Curling Analytics

Scoreboard Management Analysis

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I. Introduction

As analytics is more and more commonly adopted in sports to improve athletes' performance and match outcomes, "curling analytics" has become a buzzword in the 2022 Winter Olympics. As a curling fan and business analytics student, here I take a try to use data analytics to analyze the sport of curling to generate insight into this charming sport.

Scoreboard management in curling refers to managing the score and the hammer (the last stone of the end) of the future ends. The team that has the hammer has the advantage to score. Once a team scores, the team that did not score in the preceding end has the hammer. If neither team scores, called a blanked end, the hammer remains with the same team.

Because of the tactical value of the hammer, the team with the hammer aims to score more than multiple points or to blank the end to keep the hammer. Teams also tend to keep the hammer in even ends so that the team will have the hammer in the last end. Often, teams need to decide how much to score with the hammer in the last few ends to maximize the chance to win.

In the semi-final of Men's Curling at 2022 Winter Olympics, USA vs Great Britain, the skip of Team USA, John Shuster, decided to throw away his last stone when he has the hammer at End 9, even if he could draw to the center and score one point to tie the game. Team USA was trailing one point then and a null shot lead to another steal of one point by Team Great Britain and therefore trailing two points in the last end but with the hammer. Shuster made a very uncommon decision to keep the hammer, but is it a good decision? Looking from the future, though, Team USA lost the semi-final.

In this analysis, I'm trying to explore how many games are won under different score differences and with or without the hammer. For example, I want to how many or what

percentage of games are won when at the beginning of End 8, the team with hammer is leading with 1 point?

II. Data

World Curling Federation (WCF) is the world governing body for the sport of curling. WCF organizes world- and continental-level curling competitions. For some of the WCF competitions, WCF produces and publishes official shot-by-shot reports for the games. Shot-by-shot reports are the most detailed reports that record every stone thrown in the game. For each shot, information is typically formatted as follows:

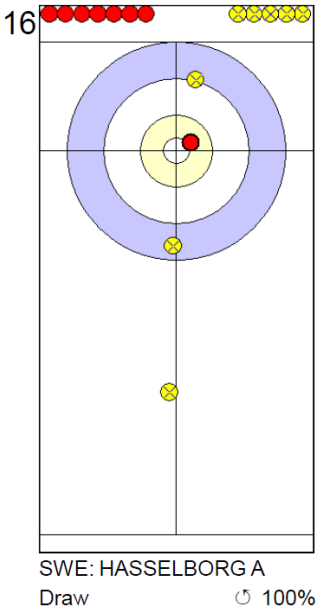

Figure 1: Example of shot-by-shot report

- The number of the shot.
- A diagram of the area of the sheet currently in play.
- A three-letter country code denoting the player's team.
- The player's name.
- The type of shot that was called.
- The direction of rotation of the rock (the "turn").
- The accuracy score of the shot. A technical official scores the shot from zero to four, and the accuracy is calculated by taking the percentage of the score divided by four. A score

of four means the shot is made as called.

The data of this project comes from official shot-by-shot reports from several WCF competitions from 2016 to 2019 totaling 1269 games. These reports were accessed from http://odf2.worldcurling.co/data/. Since these reports are in PDF format, I referred to Jordan Myslik's method and python scripts to parse the reports and extract data and store the data into an SQLite database. [1]

This analysis only considers WCF competitions that play 10 ends. End 11 is an extra end if the game is tied after End 10.

III. Method

First, I queried the data I need for the analysis from python and store them into a pandas data frame. After handling the data in the proper form, I generated a pivot table to calculate the win rate under three conditions: hammer, number of the end, and score difference. The hammer and score difference represent the situation at the beginning of the end described by the number of the end. The win rate is calculated as the number of games won under the conditions divided by the number of total games under the conditions. In the end, I exported the pivot tables to MS Excel and used a Marco to format them for presentation.

IV. Results

1. Aggregate Result – Both Men's and Women's Games

The Aggregated Win Rate Table by Percentage (Appendix I) shows when score differences reach +/- 3 or more at any point in the game, the games become one-sided. The leading side, no matter with or without the hammer, has an overwhelming chance (85%) to win.

