



Poker Cards Analysis – March 2025

The Directors

Entain Plc

This is to confirm that iTech Labs has examined the game logs for Poker games for the period **March 01, 2025, to March 31, 2025** as recorded by the respective game servers and analyzed the Poker cards for statistical randomness. The results of the analysis are given below.

For details on the gaming sites serviced by the Entain Plc game servers and used in this audit refer to the [List](#).

1. Poker hand types statistics

These calculations were done for Royal Flush, Straight Flush, Four of a Kind, Full House, Flush, Straight, 3 of a Kind, 2 pairs, 1 Pair, High Card.

The Poker hand types analysis involved creating subsets of data and conducting Chi-square tests on each subset.

The null hypothesis for the chi-square test is that the observed frequencies of each type of hand matches the theoretical values for a deck that has been shuffled using a perfect random number generator. The p-values observed in these multiple tests are expected to follow a uniform distribution for the range 0.0 to 1.0.

The analysis performs a KS Test (Kolmogorov-Smirnov test) for uniform distribution on the observed p-values, and the combined p-value result of this test is taken as the final result of the Poker hand types statistics tests.

1.1 Poker hand types statistics for 52 cards deck:

Test No.	DOF	ChiSqr	P-Value
1	9	21.13	0.01207
2	9	3.87	0.91964
3	9	5.45	0.79323
4	9	2.03	0.99099
5	9	15.08	0.08880
6	9	5.96	0.74365
7	9	7.29	0.60742
8	9	4.29	0.89151
9	9	3.99	0.91209
10	9	16.44	0.05829
11	9	16.76	0.05253
12	9	6.32	0.70722
13	9	4.02	0.91013
14	9	9.57	0.38654
15	9	17.08	0.04755
16	9	4.42	0.88183
17	9	5.82	0.75798
18	9	3.81	0.92353
19	9	10.85	0.28610
20	9	9.75	0.37092
21	9	2.74	0.97357
22	9	11.75	0.22787
23	9	7.68	0.56667
24	9	14.98	0.09146
25	9	6.31	0.70884
26	9	8.27	0.50674
27	9	5.55	0.78376

28	9	8.96	0.44067
29	9	6.74	0.66388
30	9	9.06	0.43212
31	9	3.77	0.92607
32	9	4.70	0.85964
33	9	20.27	0.01634
34	9	1.54	0.99688
35	9	12.20	0.20238
36	9	5.81	0.75880
37	9	5.34	0.80387
38	9	4.83	0.84849
39	9	7.91	0.54310
40	9	10.21	0.33408
41	9	18.84	0.02662
42	9	8.19	0.51478
43	9	7.11	0.62533
44	9	11.34	0.25328
45	9	13.86	0.12724
46	9	4.58	0.86939
47	9	5.29	0.80840
48	9	6.99	0.63822
49	9	7.91	0.54305
50	9	12.74	0.17467
51	9	10.20	0.33451
52	9	6.46	0.69316
53	9	4.48	0.87701
54	9	4.09	0.90562
55	9	5.43	0.79515
56	9	3.57	0.93753
57	9	5.36	0.80182
58	9	2.42	0.98301
59	9	3.03	0.96290
60	9	7.21	0.61502
61	9	8.15	0.51889
62	9	5.64	0.77547
63	9	17.11	0.04695
64	9	11.18	0.26375
65	9	4.49	0.87610
66	9	11.63	0.23472
67	9	8.80	0.45556
68	9	15.11	0.08794
69	9	8.47	0.48783
70	9	9.22	0.41708
71	9	8.15	0.51892
72	9	1.76	0.99468
73	9	7.53	0.58171
74	9	8.68	0.46738
75	9	7.52	0.58286
76	9	12.71	0.17632
77	9	3.46	0.94303
78	9	7.02	0.63537
79	9	8.48	0.48700
80	9	10.98	0.27728
81	9	6.31	0.70821
82	9	4.42	0.88132
83	9	17.76	0.03804

84	9	8.50	0.48449
85	9	6.30	0.70920
86	9	7.33	0.60257
87	9	11.27	0.25780
88	9	6.39	0.70026
89	9	5.59	0.78034
90	9	6.54	0.68518
91	9	12.53	0.18497
92	9	11.31	0.25511
93	9	6.76	0.66260
94	9	7.88	0.54578
95	9	17.94	0.03591
96	9	11.60	0.23699
97	9	4.41	0.88209
98	9	7.06	0.63050
99	9	6.05	0.73505
100	9	27.12	0.00133
Combined P-value for all tests (Using KS method)			
			0.08306

Notes:

- 1) The P-values are observed probabilities from the Chi-Square tests. The last row shows the result of the KS Test performed on the p-values for all Chi-Square tests, where there are sufficient data.

2. Poker rank statistics

The Poker rank analysis aims to establish that the rank of the cards in each position was equally distributed in one of the 13 possible ranks (2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K, A) for a 52 card deck.

The Poker rank analysis involved creating subsets of data and conducting Chi-square tests on each subset. The analysis performs a KS Test (Kolmogorov-Smirnov test) for uniform distribution on the observed p-values, and the combined p-value result of this test is taken as the final result of the Ranks statistics tests.

