

Blackjack Cards Analysis – June 2026

The Directors

Entain Plc

This confirms that iTech Labs has examined the game logs for blackjack games from **June 1, 2026 to June 30, 2026**, as recorded by the respective game servers. The game logs were for blackjack games using 8 decks. iTech Labs analysed the blackjack 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. Blackjack hand value

Blackjack hand value analysis involved creating subsets of data and conducting Chi-square tests on each subset. Opening hands are the value of the first two cards dealt. Final hand value is the hand value at the end of the game. The dealer's final hand value is based on the fixed rules of the game. The player's final hand value is dependent on the player's strategy choice, so it has no theoretical basis for comparison.

The null hypothesis for the chi-square test is that the observed frequencies of each type of hand match 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 blackjack opening hand value statistics tests.

1.1 Player's opening score (from first two cards):

Test No.	DOF	ChiSqr	P-Value
1	17	26.02	0.07406
2	17	24.04	0.11838
3	17	16.80	0.46811
4	17	26.26	0.06988
5	17	16.78	0.46938
6	17	14.05	0.66341
7	17	20.11	0.26881
8	17	15.15	0.58455
9	17	20.92	0.22968
10	17	15.03	0.59334
11	17	13.74	0.68536
12	17	16.85	0.46463
13	17	11.63	0.82182

Test No.	DOF	ChiSqr	P-Value
14	17	15.39	0.56714
15	17	22.16	0.17876
16	17	14.88	0.60377
17	17	21.85	0.19049
18	17	18.49	0.35832
19	17	18.50	0.35795
20	17	14.51	0.63066
21	17	16.03	0.52170
22	17	19.56	0.29759
23	17	10.83	0.86525
24	17	13.06	0.73242
25	17	10.55	0.87908
26	17	12.84	0.74715
27	17	11.98	0.80116
28	17	15.27	0.57593
29	17	18.44	0.36156
30	17	14.30	0.64570
31	17	15.42	0.56497
32	17	10.78	0.86794
33	17	20.39	0.25485
34	17	12.44	0.77259
35	17	15.20	0.58139
36	17	37.31	0.00306
37	17	12.06	0.79627
38	17	10.29	0.89095
39	17	8.74	0.94802
40	17	24.64	0.10301
41	17	26.05	0.07354
42	17	13.84	0.67874
43	17	11.01	0.85587
44	17	17.68	0.40933

Test No.	DOF	ChiSqr	P-Value
45	17	21.07	0.22313
46	17	14.11	0.65927
47	17	25.56	0.08295
48	17	17.80	0.40163
49	17	21.64	0.19894
50	17	41.62	0.00076
51	17	17.02	0.45271
52	17	15.16	0.58431
53	17	11.47	0.83120
54	17	19.13	0.32087
55	17	14.76	0.61293
56	17	15.36	0.56960
57	17	19.19	0.31779
58	17	16.95	0.45802
59	17	18.97	0.33032
60	17	14.84	0.60693
61	17	8.17	0.96289
62	17	12.70	0.75596
63	17	10.57	0.87815
64	17	24.62	0.10362
65	17	28.10	0.04374
66	17	10.08	0.90030
67	17	13.35	0.71244
68	17	14.85	0.60659
69	17	16.47	0.49068
70	17	22.69	0.15965
71	17	13.76	0.68419
72	17	23.69	0.12811
73	17	23.94	0.12121
74	17	14.89	0.60362
75	17	13.02	0.73493

Test No.	DOF	ChiSqr	P-Value
76	17	13.02	0.73483
77	17	14.35	0.64189
78	17	14.62	0.62275
79	17	18.96	0.33064
80	17	26.84	0.06049
81	17	8.40	0.95734
82	17	17.07	0.44959
83	17	18.62	0.35086
84	17	13.80	0.68146
85	17	16.21	0.50899
86	17	20.56	0.24652
87	17	13.58	0.69677
88	17	25.37	0.08682
89	17	16.99	0.45484
90	17	28.01	0.04477
91	17	14.88	0.60420
92	17	13.26	0.71836
93	17	16.01	0.52318
94	17	13.41	0.70832
95	17	12.36	0.77778
96	17	11.51	0.82901
97	17	12.48	0.77008
98	17	12.34	0.77941
99	17	15.47	0.56169
100	17	16.61	0.48111
Combined P-Value for 100 tests (Using KS method)			0.26048

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.

