Aviary's Riichi Statistics Cheat Sheet

1a. Deal-in rates vs Tenpai opponent

Suji Passed	456	37	28	½ Suji 456 Suji 19	Suji 37	Suji 28	Suji 456 Suji 19	Fresh Yakuhai	Once cut Yakuhai
4		-30%				-10%			-50%	
8	14%	10%	9%	8%	6%	4%	2%	5%	3%
12		+66%				+30%			+250%	

- Dora +50% vs riichi and +80% vs open. Dorasoba +30% to riichi and +50% to open.
- Dora ±2 is 10% more dangerous.
- One chance is -50% early game, -75% mid game, and -90% late game

1b. Relative Danger - First Row Sotogawa

Sotogawa	1 Danger	2	3	4	5	6	7	8	9
1 Discard		95%	100%	65%	110%	110%	95%	105%	105%
2	40%		90%	75%	65%	120%	110%	95%	105%
3	55%	40%		90%	80%	60%	125%	105%	95%
4	35%	55%	60%		95%	85%	50%	130%	115%
5	130%	40%	65%	90%		90%	60%	40%	135%

- First simple is 20% more effective, second row is 20% less effective

1c. Relative Danger - Sotogawa Joints (X, Y tedashi in discards)

Joint	1 Danger	2	3	4	5	6	7	8	9
(1, 1)		110%	100%	65%	105%	100%	90%	100%	100%
(2, 2)	25%		105%	60%	50%	120%	85%	80%	105%
(3, 3)	25%	20%		75%	50%	55%	110%	75%	80%
(4, 4)	25%	40%	40%		70%	60%	55%	120%	100%
(5, 5)	130%	35%	45%	60%		50%	35%	45%	100%
(1, 2)			115%	55%	65%	125%	85%	90%	105%
(2, 1)		90%	65%	55%	115%	95%	85%		110%
(2, 4)	20%		65%	60%	90%	50%	100%		95%
(4, 2)	55%		60%		80%	90%	45%	130%	115%
(1, 3)		55%		65%	80%	55%	105%	95%	85%
(3, 1)		45%		85%	80%	50%	125%	110%	85%
(3, 5)	50%	25%		70%		60%	90%	45%	105%
(5, 3)	95%	35%		70%		75%	65%	35%	130%
(2, 3)	35%		95%	55%	60%	130%	75%		85%
(3, 2)	60%		105%	50%	60%	130%	80%		90%
(3, 4)	25%	55%		90%	50%	60%	125%	85%	
(4, 3)	40%	85%		100%	50%	45%	115%	80%	
(4, 5)	45%	25%	115%		105%	45%	50%		105%
(5, 4)	35%	45%	50%		90%	35%	40%		155%
(1, 9)		90%	100%	60%	110%	75%	85%		100%
(1, 7)		95%	125%	25%	80%	95%		45%	55%
(7, 1)	105%	110%	25%	80%	85%		45%		55%
(2, 8)	45%		85%	95%	30%	90%	100%		55%
(1, 6)		115%	30%	40%	100%		50%	65%	30%
(6, 1)	120%	40%	40%	95%		55%		50%	40%
(2, 7)	35%		115%	25%	40%	105%		50%	60%
(7, 2)	60%		120%	40%	35%	105%		45%	55%
(1, 4)		55%	50%		90%	80%	50%	120%	105%
(4, 1)		60%	60%		100%	85%	45%	135%	110%
(2, 5)		55%	45%		90%	60%		40%	125%
(5, 2)	90%	50%	60%		90%	60%		35%	135%
(3, 6)	50%	45%		60%	55%		75%	65%	30%
(6, 3)	55%		60%		60%	55%	55%	30%	30%

1d. Relative Danger -1st Row Riichi vs 3rd Row Riichi

1st Row	1 Danger	2	3	4	5	6	7	8	9
1 Riichi		115%	105%	60%	80%	95%	90%	85%	95%
2	155%		70%	90%	55%	85%	90%	90%	100%
3	115%	70%		85%	80%	50%	95%	95%	70%
4	30%	100%	60%		80%	90%	70%	85%	100%
5	105%	75%	80%	75%		75%	85%	70%	100%