2.1 Poker rank statistics for 52 cards deck:

Test No.	DOF	ChiSqr	P-Value
1	84	60.68	0.97418
2	84	71.03	0.84260
3	84	71.52	0.83226
4	84	70.03	0.86264
5	84	113.08	0.01890
6	84	59.92	0.97829
7	84	70.50	0.85335
8	84	71.07	0.84167
9	84	71.78	0.82657
10	84	75.29	0.74054
11	84	96.96	0.15779
12	84	86.34	0.40909
13	84	119.64	0.00647
14	84	76.16	0.71654
15	84	73.18	0.79431
16	84	99.92	0.11339
17	84	65.10	0.93720
18	84	69.90	0.86504
19	84	75.89	0.72403
20	84	104.74	0.06239
21	84	88.31	0.35252
22	84	91.00	0.28201
23	84	83.55	0.49330
24	84	62.92	0.95850

25	84	69.91	0.86488
26	84	98.45	0.13403
27	84	69.55	0.87160
28	84	87.30	0.38102
29	84	76.40	0.71000
30	84	91.78	0.26310
31	84	74.43	0.76319
32	84	71.92	0.82359
33	84	81.67	0.55176
34	84	97.28	0.15251
35	84	91.79	0.26296
36	84	84.60	0.46120
37	84	84.46	0.46535
38	84	87.69	0.36994
39	84	81.01	0.57226
40	84	67.94	0.89898
41	84	84.92	0.45148
42	84	91.60	0.26745
43	84	93.85	0.21682
44	84	75.45	0.73624
45	84	93.36	0.22725
46	84	85.91	0.42161
47	84	91.61	0.26711
48	84	75.91	0.72349
49	84	82.24	0.53382
50	84	67.65	0.90355
51	84	74.37	0.76459
52	84	108.29	0.03841
53	84	80.02	0.60269
54	84	114.18	0.01590
55	84	87.93	0.36325
56	84	81.97	0.54239
57	84	82.92	0.51292
58	84	92.35	0.24972
59	84	81.44	0.55891
60	84	87.16	0.38523
61	84	84.94	0.45077
62	84	83.05	0.50886
63	84	75.52	0.73415
64	84	94.56	0.20222
65	84	83.59	0.49197
66	84	87.07	0.38765
67	84	74.01	0.77387
68	84	94.75	0.19833
69	84	58.38	0.98502
70	84	85.71	0.42776
71	84	77.74	0.67129
72	84	77.82	0.66897
73	84	94.24	0.20860
74	84	65.11	0.93714
75	84	83.10	0.50715
76	84	98.03	0.14050
77	84	78.60	0.64582
78	84	82.48	0.52646
79	84	92.44	0.24769
80	84	95.97	0.17514

81	84	78.45	0.65029
82	84	71.59	0.83065
83	84	81.80	0.54764
84	84	95.59	0.18214
85	84	73.75	0.78037
86	84	61.59	0.96852
87	84	86.69	0.39882
88	84	114.66	0.01475
89	84	87.57	0.37345
90	84	99.26	0.12226
91	84	93.39	0.22670
92	84	78.84	0.63866
93	84	87.85	0.36541
94	84	96.26	0.16997
95	84	91.05	0.28077
96	84	88.92	0.33591
97	84	66.30	0.92268
98	84	94.42	0.20492
99	84	108.21	0.03889
100	84	91.88	0.26069
Combined P-value for all tests (Using KS method)			0.98860

Notes:

- 1) The P-values are observed probabilities from the Chi-Square tests. The last row shows the result of the KS Test performed on the p-values for all Chi-Square tests, where there are sufficient data.

3. Poker suits statistics

The Poker suits analysis aims to verify that the cards dealt exhibit an equal probability of all 4 suits (Clubs, Diamonds, Hearts and Spades) in all positions.

The Poker suits analysis involved creating subsets of data and conducting Chi-square tests on each subset. The analysis performs a KS Test (Kolmogorov-Smirnov test) for uniform distribution on the observed p-values, and the combined p-value result of this test is taken as the final result of the Suits statistics tests.

3.1 Poker suits statistics for 52 cards deck:

Test No.	Positions	DOF	ChiSqr	P-Value
1	7	21	22.71	0.35945
2	7	21	23.80	0.30283
3	7	21	27.95	0.14154
4	7	21	19.14	0.57623
5	7	21	31.62	0.06391
6	7	21	16.04	0.76722
7	7	21	23.82	0.30167
8	7	21	21.58	0.42382
9	7	21	16.23	0.75668
10	7	21	21.78	0.41229
11	7	21	24.15	0.28608
12	7	21	24.90	0.25152
13	7	21	16.66	0.73128
14	7	21	12.36	0.92949
15	7	21	21.63	0.42133
16	7	21	15.15	0.81510
17	7	21	15.71	0.78554
18	7	21	34.02	0.03608
19	7	21	18.49	0.61804
20	7	21	22.83	0.35324
21	7	21	23.38	0.32407
22	7	21	17.87	0.65713