1.2 Dealer's opening score (from first two cards):

Test No.	DOF	ChiSqr	P-Value
1	17	26.74	0.06198
2	17	12.44	0.77295
3	17	17.61	0.41377
4	17	9.80	0.91191
5	17	22.02	0.18378
6	17	7.59	0.97446
7	17	27.90	0.04611
8	17	24.13	0.11598
9	17	34.58	0.00706
10	17	13.04	0.73378
11	17	10.06	0.90103
12	17	11.73	0.81624
13	17	12.28	0.78306
14	17	29.06	0.03395
15	17	15.98	0.52554
16	17	25.84	0.07740
17	17	12.51	0.76838
18	17	20.56	0.24665
19	17	17.20	0.44110
20	17	19.63	0.29342
21	17	15.84	0.53546
22	17	20.57	0.24628
23	17	25.55	0.08306
24	17	12.85	0.74645
25	17	20.54	0.24765
26	17	10.28	0.89152
27	17	26.72	0.06228
28	17	21.18	0.21847
29	17	14.41	0.63813
30	17	19.31	0.31089

Test No.	DOF	ChiSqr	P-Value
31	17	14.55	0.62793
32	17	11.64	0.82145
33	17	13.58	0.69655
34	17	6.75	0.98654
35	17	11.65	0.82112
36	17	15.96	0.52643
37	17	13.67	0.69041
38	17	16.69	0.47571
39	17	17.13	0.44528
40	17	16.57	0.48395
41	17	24.51	0.10622
42	17	14.60	0.62427
43	17	12.22	0.78636
44	17	18.42	0.36264
45	17	25.40	0.08601
46	17	14.13	0.65761
47	17	11.22	0.84477
48	17	16.97	0.45665
49	17	20.92	0.22967
50	17	12.78	0.75104
51	17	18.21	0.37572
52	17	21.18	0.21852
53	17	19.87	0.28108
54	17	19.01	0.32822
55	17	14.83	0.60788
56	17	30.72	0.02163
57	17	15.46	0.56212
58	17	23.23	0.14176
59	17	16.94	0.45864
60	17	20.05	0.27188
61	17	15.02	0.59375

Test No.	DOF	ChiSqr	P-Value
62	17	10.52	0.88019
63	17	12.41	0.77484
64	17	8.87	0.94419
65	17	21.59	0.20090
66	17	11.65	0.82109
67	17	4.59	0.99872
68	17	20.33	0.25775
69	17	20.37	0.25579
70	17	14.36	0.64118
71	17	14.43	0.63638
72	17	17.02	0.45267
73	17	10.71	0.87142
74	17	30.23	0.02476
75	17	14.84	0.60718
76	17	15.08	0.58957
77	17	12.47	0.77068
78	17	16.52	0.48733
79	17	9.58	0.92035
80	17	13.41	0.70838
81	17	15.01	0.59481
82	17	9.81	0.91123
83	17	10.32	0.88963
84	17	11.06	0.85352
85	17	7.57	0.97481
86	17	15.01	0.59471
87	17	13.05	0.73269
88	17	8.44	0.95623
89	17	8.94	0.94227
90	17	12.70	0.75615
91	17	14.12	0.65855
92	17	25.91	0.07611

Test No.	DOF	ChiSqr	P-Value
93	17	13.40	0.70933
94	17	10.02	0.90259
95	17	16.24	0.50663
96	17	8.67	0.95008
97	17	14.69	0.61778
98	17	19.24	0.31503
99	17	13.84	0.67829
100	17	13.76	0.68402
Combined P-Value for 100 tests (Using KS method)			0.06374

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.