3rd Row	1 Danger	2	3	4	5	6	7	8	9
1 Riichi		160%	185%	65%	130%	110%	75%	120%	105%
2	205%		145%	135%	85%	130%	105%	105%	135%
3	155%	140%		135%	120%	75%	110%	120%	90%
4	15%	140%	120%		130%	105%	75%	145%	105%
5	140%	55%	110%	115%		120%	135%	45%	155%

1e. Relative Danger - Riichi Joint (Riichi on Y, X in discards)

Joint	1 Danger	2	3	4	5	6	7	8	9
(1, 1)		130%	120%	65%	90%	95%	90%	90%	100%
(2, 2)	175%		90%	115%	65%	95%	95%	90%	100%
(3, 3)	135%	100%		100%	100%	60%	100%	95%	80%
(4, 4)	25%	120%	70%		100%	80%	75%	105%	95%
(5, 5)	115%	70%	95%	90%		95%	95%	65%	115%
(1, 2)			110%	85%	85%	110%	100%	120%	105%
(2, 1)		90%	55%	55%	110%	95%	90%		80%
(2, 4)		110%		80%	130%	80%		120%	120%
(4, 2)	85%		80%		85%	75%		135%	100%
(1, 3)		135%		55%	140%	60%	90%	115%	80%
(3, 1)		30%		100%	70%	65%	140%	90%	145%
(3, 5)	60%	40%		110%		75%	160%	60%	145%
(5, 3)	250%	70%		130%		80%	75%	30%	110%
(2, 3)	105%		140%	75%	90%	140%	85%		80%
(3, 2)	150%		135%	35%	60%	125%	70%		120%
(3, 4)	20%	125%		155%	65%	85%	135%	100%	
(4, 3)	70%	225%		155%	55%	80%	120%	115%	
(4, 5)	50%	35%	265%		270%	75%	80%		255%
(5, 4)	30%	130%	90%		75%	55%	60%		70%
(1, 7)		80%	100%		105%		110%		135%
(7, 1)	145%	120%	25%	80%	65%		30%		30%
(2, 8)	45%		65%	60%	30%	115%	85%		175%
(1, 9)		85%	75%	55%	105%	65%	110%	165%	65%
(1, 6)		90%	70%	55%	110%		65%	125%	25%
(6, 1)		190%	95%	30%	90%		45%	65%	40%
(2, 7)	30%		85%	35%	60%	110%		65%	50%
(7, 2)	190%		110%	85%	40%	65%		50%	50%
(1, 4)		105%	70%		90%	85%	75%	90%	85%
(4, 1)		45%	125%		75%	75%	30%	85%	95%
(2, 5)		65%	65%		105%	100%	60%		135%
(5, 2)	290%		80%	125%		100%	65%	50%	150%
(6, 3)	135%	110%		85%	70%		40%	30%	20%

2a. Riichi/Dama Wait Winrate

Turn 8 Riichi Winrate Ranking

Shape	Wait	Riichi	Dama	Shape	Wait	Riichi	Dama
Sanmen	147	66%	72%	Trap	4,6	50%	41%
Sanmen	258	65%	72%	Shanpon	1,9 + 2-8	48%	43%
Shanpon	Z + Z	59%	52%	Z Tanki	Fresh	48%	40%
Ryanmen	14	57%	67%	Single	1,9	47%	48%
Trap	1,9	57%	48%	Trap	3,7	47%	43%
Z Tanki	1 out	55%	54%	Trap	5	46%	39%
Shanpon	Z + 1,9	55%	48%	Z Tanki	2 out	44%	39%
Ryanmen	25	54%	63%	Single	2,8	41%	45%
Shanpon	1,9 + 1,9	53%	54%	Shanpon	2-8 + 2-8	41%	44%
Shanpon	Z + 2,8	52%	46%	Single	3,7	38%	43%
Ryanmen	36	52%	62%	Single	4,6	36%	41%
Trap	2,8	52%	45%	Single	5	33%	39%