Table 1 shows the win rates when the score differences within +/- 2 points. Unsurprisingly, the hammer is very powerful when the game is close, if the score difference is within +/-1 point. Having the hammer can significantly boost the chances the team wins the game. Similar to the traditional perception, the hammer in even ends during the second

half of the games is a little stronger than the hammer in odd ends. However, my analysis reveals that a lead in score, even as small as one point, can almost fully compensate for the disadvantage of the first stone. Across the game, a lead of one point with first stone always gives a small edge to win the game, while trailing one point with hammer always faces a small disadvantage to lose.

The most common goal for scoreboard management in curling is to secure the hammer in the last end and convert the hammer to a win. The analysis supports the value of hammer when the game is tied in the last end (End 10 or 11), as the hammer side can easily score one point to win the game.

Score Diff	**-2**		**-1**		**0**		**+1**		**+2**	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11					65.55%	34.45%				
10	15.93%	2.99%	45.45%	12.15%	78.57%	21.43%	87.85%	54.55%	97.01%	84.07%
9	16.53%	3.13%	37.27%	10.10%	56.62%	43.38%	89.90%	62.73%	96.88%	83.47%
8	18.71%	3.75%	45.51%	14.40%	62.58%	37.42%	85.60%	54.49%	96.25%	81.29%
7	23.90%	7.69%	41.94%	14.84%	56.55%	43.45%	85.16%	58.06%	92.31%	76.10%
6	24.68%	8.57%	44.57%	19.08%	63.28%	36.72%	80.92%	55.43%	91.43%	75.32%
5	25.84%	11.11%	39.91%	16.33%	60.80%	39.20%	83.67%	60.09%	88.89%	74.16%
4	24.55%	6.25%	47.13%	19.08%	60.99%	39.01%	80.92%	52.87%	93.75%	75.45%
3	21.10%	14.29%	46.93%	20.17%	59.65%	40.35%	79.83%	53.07%	85.71%	78.90%
2	20.29%		48.51%		62.04%	37.96%		51.49%		79.71%

Table 1: Aggregate Win Rate Table by Percentage (excerpt)

2. Men's Games Result

Like many other sports, the difference in physicality between males and females may change the shape of the sport for each gender. The traditional perception of men's curling is that male athletes can make heavier takeouts and therefore easier to simplify the game. The simple game situation mostly benefits the hammer side because it's easier to score or blank the end, while it's harder for the other side to steal, although it's also harder to score multiple points for both sides.

Table 2 is a similar excerpt of the Men's Games Win Rate Table by Percentage (Appendix II) for score differences within +/- 2 points. Compared to the aggregate result,

men's games show a more significant trend. A lead with or without hammer is more winning in men's games than the aggregate result during the second half of the game, and therefore, trailing with hammer is harder to win.

Score Diff	-2		-1		0		+1		+2	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11					73.77%	26.23%				
10	14.29%	0.00%	38.89%	3.57%	80.70%	19.30%	96.43%	61.11%	100.00%	85.71%
9	8.62%	0.00%	42.68%	4.00%	66.22%	33.78%	96.00%	57.32%	100.00%	91.38%
8	12.86%	2.94%	42.86%	12.07%	59.30%	40.70%	87.93%	57.14%	97.06%	87.14%
7	18.39%	3.45%	41.46%	15.52%	53.01%	46.99%	84.48%	58.54%	96.55%	81.61%
6	26.67%	2.94%	47.87%	15.63%	65.31%	34.69%	84.38%	52.13%	97.06%	73.33%
5	23.08%	10.34%	41.73%	7.69%	61.62%	38.38%	92.31%	58.27%	89.66%	76.92%
4	21.24%	0.00%	48.41%	11.11%	59.06%	40.94%	88.89%	51.59%	100.00%	78.76%
3	16.16%	9.52%	48.70%	15.87%	61.22%	38.78%	84.13%	51.30%	90.48%	83.84%
2	19.48%		46.33%		62.76%	37.24%		53.67%		80.52%

Table 2: Men's Games Win Rate Table by Percentage (excerpt)

3. Women's Game Result

Table 3 is an excerpt of the Women's Games Win Rate Table by Percentage (Appendix V). As we can see, the power of the hammer and a lead of one point is less evident than in men's game. However, there are two outstanding differences in women's games.