23	7	21	18.11	0.64231
24	7	21	18.92	0.59031
25	7	21	17.09	0.70581
26	7	21	21.57	0.42493
27	7	21	21.89	0.40569
28	7	21	20.74	0.47518
29	7	21	22.31	0.38191
30	7	21	8.24	0.99402
31	7	21	11.55	0.95102
32	7	21	12.25	0.93270
33	7	21	22.93	0.34756
34	7	21	21.94	0.40295
35	7	21	21.67	0.41878
36	7	21	16.25	0.75552
37	7	21	14.44	0.84996
38	7	21	16.34	0.75015
39	7	21	27.04	0.16946
40	7	21	22.35	0.37966
41	7	21	11.74	0.94641
42	7	21	23.00	0.34399
43	7	21	15.95	0.77265
44	7	21	13.82	0.87723
45	7	21	16.70	0.72919
46	7	21	19.04	0.58247
47	7	21	27.98	0.14070
48	7	21	24.25	0.28121
49	7	21	21.36	0.43740
50	7	21	28.01	0.13997
51	7	21	13.89	0.87421
52	7	21	30.54	0.08160
53	7	21	21.31	0.44029
54	7	21	24.36	0.27597
55	7	21	15.31	0.80692
56	7	21	15.33	0.80613
57	7	21	22.85	0.35211
58	7	21	30.66	0.07958
59	7	21	23.49	0.31830
60	7	21	30.49	0.08259
61	7	21	13.87	0.87491
62	7	21	24.60	0.26482
63	7	21	20.17	0.51063
64	7	21	38.35	0.01173
65	7	21	19.85	0.53066
66	7	21	17.96	0.65138
67	7	21	17.55	0.67711
68	7	21	22.05	0.39649
69	7	21	18.30	0.62972
70	7	21	23.09	0.33943
71	7	21	22.32	0.38101
72	7	21	25.86	0.21177
73	7	21	18.25	0.63286
74	7	21	7.91	0.99550
75	7	21	19.29	0.56641
76	7	21	19.32	0.56432
77	7	21	19.67	0.54200
78	7	21	24.04	0.29113

79	7	21	27.60	0.15197
80	7	21	13.35	0.89571
81	7	21	18.26	0.63244
82	7	21	19.47	0.55510
83	7	21	15.08	0.81916
84	7	21	14.22	0.85985
85	7	21	18.42	0.62212
86	7	21	26.57	0.18542
87	7	21	19.11	0.57777
88	7	21	9.56	0.98403
89	7	21	19.94	0.52503
90	7	21	22.16	0.39060
91	7	21	35.54	0.02458
92	7	21	34.97	0.02842
93	7	21	7.55	0.99677
94	7	21	32.62	0.05058
95	7	21	22.69	0.36098
96	7	21	16.87	0.71876
97	7	21	15.84	0.77868
98	7	21	23.77	0.30428
99	7	21	26.77	0.17850
100	7	21	17.90	0.65539
Combined P-value for all tests (Using KS method)				0.43402

Notes:

- 1) The P-values are observed probabilities from the Chi-Square tests. The last row shows the result of the KS Test performed on the p-values for all Chi-Square tests, where there are sufficient data.

4. Summary of the analysis

4.1 Summary of the analysis of 52 cards deck:

The analysis of 52 cards completes by combining the result of the KS Test performed in the 3 types of analysis (Hand Types, Ranks and Suits) for 52 card decks using the Holm's method and producing a single Combined P -value.

The combined p-value produced using the Holm's method is used as indication for statistical randomness.

Combination of p-values using Holm's Method		
Test	P-Value	P-Adjusted
Ranks Test	0.98860	0.98860
Suits Test	0.43402	0.86803
Hand Types Test	0.08306	0.24917
Combined P-Value using Holm's Method		0.24917

Notes:

- 1) The combined p-value of all statistical tests using Holm's Method conducted for 52 card decks is greater than the minimum value of 0.05 which indicates that the randomness of the observed data falls within 95% confidence limits.

The final outcome of the analysis of 52 cards deck indicates that the RNG is working correctly.

4. Conclusion

Analysis of actual data from game logs for 'Hand Types', 'Ranks' and 'Suits' for **52-card decks** indicated statistical randomness. Since there is no data in the case of 36 card deck, this report does not contain the details of 36 card deck.

iTech Labs has done limited sanity checks to verify the integrity of the game logs. iTech Labs also maintains a copy of the game logs for verification purposes. There were a large enough number of game records to give the calculations sufficient statistical power.

We conclude that the Random Number Generator (RNG) is working correctly.

Please click [here](#) to see the [Original](#) report.

Signed:



Alvin Rizaldi
Chief Executive Officer
iTech Labs

Date: 13 May 2025

Signed:



Divya Bhargava
Project Manager
iTech Labs

Date: 13 May 2025

Disclaimer.

While it is not possible to test all possible scenarios in a laboratory environment, iTech Labs has conducted a level of testing appropriate for a component test of this type.

