

Blackjack Cards Analysis – March 2026

The Directors

Entain Plc

This confirms that iTech Labs has examined the game logs for blackjack games from **March 1, 2026 to March 31, 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	10.14	0.89776
2	17	21.26	0.21493
3	17	9.83	0.91063
4	17	16.00	0.52372
5	17	27.79	0.04749
6	17	29.96	0.02666
7	17	21.42	0.20788
8	17	7.73	0.97203
9	17	15.68	0.54664
10	17	16.83	0.46582
11	17	18.04	0.38641
12	17	19.17	0.31877
13	17	18.06	0.38528

Test No.	DOF	ChiSqr	P-Value
14	17	21.70	0.19666
15	17	20.86	0.23267
16	17	15.98	0.52547
17	17	11.71	0.81735
18	17	17.77	0.40364
19	17	15.53	0.55750
20	17	28.02	0.04474
21	17	18.58	0.35313
22	17	5.92	0.99371
23	17	7.03	0.98313
24	17	21.41	0.20854
25	17	14.18	0.65437
26	17	9.72	0.91477
27	17	15.04	0.59262
28	17	21.55	0.20275
29	17	20.18	0.26507
30	17	13.13	0.72761
31	17	17.71	0.40767
32	17	14.15	0.65664
33	17	15.19	0.58186
34	17	8.02	0.96602
35	17	12.78	0.75108
36	17	14.79	0.61044
37	17	16.14	0.51385
38	17	12.69	0.75641
39	17	15.94	0.52844
40	17	14.21	0.65235
41	17	16.12	0.51500
42	17	20.47	0.25070
43	17	15.76	0.54117
44	17	21.00	0.22637

Test No.	DOF	ChiSqr	P-Value
45	17	27.91	0.04603
46	17	10.68	0.87248
47	17	13.00	0.73607
48	17	10.92	0.86052
49	17	13.06	0.73234
50	17	20.69	0.24056
51	17	15.71	0.54442
52	17	19.45	0.30336
53	17	34.03	0.00831
54	17	19.52	0.29972
55	17	13.14	0.72699
56	17	12.16	0.79066
57	17	25.93	0.07580
58	17	15.12	0.58656
59	17	16.24	0.50716
60	17	41.06	0.00092
61	17	14.54	0.62841
62	17	18.09	0.38339
63	17	28.31	0.04147
64	17	16.29	0.50350
65	17	9.74	0.91408
66	17	12.18	0.78906
67	17	14.07	0.66235
68	17	12.17	0.78959
69	17	19.15	0.32026
70	17	17.14	0.44476
71	17	14.15	0.65668
72	17	14.93	0.60060
73	17	13.65	0.69186
74	17	10.25	0.89266
75	17	18.70	0.34586

Test No.	DOF	ChiSqr	P-Value
76	17	15.64	0.54940
77	17	13.52	0.70103
78	17	22.73	0.15829
79	17	12.88	0.74400
80	17	15.20	0.58085
81	17	6.34	0.99064
82	17	14.61	0.62328
83	17	11.54	0.82692
84	17	16.13	0.51450
85	17	17.53	0.41926
86	17	13.05	0.73303
87	17	19.98	0.27509
88	17	11.41	0.83472
89	17	16.23	0.50748
90	17	18.21	0.37600
91	17	7.86	0.96938
92	17	15.13	0.58645
93	17	18.18	0.37761
94	17	17.69	0.40838
95	17	22.70	0.15928
96	17	10.67	0.87336
97	17	24.70	0.10153
98	17	9.68	0.91644
99	17	10.89	0.86202
100	17	15.46	0.56237
Combined P-Value for 100 tests (Using KS method)			0.14206

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	8.57	0.95290
2	17	22.81	0.15541
3	17	36.53	0.00390
4	17	30.65	0.02202
5	17	15.14	0.58535
6	17	23.11	0.14555
7	17	21.62	0.19992
8	17	14.92	0.60143
9	17	12.35	0.77862
10	17	14.68	0.61859
11	17	24.51	0.10618
12	17	30.85	0.02080
13	17	27.48	0.05134
14	17	14.19	0.65396
15	17	15.33	0.57177
16	17	15.30	0.57374
17	17	8.31	0.95954
18	17	13.01	0.73570
19	17	26.76	0.06171
20	17	29.37	0.03126
21	17	16.37	0.49783
22	17	23.94	0.12119
23	17	22.21	0.17688
24	17	18.00	0.38853
25	17	22.66	0.16055
26	17	16.49	0.48923
27	17	18.06	0.38530
28	17	11.68	0.81931
29	17	11.54	0.82714
30	17	10.84	0.86459