For the first time, we see a disadvantage of hammer when the game is tied. As we can see from Table 3, at the beginning of End 9, if the game is tied, the team with hammer only won 45.16% of the games, less than the teams with the first stone. The reason for this special phenomenon may come from End 10. In End 10, the team trailing one point with hammer has a win rate of 52.11%, also higher than men's games and the aggregate result. The hammer changes to the other team when the team with hammer scores. Therefore, if the hammer team scores one point in End 9, the team lost many more games than men's games. This phenomenon is very interesting and worth further investigation.

Score Diff	-2		-1		0		+1		+2	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11					56.90%	43.10%				
10	17.54%	4.55%	52.11%	21.57%	76.36%	23.64%	78.43%	47.89%	95.45%	82.46%
9	23.81%	5.26%	31.65%	16.33%	45.16%	54.84%	83.67%	68.35%	94.74%	76.19%
8	24.64%	4.35%	48.19%	16.42%	66.23%	33.77%	83.58%	51.81%	95.65%	75.36%
7	30.56%	10.20%	42.47%	14.29%	60.00%	40.00%	85.71%	57.53%	89.80%	69.44%
6	22.89%	13.89%	41.11%	22.39%	60.76%	39.24%	77.61%	58.89%	86.11%	77.11%
5	28.00%	12.00%	37.50%	23.17%	60.00%	40.00%	76.83%	62.50%	88.00%	72.00%
4	27.93%	15.00%	45.93%	24.68%	63.54%	36.46%	75.32%	54.07%	85.00%	72.07%
3	25.21%	17.86%	45.16%	25.00%	57.97%	42.03%	75.00%	54.84%	82.14%	74.79%
2	21.31%		50.69%		61.45%	38.55%		49.31%		78.69%

Table 3: Women's Games Win Rate Table by Percentage (excerpt)

V. Discussions

The result of this analysis confirms but elaborates the traditional perception of the sport of curling. The analysis indicates the hammer only has the power to affect the match outcome when the score difference is within +/- 1 point. Beyond that range, the hammer has little impact on match outcome. The hammer's impact is the most evident when the game is tied, as the hammer side has a significant advantage to win the game, with one exception in women's games.

Here I suggest some tactical inferences from the analysis. Teams should fight for the hammer of the first end. My reasoning for this suggestion comes from the fact that a lead can give the team an edge to win, and the first hammer side has the better chance to score first. Hammer of the first end is decided by a Draw Shot Challenge (DSC) during round-robin and by standings during playoffs. Since the standing is less controllable, I further suggest investing in practicing DSC in an attempt to secure the hammer in the first end.

One specific recommendation I can make from the analysis is what should the hammer side do in End 9 when the game is tied. The outstanding recommendation is to play a simple game and blank the end to keep the hammer. The reasoning is that although the hammer side can play a radical strategy to score two points, blanking the end is simpler to achieve with a lower risk to steal. For men's games, it's also ok to score one point if the team fails to blank, as leading one point with the first stone still gives the team a solid chance to win. For

women's games, leading one point with first stone in End 10 is still a fair game to fight for.

Let's come back to John Shuster's decision described in the introduction. According to Table 2, the win rate of trailing two points with hammer in End 10 is 14.29%, and the win rate of tied with first stone in End 10 is 19.30%. From the numbers, I wouldn't say Shuster made a great decision to lose one point because he lowered his chance to win by 5%. However, Shuster was facing a difficult situation regardless, with less than 20% of chance to win either way. Maybe Shuster believed hammer gives him an attacking position that gives him more confidence to play well. That said, he lost the semi-final in the end, unfortunately.

The limitation of this analysis is obvious. The analysis simplifies the complexity of the sport, like the discussion about Shuster's decision above. A more serious problem of this analysis comes from the data. In 2019, WCF changes the free guard zone rules from four stones to five stones. Under the new rules, stones in the free guard zone cannot be taken out until the fifth stone is played. We have a mix of pre- and after-2019 competitions in the dataset so the rule change may confound the result of the analysis. Furthermore, WCF is purposing another rule change in 2022. The conclusion of this analysis may become obsolete.