1.3 Dealer's final score (total of all cards for hands with 3 or more cards):

Test No.	DOF	ChiSqr	P-Value
1	50	57.88	0.20736
2	50	57.93	0.20606
3	50	41.89	0.78580
4	50	48.61	0.52920
5	50	37.55	0.90283
6	50	37.78	0.89801
7	50	50.14	0.46789
8	50	62.54	0.10978
9	50	58.07	0.20247
10	50	24.11	0.99927
11	50	64.91	0.07648
12	50	45.12	0.66934
13	50	41.57	0.79612
14	50	51.85	0.40165
15	50	52.69	0.37033
16	50	71.08	0.02660

Test No.	DOF	ChiSqr	P-Value
17	50	66.85	0.05580
18	50	49.27	0.50273
19	50	37.91	0.89523
20	50	68.31	0.04357
21	50	36.42	0.92463
22	50	55.40	0.27845
23	50	46.44	0.61718
24	50	40.45	0.83047
25	50	44.09	0.70821
26	50	50.29	0.46171
27	50	57.23	0.22458
28	50	64.40	0.08277
29	50	55.88	0.26339
30	50	57.52	0.21662
31	50	43.12	0.74361
32	50	59.72	0.16327
33	50	44.60	0.68897
34	50	38.80	0.87459
35	50	54.72	0.30020
36	50	43.02	0.74717
37	50	60.48	0.14717
38	50	53.87	0.32861
39	50	59.80	0.16145
40	50	39.48	0.85740
41	50	51.11	0.42992
42	50	51.03	0.43304
43	50	39.24	0.86352
44	50	59.29	0.17279
45	50	44.29	0.70087
46	50	38.74	0.87606
47	50	46.04	0.63282

Test No.	DOF	ChiSqr	P-Value
48	50	69.90	0.03298
49	50	33.06	0.96897
50	50	52.59	0.37421
51	50	49.29	0.50184
52	50	72.58	0.02013
53	50	67.61	0.04911
54	50	28.38	0.99409
55	50	48.85	0.51956
56	50	59.69	0.16392
57	50	42.24	0.77409
58	50	64.22	0.08515
59	50	64.21	0.08532
60	50	52.58	0.37460
61	50	33.64	0.96333
62	50	46.50	0.61466
63	50	43.25	0.73915
64	50	45.15	0.66812
65	50	43.83	0.71800
66	50	39.98	0.84372
67	50	53.42	0.34441
68	50	48.20	0.54580
69	50	48.64	0.52801
70	50	59.74	0.16286
71	50	59.09	0.17759
72	50	51.53	0.41378
73	50	55.50	0.27527
74	50	58.27	0.19725
75	50	50.65	0.44759
76	50	31.99	0.97777
77	50	66.02	0.06401
78	50	52.87	0.36382

Test No.	DOF	ChiSqr	P-Value
79	50	57.23	0.22472
80	50	45.34	0.66063
81	50	42.42	0.76808
82	50	44.18	0.70503
83	50	47.93	0.55688
84	50	41.71	0.79156
85	50	46.48	0.61534
86	50	68.82	0.03989
87	50	67.01	0.05433
88	50	64.82	0.07753
89	50	62.19	0.11564
90	50	46.75	0.60465
91	50	60.91	0.13870
92	50	44.47	0.69421
93	50	54.40	0.31075
94	50	54.80	0.29755
95	50	59.31	0.17234
96	50	57.02	0.23030
97	50	43.30	0.73735
98	50	41.01	0.81354
99	50	49.60	0.48945
100	50	45.96	0.63610
Combined P-Value for 100 tests (Using KS method)			0.38081

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. Blackjack rank statistics

The blackjack rank analysis aims to establish that the rank of the cards to player and dealer was equally distributed in one of the 13 possible ranks (2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K, A).