- -10% for ryanmen dora wait, -30% for single dora wait
- Trap wait, single 123 +25%, single 45 +45%. Shanpon +10%
- Furiten -35% for sanmenchan, -40% for ryanmen

2b. Riichi Average Points

w/o Riichi	Riichi size	Dealer	ND
(Riichi nomi)	1 han 40 fu	4300	2900
1 han 30 fu	2 han 30 fu	5800	3900
1 han 40 fu	2 han 40 fu	7600	5100
2 han 30 fu	3 han 30 fu	9700	6500
2 han 40 fu	3 han 40 fu	11200	7500
3 han 30 fu	4 han 30 fu	13700	9100
3 han 40 fu	4 han 40 fu	14000	9200
3 han 50 fu	4 han 50 fu	13800	9200
4 han 40 fu	5 han	16950	11300
5 han	6 han	19650	13100
6 han	7 han	22650	15100

2c. Opponent Ron Scores

Avg Dealer Ron scores by Turn

Turn	Ippatsu	Riichi	Tanyao	Yakuhai	Honitsu
4	10400	7100	4600	4500	9800
8	10900	7600	4800	4900	9900
12	11600	8400	5100	5500	10300

Avg Non-Dealer Riichi Ron scores by Dealin Tile

19	28	34567	Honor	Dora	Dora +-2
4800	5000	5400	5900	7600	5800

Avg Non-Dealer Ron scores by Turn

Turn	Ippatsu	Riichi	Tanyao	Yakuhai	Honitsu
4	7100	5000	3100	2700	6500
8	7600	5400	3100	3000	6700
12	8000	6000	3500	3500	7000

Avg Non-Dealer Ron scores by Dora in calls

Yaku	0	1	2	3	Avg
Tanyao	3600	4900	6700	9400	4100
Yakuhai	3900	4900	6600	10100	4300

Avg Non-Dealer Ron scores by Dora discarded

Thrown	Ippatsu	Riichi	Tanyao	Yakuhai	Honitsu
1	7300	5100	2800	3200	6600
2	7200	4800	2500	2600	6600
3	7500	4800	2400	2700	6700
4	5200	4300	2200	2500	6300

Average Oikake Riichi (Turn 10)

Who	Good wait	Width	Ron score	Tsumo	Win %
D vs ND	66.8%	6.56	9500	12300	40.1%
ND vs ND	68.4%	6.62	6700	8600	39.5%
ND vs D	72.1%	6.76	7000	8900	41.7%

2d. Betaori Cost

Turn	vs 0 Riichi Dealer	vs 0 Riichi ND	vs 1 Riichi Dealer (ND)	vs 1 Riichi ND (ND)	vs 1 Riichi ND (Dealer)	vs 2 Riichi Dealer (ND ND)	vs 2 Riichi ND (ND ND)	vs 2 Riichi ND (D ND)	vs 3 Riichi Dealer (3x ND)	vs 3 Riichi ND (D ND ND)
8	-1600	-1200	-1900	-1100	-1700	-1700	-900	-1300	-1600	-800
12	-1500	-1200	-1800	-1200	-1600	-1800	-1100	-1400	-1700	-900
16	-1300	-1200	-1400	-1300	-1400	-1700	-1500	-1600	-2300	-1900

Turn	0 others open	1 other open		2 others open			3 others open			
8	-1600	-1200	-1300	-1000	-1100	-1100	-800	-900	-900	-700
12	-1600	-1200	-1400	-1100	-1200	-1300	-900	-1100	-1100	-900
16	-1400	-1200	-1400	-1200	-1200	-1500	-1200	-1300	-1400	-1300

2e. Oikake Riichi Winrate

Turn	Sanmenchan+ Win	Draw	Dealin	Ryanmen Win	Draw	Dealin	Single Win	Draw	Dealin	Honor Win	Draw	Dealin
8	56%	3%	12%	48%	5%	16%	32%	10%	21%	43%	5%	22%
12	42%	11%	12%	40%	14%	14%	29%	19%	18%	36%	13%	19%
16	33%	47%	6%	22%	50%	7%	14%	51%	10%	18%	59%	8%