CurlingZone is a website focusing on reporting curling news and competitions. Under their Analytics page (https://www.curlingzone.com/analytics.php#1), they keep track of a record similar to this analysis. CurlingZone records many other games than WCF competitions and therefore has a much larger volume of data. Their records may be a more robust and accurate representation of the sport.

VI. Reference

[1] Jordan William Myslik. (2020). curling-analytics. https://github.com/jwmyslik/curling-analytics

Appendix I: Aggregate Win Rate Table by Percentage

Score Diff	-4		-3		-2		-1		0		+1		+2		+3		+4	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11									65.55%	34.45%								
10	0.00%	0.00%	2.22%	0.00%	15.93%	2.99%	45.45%	12.15%	78.57%	21.43%	87.85%	54.55%	97.01%	84.07%	100.00%	97.78%	100.00%	100.00%
9	0.94%	0.00%	3.54%	4.76%	16.53%	3.13%	37.27%	10.10%	56.62%	43.38%	89.90%	62.73%	96.88%	83.47%	95.24%	96.46%	100.00%	99.06%
8	2.26%	1.69%	5.06%	1.75%	18.71%	3.75%	45.51%	14.40%	62.58%	37.42%	85.60%	54.49%	96.25%	81.29%	98.25%	94.94%	98.31%	97.74%
7	1.06%	1.79%	13.73%	2.08%	23.90%	7.69%	41.94%	14.84%	56.55%	43.45%	85.16%	58.06%	92.31%	76.10%	97.92%	86.27%	98.21%	98.94%
6	2.53%	0.00%	13.85%	2.22%	24.68%	8.57%	44.57%	19.08%	63.28%	36.72%	80.92%	55.43%	91.43%	75.32%	97.78%	86.15%	100.00%	97.47%
5	1.76%	0.00%	14.29%	3.70%	25.84%	11.11%	39.91%	16.33%	60.80%	39.20%	83.67%	60.09%	88.89%	74.16%	96.30%	85.71%	100.00%	98.24%
4	3.57%	0.00%	9.24%	0.00%	24.55%	6.25%	47.13%	19.08%	60.99%	39.01%	80.92%	52.87%	93.75%	75.45%	100.00%	90.76%	100.00%	96.43%
3	1.49%	0.00%	11.83%	0.00%	21.10%	14.29%	46.93%	20.17%	59.65%	40.35%	79.83%	53.07%	85.71%	78.90%	100.00%	88.17%	100.00%	98.51%
2	8.00%		10.23%		20.29%		48.51%		62.04%	37.96%		51.49%		79.71%		89.77%		92.00%

HMR: Hammer

FS: First Stone

Appendix II: Aggregate Win Rate Table by Number

Score Diff	-4		-3		-2		-1		0		+1		+2		+3		+4	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11									78-41	41-78								
10	0-30	0-6	2-88	0-35	18-95	2-65	65-78	13-94	88-24	24-88	94-13	78-65	65-2	95-18	35-0	88-2	6-0	30-0
9	1-105	0-20	4-109	2-40	20-101	2-62	60-101	10-89	77-59	59-77	89-10	101-60	62-2	101-20	40-2	109-4	20-0	105-1
8	3-130	1-58	4-75	1-56	26-113	3-77	76-91	18-107	102-61	61-102	107-18	91-76	77-3	113-26	56-1	75-4	58-1	130-3
7	2-187	1-55	14-88	1-47	38-121	6-72	65-90	19-109	95-73	73-95	109-19	90-65	72-6	121-38	47-1	88-14	55-1	187-2
6	5-193	0-55	18-112	1-44	39-119	6-64	82-102	25-106	112-65	65-112	106-25	102-82	64-6	119-39	44-1	112-18	55-0	193-5
5	3-167	0-31	17-102	1-26	46-132	6-48	89-134	24-123	121-78	78-121	123-24	134-89	48-6	132-46	26-1	102-17	31-0	167-3
4	4-108	0-11	11-108	0-19	55-169	3-45	123-138	25-106	136-87	87-136	106-25	138-123	45-3	169-55	19-0	108-11	11-0	108-4
3	1-66	0-3	11-82	0-5	46-172	7-42	145-164	24-95	170-115	115-170	95-24	164-145	42-7	172-46	5-0	82-11	3-0	66-1
2	2-23		9-79		56-220		211-224		201-123	123-201		224-211		220-56		79-9		23-2