Test No.	DOF	ChiSqr	P-Value
31	17	19.64	0.29323
32	17	18.44	0.36157
33	17	29.18	0.03290
34	17	10.99	0.85709
35	17	13.05	0.73273
36	17	19.36	0.30837
37	17	17.19	0.44156
38	17	11.18	0.84684
39	17	22.29	0.17377
40	17	17.89	0.39605
41	17	12.01	0.79965
42	17	28.69	0.03750
43	17	15.88	0.53201
44	17	13.89	0.67485
45	17	8.68	0.94977
46	17	16.85	0.46474
47	17	34.41	0.00744
48	17	18.61	0.35131
49	17	18.52	0.35663
50	17	17.98	0.39018
51	17	22.92	0.15184
52	17	9.76	0.91349
53	17	12.97	0.73844
54	17	15.31	0.57336
55	17	24.19	0.11446
56	17	13.11	0.72872
57	17	13.63	0.69338
58	17	26.37	0.06797
59	17	10.71	0.87135
60	17	12.31	0.78124
61	17	14.28	0.64734

Test No.	DOF	ChiSqr	P-Value
62	17	15.52	0.55806
63	17	18.78	0.34153
64	17	20.28	0.26014
65	17	14.95	0.59896
66	17	15.45	0.56308
67	17	12.86	0.74518
68	17	23.12	0.14526
69	17	19.96	0.27653
70	17	22.16	0.17864
71	17	10.74	0.86955
72	17	17.45	0.42428
73	17	26.29	0.06932
74	17	17.10	0.44787
75	17	18.96	0.33104
76	17	5.45	0.99619
77	17	15.74	0.54217
78	17	17.51	0.42010
79	17	19.76	0.28685
80	17	22.34	0.17184
81	17	6.82	0.98572
82	17	16.22	0.50845
83	17	12.57	0.76446
84	17	13.53	0.69983
85	17	15.81	0.53740
86	17	12.69	0.75649
87	17	17.78	0.40282
88	17	12.63	0.76044
89	17	11.87	0.80773
90	17	32.51	0.01300
91	17	7.88	0.96897
92	17	21.37	0.21028

Test No.	DOF	ChiSqr	P-Value
93	17	15.38	0.56848
94	17	19.74	0.28790
95	17	16.84	0.46547
96	17	13.43	0.70707
97	17	11.73	0.81639
98	17	14.67	0.61916
99	17	12.43	0.77316
100	17	16.92	0.45956
Combined P-Value for 100 tests (Using KS method)			0.94943

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	37.05	0.91299
2	50	68.32	0.04351
3	50	57.72	0.21146
4	50	57.36	0.22096
5	50	39.34	0.86105
6	50	49.60	0.48955
7	50	37.09	0.91210
8	50	55.30	0.28133
9	50	58.98	0.18008
10	50	48.91	0.51707
11	50	41.84	0.78730
12	50	50.16	0.46700
13	50	56.46	0.24644
14	50	48.76	0.52319
15	50	51.61	0.41071
16	50	53.52	0.34079

Test No.	DOF	ChiSqr	P-Value
17	50	50.03	0.47217
18	50	42.77	0.75611
19	50	48.68	0.52650
20	50	40.02	0.84274
21	50	53.26	0.34996
22	50	48.28	0.54265
23	50	43.59	0.72664
24	50	59.33	0.17196
25	50	56.42	0.24754
26	50	45.90	0.63855
27	50	38.46	0.88279
28	50	48.13	0.54860
29	50	47.07	0.59169
30	50	36.30	0.92664
31	50	50.81	0.44149
32	50	70.76	0.02822
33	50	44.46	0.69436
34	50	44.70	0.68526
35	50	67.49	0.05017
36	50	65.53	0.06923
37	50	40.80	0.82017
38	50	39.96	0.84420
39	50	54.19	0.31788
40	50	65.31	0.07177
41	50	45.16	0.66765
42	50	46.55	0.61272
43	50	30.89	0.98461
44	50	40.52	0.82847
45	50	50.90	0.43800
46	50	41.53	0.79744
47	50	44.41	0.69633

Test No.	DOF	ChiSqr	P-Value
48	50	55.62	0.27134
49	50	73.33	0.01744
50	50	58.17	0.19981
51	50	46.14	0.62919
52	50	58.17	0.19993
53	50	49.32	0.50078
54	50	61.24	0.13252
55	50	27.55	0.99588
56	50	55.60	0.27196
57	50	46.22	0.62574
58	50	66.24	0.06171
59	50	42.93	0.75058
60	50	46.50	0.61455
61	50	60.83	0.14027
62	50	56.12	0.25642
63	50	60.25	0.15197
64	50	56.92	0.23332
65	50	33.90	0.96044
66	50	34.98	0.94710
67	50	42.34	0.77082
68	50	41.48	0.79912
69	50	43.84	0.71773
70	50	47.10	0.59064
71	50	50.50	0.45367
72	50	40.30	0.83480
73	50	55.95	0.26134
74	50	48.38	0.53859
75	50	48.26	0.54336
76	50	47.96	0.55556
77	50	60.94	0.13806
78	50	51.30	0.42252