2f. Riichi/Dama and Push/Fold Policy

Positive EV Damaten

Wait	Han/Fu	Damaten
Ryanmen	3/40	After T12
Ryanmen	3/50	Always
Ryanmen	4/30, 5	After T8
Ryanmen	6+	Always
Kanchan	3/40+	Always
Honor	6+	Always

Push Musuji in 1 shanten

Situation	Push
D v ND	Early game, good shape, 1 han
D v ND	Early game, bad shape, 2 han
D v ND	Mid game, good shape, 3 han
ND v ND	Early game, good shape, 3 han
ND v ND	Mid game, good shape, 4 han
ND v D	Early game, good shape, 4 han

- Also yakunashi dama 1 Han middle tile bad wait in the mid-late game.

Push vs 1 Riichi (Open/Oikake)

Wait	Push
Ryanmen	All ex. 1 Han ND vs D
Kanchan	1 Han as D
Kanchan	2 Han as ND vs ND
Kanchan	3 Han as ND vs D
Honor	1 Han as D
Honor	2 Han as ND

Push vs 2 Riichi (Open/Oikake)

Wait	Push
Ryanmen	1 Han as D
Ryanmen	2 Han ND vs ND ND
Ryanmen	3 Han ND vs ND D
Kanchan	2 Han as D
Kanchan	4 Han as ND vs ND ND
Kanchan	5 Han as ND vs ND D

- EV assumes only push/fold. In marginal situations, mawashi may be superior.

1f. Riichi & Open Wait Distribution

Distribution of Shapes, Riichi

Waits on	freq	23456/34567/45678	23/34/45	13/12/56	24/35	Tanki	Shanpon
1	3.7%	17%	70%			4%	9%
2	4.9%	13%	60%	17%		3%	7%
3	6.0%	11%	56%	13%	14%	2%	
4	5.9%	9%	45%	50%	13%		20%
5	7.6%	9%	35%	43%	10%	1%	3%
5	7.6%	8%	39%	39%	6%	2%	4%

Distribution of Shapes, Open

Waits on	freq	23456/34567/45678	23/34/45	13/12/56	24/35	Tanki	Shanpon
1	2.4%	9%	69%			6%	16%
2	4.4%	6%	57%	18%		5%	14%
3	5.9%	4%	50%	13%	20%	4%	
4	6.7%	3%	25%	44%	17%	2%	8%
5	7.1%	4%	35%	35%	14%	3%	9%

3a. Open Tenpai Chance

Tenpai chance

Calls	0	1	2	3
Turn 4	1%	7%	28%	77%
8	4%	27%	53%	88%
12	12%	46%	69%	92%
16	19%	55%	73%	91%

Relative tenpai chance at turn 8, 1 call

Has called Kan	123%	Right after Pair drop	72%
Has discarded Dora	141%	Right after Kanchan drop	87%
Just called on Turn 8	121%	Right after Ryanmen drop	87%
Right After Honor Tedashi	64%	Called ryanmen (Tanyao)	103%
Right After Number Tedashi	91%	Called pon (Tanyao)	96%
Tsumogiri 3 times	143%	Called kanchan (Tanyao)	88%
Tsumogiri 6 times	143%	Called dora pon (Tanyao)	60%

- Honitsu is a bit slower, pulling down the average

3b. Closed & Open Win Chance Projection

Chance of winning a closed hand

Shanten	Turn 4	6	8	10	12
4+	3%	2%	1%	1%	0%
3 Kan	3%	2%	1%	1%	0%
3 Perfect	4%	3%	2%	1%	0%
3 Sticky	8%	4%	3%	1%	0%
2 Kan	12%	8%	5%	3%	2%
2 Perfect	12%	8%	6%	4%	1%
2 Sticky	18%	12%	8%	5%	2%
1 Kan	21%	16%	12%	9%	5%
1 Perfect	32%	25%	20%	15%	11%
1 Sticky	40%	34%	26%	19%	13%
0 Bad	51%	42%	37%	32%	28%
0 Good	66%	66%	58%	52%	49%
0 V good	80%	62%	65%	59%	52%