HMR: Hammer

FS: First Stone

XX-XX: Games Won - Games Lost

Appendix III: Men's Games Win Rate Table by Percentage

Score Diff	-4		-3		-2		-1		0		+1		+2		+3		+4	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11									73.77%	26.23%								
10	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	38.89%	3.57%	80.70%	19.30%	96.43%	61.11%	100.00%	85.71%	100.00%	100.00%	100.00%	100.00%
9	0.00%	0.00%	3.70%	0.00%	8.62%	0.00%	42.68%	4.00%	66.22%	33.78%	96.00%	57.32%	100.00%	91.38%	100.00%	96.30%	100.00%	100.00%
8	0.00%	0.00%	5.41%	0.00%	12.86%	2.94%	42.86%	12.07%	59.30%	40.70%	87.93%	57.14%	97.06%	87.14%	100.00%	94.59%	100.00%	100.00%
7	0.00%	0.00%	16.67%	0.00%	18.39%	3.45%	41.46%	15.52%	53.01%	46.99%	84.48%	58.54%	96.55%	81.61%	100.00%	83.33%	100.00%	100.00%
6	1.12%	0.00%	11.11%	0.00%	26.67%	2.94%	47.87%	15.63%	65.31%	34.69%	84.38%	52.13%	97.06%	73.33%	100.00%	88.89%	100.00%	98.88%
5	1.11%	0.00%	11.54%	0.00%	23.08%	10.34%	41.73%	7.69%	61.62%	38.38%	92.31%	58.27%	89.66%	76.92%	100.00%	88.46%	100.00%	98.89%
4	3.39%	0.00%	2.04%	0.00%	21.24%	0.00%	48.41%	11.11%	59.06%	40.94%	88.89%	51.59%	100.00%	78.76%	100.00%	97.96%	100.00%	96.61%
3	0.00%	0.00%	9.80%	0.00%	16.16%	9.52%	48.70%	15.87%	61.22%	38.78%	84.13%	51.30%	90.48%	83.84%	100.00%	90.20%	100.00%	100.00%
2	7.14%		4.88%		19.48%		46.33%		62.76%	37.24%		53.67%		80.52%		95.12%		92.86%

HMR: Hammer

FS: First Stone

Appendix IV: Men's Games Win Rate Table by Number

Score Diff	-4		-3		-2		-1		0		+1		+2		+3		+4	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11									45-16	16-45								
10	0-14	0-4	0-43	0-15	8-48	0-23	28-44	2-54	46-11	11-46	54-2	44-28	23-0	48-8	15-0	43-0	4-0	14-0
9	0-46	0-9	2-52	0-16	5-53	0-26	35-47	2-48	49-25	25-49	48-2	47-35	26-0	53-5	16-0	52-2	9-0	46-0
8	0-71	0-28	2-35	0-27	9-61	1-33	36-48	7-51	51-35	35-51	51-7	48-36	33-1	61-9	27-0	35-2	28-0	71-0
7	0-96	0-29	8-40	0-23	16-71	1-28	34-48	9-49	44-39	39-44	49-9	48-34	28-1	71-16	23-0	40-8	29-0	96-0
6	1-88	0-29	7-56	0-26	20-55	1-33	45-49	10-54	64-34	34-64	54-10	49-45	33-1	55-20	26-0	56-7	29-0	88-1
5	1-89	0-15	6-46	0-17	18-60	3-26	53-74	5-60	61-38	38-61	60-5	74-53	26-3	60-18	17-0	46-6	15-0	89-1
4	2-57	0-6	1-48	0-10	24-89	0-28	61-65	6-48	75-52	52-75	48-6	65-61	28-0	89-24	10-0	48-1	6-0	57-2
3	0-33	0-1	5-46	0-3	16-83	2-19	75-79	10-53	90-57	57-90	53-10	79-75	19-2	83-16	3-0	46-5	1-0	33-0
2	1-13		2-39		30-124		101-117		91-54	54-91		117-101		124-30		39-2		13-1