The blackjack 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 Blackjack rank statistics for all player cards:

Test No.	DOF	ChiSqr	P-Value
1	12	16.68	0.16220
2	12	2.71	0.99727
3	12	8.80	0.72009
4	12	8.48	0.74619
5	12	7.03	0.85550
6	12	11.13	0.51785
7	12	17.44	0.13392
8	12	13.57	0.32898
9	12	15.21	0.23029
10	12	13.77	0.31591
11	12	8.39	0.75420
12	12	12.75	0.38725
13	12	4.08	0.98202
14	12	13.79	0.31433
15	12	19.33	0.08085
16	12	14.74	0.25618
17	12	18.80	0.09338
18	12	14.52	0.26899
19	12	13.14	0.35896
20	12	11.91	0.45323
21	12	4.94	0.95997
22	12	10.25	0.59361
23	12	16.19	0.18250
24	12	8.21	0.76874
25	12	11.37	0.49717
26	12	15.87	0.19732
27	12	16.45	0.17152
28	12	4.68	0.96793
29	12	6.09	0.91139
30	12	2.40	0.99850

Test No.	DOF	ChiSqr	P-Value
31	12	25.61	0.01216
32	12	7.00	0.85763
33	12	16.60	0.16532
34	12	16.42	0.17279
35	12	8.59	0.73777
36	12	9.71	0.64148
37	12	6.20	0.90584
38	12	7.54	0.81970
39	12	8.36	0.75640
40	12	4.84	0.96325
41	12	17.03	0.14838
42	12	8.69	0.72953
43	12	5.48	0.93990
44	12	5.09	0.95475
45	12	9.49	0.66029
46	12	13.14	0.35866
47	12	27.26	0.00709
48	12	10.07	0.60966
49	12	11.51	0.48604
50	12	23.52	0.02361
51	12	14.02	0.29943
52	12	18.99	0.08884
53	12	5.92	0.91991
54	12	7.90	0.79313
55	12	10.78	0.54803
56	12	15.18	0.23158
57	12	6.52	0.88746
58	12	7.62	0.81393
59	12	14.42	0.27452
60	12	16.47	0.17081
61	12	7.71	0.80721

Test No.	DOF	ChiSqr	P-Value
62	12	12.29	0.42284
63	12	9.40	0.66818
64	12	24.92	0.01523
65	12	23.60	0.02304
66	12	14.75	0.25539
67	12	15.42	0.21927
68	12	17.39	0.13554
69	12	10.49	0.57323
70	12	9.33	0.67469
71	12	13.53	0.33159
72	12	9.46	0.66357
73	12	9.22	0.68377
74	12	7.72	0.80661
75	12	11.87	0.45601
76	12	8.68	0.73008
77	12	11.37	0.49759
78	12	3.31	0.99293
79	12	5.09	0.95508
80	12	9.53	0.65677
81	12	10.05	0.61201
82	12	7.94	0.79019
83	12	25.17	0.01404
84	12	7.83	0.79865
85	12	21.37	0.04520
86	12	15.63	0.20883
87	12	13.42	0.33961
88	12	6.21	0.90529
89	12	9.29	0.67789
90	12	12.22	0.42841
91	12	13.01	0.36860
92	12	8.38	0.75518

Test No.	DOF	ChiSqr	P-Value
93	12	5.42	0.94238
94	12	14.62	0.26288
95	12	10.09	0.60815
96	12	9.96	0.61912
97	12	10.95	0.53304
98	12	9.95	0.62026
99	12	15.47	0.21663
100	12	10.79	0.54664
Combined P-Value for 100 tests (Using KS method)			0.55759

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.

2.2 Blackjack rank statistics for all dealer cards:

Test No.	DOF	ChiSqr	P-Value
1	12	21.43	0.04446
2	12	12.33	0.41974
3	12	16.04	0.18935
4	12	9.39	0.66907
5	12	4.46	0.97358
6	12	5.47	0.94046
7	12	14.60	0.26429
8	12	13.55	0.33025
9	12	19.08	0.08661
10	12	7.12	0.84935
11	12	6.16	0.90773
12	12	7.78	0.80210
13	12	15.47	0.21655
14	12	8.23	0.76699
15	12	8.46	0.74858
16	12	5.88	0.92223

