small gap in winning probabilities between teams 1 and 2 and teams 3 and 4, as well as a fairly large gap between the winning probabilities of teams 3 and 4 and teams 5 and 6. In my opinion, the seven-match McIntyre final six system is preferable to the eight-match system currently in use.

References

[1] Page Playoff System. `https://en.wikipedia.org/w/index.php?title=Page_playoff_system&oldid=1202510072`

[2] McIntyre System. `https://en.wikipedia.org/w/index.php?title=McIntyre_system&oldid=1182407795`

[3] Peter Winkler. Probability in your head. In "The Mathematics of Various Entertaining Subjects, volume 3", pp. 3–10, Princeton Univ. Press, 2019.