HMR: Hammer

FS: First Stone

XX-XX: Games Won-Games Lost

Appendix V: Women's Games Win Rate Table by Percentage

Score Diff	-4		-3		-2		-1		0		+1		+2		+3		+4	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11									56.90%	43.10%								
10	0.00%	0.00%	4.26%	0.00%	17.54%	4.55%	52.11%	21.57%	76.36%	23.64%	78.43%	47.89%	95.45%	82.46%	100.00%	95.74%	100.00%	100.00%
9	1.67%	0.00%	3.39%	7.69%	23.81%	5.26%	31.65%	16.33%	45.16%	54.84%	83.67%	68.35%	94.74%	76.19%	92.31%	96.61%	100.00%	98.33%
8	4.84%	3.23%	4.76%	3.33%	24.64%	4.35%	48.19%	16.42%	66.23%	33.77%	83.58%	51.81%	95.65%	75.36%	96.67%	95.24%	96.77%	95.16%
7	2.15%	3.70%	11.11%	4.00%	30.56%	10.20%	42.47%	14.29%	60.00%	40.00%	85.71%	57.53%	89.80%	69.44%	96.00%	88.89%	96.30%	97.85%
6	3.67%	0.00%	16.42%	5.26%	22.89%	13.89%	41.11%	22.39%	60.76%	39.24%	77.61%	58.89%	86.11%	77.11%	94.74%	83.58%	100.00%	96.33%
5	2.50%	0.00%	16.42%	10.00%	28.00%	12.00%	37.50%	23.17%	60.00%	40.00%	76.83%	62.50%	88.00%	72.00%	90.00%	83.58%	100.00%	97.50%
4	3.77%	0.00%	14.29%	0.00%	27.93%	15.00%	45.93%	24.68%	63.54%	36.46%	75.32%	54.07%	85.00%	72.07%	100.00%	85.71%	100.00%	96.23%
3	2.94%	0.00%	14.29%	0.00%	25.21%	17.86%	45.16%	25.00%	57.97%	42.03%	75.00%	54.84%	82.14%	74.79%	100.00%	85.71%	100.00%	97.06%
2	9.09%		14.89%		21.31%		50.69%		61.45%	38.55%		49.31%		78.69%		85.11%		90.91%

HMR: Hammer

FS: First Stone

Appendix VI: Women's Games Win Rate Table by Number

Score Diff	-4		-3		-2		-1		0		+1		+2		+3		+4	
End No	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS	HMR	FS
11									33-25	25-33								
10	0-16	0-2	2-45	0-20	10-47	2-42	37-34	11-40	42-13	13-42	40-11	34-37	42-2	47-10	20-0	45-2	2-0	16-0
9	1-59	0-11	2-57	2-24	15-48	2-36	25-54	8-41	28-34	34-28	41-8	54-25	36-2	48-15	24-2	57-2	11-0	59-1
8	3-59	1-30	2-40	1-29	17-52	2-44	40-43	11-56	51-26	26-51	56-11	43-40	44-2	52-17	29-1	40-2	30-1	59-3
7	2-91	1-26	6-48	1-24	22-50	5-44	31-42	10-60	51-34	34-51	60-10	42-31	44-5	50-22	24-1	48-6	26-1	91-2
6	4-105	0-26	11-56	1-18	19-64	5-31	37-53	15-52	48-31	31-48	52-15	53-37	31-5	64-19	18-1	56-11	26-0	105-4
5	2-78	0-16	11-56	1-9	28-72	3-22	36-60	19-63	60-40	40-60	63-19	60-36	22-3	72-28	9-1	56-11	16-0	78-2
4	2-51	0-5	10-60	0-9	31-80	3-17	62-73	19-58	61-35	35-61	58-19	73-62	17-3	80-31	9-0	60-10	5-0	51-2
3	1-33	0-2	6-36	0-2	30-89	5-23	70-85	14-42	80-58	58-80	42-14	85-70	23-5	89-30	2-0	36-6	2-0	33-1
2	1-10		7-40		26-96		110-107		110-69	69-110		107-110		96-26		40-7		10-1

HMR: Hammer

FS: First Stone

XX-XX: Games Won-Games Lost