Test No.	DOF	ChiSqr	P-Value
17	12	17.26	0.14014
18	12	6.67	0.87850
19	12	9.60	0.65103
20	12	14.49	0.27072
21	12	14.04	0.29787
22	12	10.33	0.58696
23	12	19.72	0.07253
24	12	8.67	0.73057
25	12	6.51	0.88799
26	12	9.84	0.63017
27	12	10.58	0.56513
28	12	13.09	0.36232
29	12	16.60	0.16515
30	12	8.29	0.76224
31	12	14.38	0.27704
32	12	4.30	0.97733
33	12	20.66	0.05559
34	12	12.23	0.42715
35	12	14.38	0.27728
36	12	7.48	0.82470
37	12	4.55	0.97148
38	12	7.41	0.82959
39	12	20.57	0.05711
40	12	8.75	0.72454
41	12	11.38	0.49692
42	12	10.64	0.56043
43	12	3.47	0.99121
44	12	11.22	0.50991
45	12	17.41	0.13495
46	12	11.92	0.45245
47	12	13.41	0.33968

Test No.	DOF	ChiSqr	P-Value
48	12	11.69	0.47097
49	12	21.52	0.04328
50	12	24.18	0.01920
51	12	6.85	0.86743
52	12	9.72	0.64086
53	12	14.69	0.25860
54	12	11.80	0.46204
55	12	11.04	0.52541
56	12	22.55	0.03182
57	12	22.39	0.03338
58	12	12.96	0.37203
59	12	8.38	0.75445
60	12	11.40	0.49498
61	12	11.77	0.46408
62	12	9.30	0.67746
63	12	7.86	0.79628
64	12	7.55	0.81923
65	12	9.53	0.65677
66	12	28.23	0.00512
67	12	10.71	0.55436
68	12	9.85	0.62929
69	12	10.29	0.59054
70	12	9.45	0.66392
71	12	14.93	0.24507
72	12	11.04	0.52566
73	12	15.47	0.21683
74	12	11.70	0.47006
75	12	9.63	0.64847
76	12	8.71	0.72765
77	12	17.07	0.14709
78	12	14.43	0.27404

Test No.	DOF	ChiSqr	P-Value
79	12	16.02	0.19037
80	12	10.22	0.59667
81	12	11.20	0.51212
82	12	21.02	0.05004
83	12	9.43	0.66592
84	12	13.16	0.35745
85	12	14.87	0.24840
86	12	8.85	0.71577
87	12	9.13	0.69187
88	12	10.43	0.57864
89	12	13.18	0.35617
90	12	10.22	0.59658
91	12	9.27	0.67989
92	12	9.27	0.67954
93	12	11.63	0.47592
94	12	13.98	0.30192
95	12	16.06	0.18837
96	12	6.85	0.86762
97	12	12.86	0.37952
98	12	10.73	0.55245
99	12	10.32	0.58835
100	12	14.71	0.25764
Combined P-Value for 100 tests (Using KS method)			0.93524

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. Summary of the analysis of blackjack tests

The Blackjack cards analysis is completed by combining the result of the KS Test performed in the two types of analysis (Hand Values and Ranks) for using Holm's method and producing a single Combined P-value.

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

Combination of p-values using Holm's Method		
Test	P-Value	P-Adjusted
Opening Score (Player)	0.26048	1.00000
Opening Score (Dealer)	0.06374	0.31872
Dealer's Final Score	0.38081	1.00000
Player Cards Rank	0.55759	1.00000
Dealer Cards Rank	0.93524	1.00000
Combined P-Value using Holm's Method		0.31872

Notes:

- 1) The combined p-value of all statistical tests using Holm's Method conducted for blackjack 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 blackjack indicates that the RNG is working correctly.

4. Conclusion

Analysis of actual data from game logs for 'player opening score', 'dealer opening score', 'dealer final score', 'player card rank' and 'dealer card rank' indicated statistical randomness. The results were satisfactory for 8 decks blackjack.

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

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.

The scope of the review did not include reviews of financial controls or casino operations. We believe that the probabilities were calculated correctly from the game logs.

Signed:



James Boje
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Executive
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