Open hand winrate (or still closed but will call)

Shanten	Turn 4	6	8	10	12
4+	8%	5%	0%	0%	0%
3 Kan	12%	7%	4%	0%	0%
3 Perfect	13%	6%	5%	6%	0%
3 Sticky	18%	13%	4%	1%	2%
2 Kan	23%	17%	12%	7%	3%
2 Perfect	26%	19%	15%	10%	5%
2 Sticky	30%	22%	15%	8%	4%
1 Kan	36%	28%	22%	17%	11%
1 Perfect	45%	38%	29%	24%	17%
1 Sticky	48%	39%	32%	23%	14%
0 Bad	55%	50%	42%	37%	30%
0 Good	72%	65%	59%	52%	45%
0 V good	84%	75%	73%	67%	56%

3c. Chance to complete Yakuhai Pair

Dragon or Round Wind, chance to eventually get

Turn	Closed Fresh	Closed 1 out	Atozuke Fresh	Atozuke 1 out	Atozuke terminal Fresh	Atozuke terminal 1 out
2	74%	69%	66%	58%	64%	62%
4	64%	63%	56%	54%	54%	53%
6	52%	57%	46%	51%	43%	48%
8	42%	51%	38%	47%	35%	44%
10	34%	46%	31%	44%	29%	41%
12	26%	40%	24%	40%	22%	37%

Relative chance to eventually get

Seat wind, Fresh	117%
Seat wind, 1 out	101%
Double wind, Fresh	94%
Double wind, 1 out	91%
Dora Yakuhai, Fresh	66%
Dora Yakuhai, 1 out	69%

3d. Calling Policy

Situation	1-shanten Calling Policy
Mentanpin, Perfect	T12
Tanyao nomi, Perfect	T10
Tanyao dora 1, Perfect	T10
Tanyao dora 2, Perfect	T6
Tanyao nomi, Ryanmen-Kanchan	Bad side: T5, Good side: T12
Sanshoku nomi, Ryanmen-Kanchan	Bad side: T8, Good side: T12

4a. Chance to Finish 4th in All Last

I am... (Score gap at least X)	3rd Dealer	3rd ND, ND 4th	3rd ND, D 4th	4th Dealer	4th ND, ND 3rd	4th ND, D 3rd
0	51%	35%	30%	63%	58%	42%
1000	43%	33%	27%	67%	61%	52%
2000	34%	28%	25%	70%	68%	61%
3000	26%	22%	22%	73%	74%	69%
4000	20%	18%	18%	77%	79%	76%

4b. Utility (Value of winning 8000 / dealing in 8000)

1st Place

Situation	Round	Ratio
Even points, 250-250-250-250	E3	0.92
	S1	0.89
	S3	0.76
Small lead, 300-200-250-250	E3	0.69
	S1	0.51
	S3	0.28
Big lead, 400-200-200-200	E3	0.39
	S1	0.33
	S3	0.08
Close second, 400-350-150-100	E3	0.45
	S1	0.50
	S3	0.34

2nd/3rd Place

Situation	Round	Ratio
Close points, 250-300-250-200	E3	0.86
	S1	0.80
	S3	0.57
Distant 1st & 4th, 250-250-400-100	E3	0.85
	S1	0.78
	S3	0.68
2nd chasing 1st, 350-400-100-150	E3	0.86
	S1	0.87
	S3	1.73
3rd avoiding last, 150-100-350-400	E3	1.16
	S1	0.96
	S3	0.56

4th Place

Situation	Round	Ratio
A bit behind, 200-300-250-250	E3	1.08
	S1	1.39
	S3	2.94
Far behind, 100,300,300,300	E3	1.53
	S1	1.91
	S3	8.79
10k but close 3rd, 100-150-400-350	E3	1.18
	S1	1.43
	S3	3.68
Just 1000 behind, 240-260-250-250	E3	1.01
	S1	1.01
	S3	1.09