Test No.	DOF	ChiSqr	P-Value
79	50	77.45	0.00767
80	50	47.98	0.55475
81	50	35.71	0.93643
82	50	57.95	0.20544
83	50	74.79	0.01312
84	50	38.62	0.87908
85	50	52.69	0.37055
86	50	44.01	0.71121
87	50	54.03	0.32309
88	50	63.33	0.09761
89	50	33.89	0.96057
90	50	42.38	0.76953
91	50	36.68	0.91999
92	50	53.82	0.33034
93	50	48.79	0.52181
94	50	61.64	0.12510
95	50	61.70	0.12403
96	50	59.96	0.15802
97	50	47.28	0.58320
98	50	48.87	0.51874
99	50	40.21	0.83733
100	50	49.94	0.47565
Combined P-Value for 100 tests (Using KS method)			0.99842

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	8.02	0.78357
2	12	10.22	0.59649
3	12	16.86	0.15509
4	12	12.09	0.43872
5	12	12.22	0.42826
6	12	4.50	0.97271
7	12	13.26	0.35064
8	12	9.39	0.66931
9	12	18.86	0.09191
10	12	13.87	0.30922
11	12	8.06	0.78042
12	12	6.69	0.87722
13	12	16.51	0.16898
14	12	38.78	0.00011
15	12	8.08	0.77916
16	12	4.15	0.98066
17	12	19.09	0.08647
18	12	6.66	0.87942
19	12	14.02	0.29931
20	12	17.57	0.12945
21	12	10.50	0.57262
22	12	15.31	0.22471
23	12	10.82	0.54475
24	12	18.55	0.09988
25	12	12.89	0.37738
26	12	7.65	0.81155
27	12	5.68	0.93144
28	12	8.68	0.72974
29	12	15.49	0.21573
30	12	9.50	0.65939

Test No.	DOF	ChiSqr	P-Value
31	12	4.74	0.96599
32	12	7.60	0.81548
33	12	10.72	0.55279
34	12	20.39	0.06004
35	12	23.20	0.02612
36	12	12.37	0.41683
37	12	12.64	0.39597
38	12	13.42	0.33954
39	12	7.20	0.84391
40	12	24.17	0.01930
41	12	13.47	0.33569
42	12	13.49	0.33466
43	12	11.98	0.44729
44	12	8.82	0.71814
45	12	7.58	0.81733
46	12	10.56	0.56669
47	12	16.34	0.17628
48	12	12.30	0.42182
49	12	23.83	0.02146
50	12	12.95	0.37261
51	12	5.76	0.92793
52	12	16.50	0.16948
53	12	13.00	0.36911
54	12	7.99	0.78630
55	12	7.37	0.83237
56	12	7.07	0.85309
57	12	14.44	0.27362
58	12	11.44	0.49130
59	12	11.77	0.46408
60	12	18.97	0.08930
61	12	9.23	0.68308

Test No.	DOF	ChiSqr	P-Value
62	12	8.06	0.78082
63	12	12.38	0.41582
64	12	27.60	0.00633
65	12	13.77	0.31550
66	12	9.63	0.64796
67	12	5.34	0.94549
68	12	8.41	0.75272
69	12	19.58	0.07545
70	12	3.89	0.98541
71	12	8.63	0.73444
72	12	11.62	0.47678
73	12	12.30	0.42217
74	12	14.38	0.27714
75	12	5.21	0.95066
76	12	7.47	0.82505
77	12	3.68	0.98856
78	12	7.10	0.85065
79	12	7.07	0.85324
80	12	12.28	0.42360
81	12	8.20	0.76938
82	12	8.99	0.70356
83	12	17.06	0.14752
84	12	7.69	0.80874
85	12	17.61	0.12811
86	12	10.32	0.58803
87	12	10.51	0.57171
88	12	23.67	0.02253
89	12	13.96	0.30342
90	12	10.40	0.58121
91	12	10.12	0.60525
92	12	12.15	0.43362

Test No.	DOF	ChiSqr	P-Value
93	12	8.51	0.74402
94	12	14.03	0.29881
95	12	20.60	0.05660
96	12	8.14	0.77445
97	12	15.70	0.20543
98	12	11.27	0.50585
99	12	10.99	0.52938
100	12	17.70	0.12501
Combined P-Value for 100 tests (Using KS method)			0.96138

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	5.68	0.93135
2	12	6.79	0.87130
3	12	24.12	0.01960
4	12	9.31	0.67634
5	12	6.21	0.90491
6	12	17.32	0.13781
7	12	4.72	0.96657
8	12	13.12	0.36067
9	12	7.59	0.81615
10	12	5.52	0.93837
11	12	12.21	0.42904
12	12	15.32	0.22430
13	12	8.70	0.72832
14	12	11.16	0.51509
15	12	9.37	0.67113
16	12	7.41	0.82973

Test No.	DOF	ChiSqr	P-Value
17	12	11.03	0.52635
18	12	9.45	0.66452
19	12	8.45	0.74880
20	12	14.29	0.28270
21	12	3.32	0.99287
22	12	14.58	0.26504
23	12	10.14	0.60342
24	12	10.93	0.53467
25	12	9.30	0.67729
26	12	8.40	0.75322
27	12	16.09	0.18719
28	12	12.27	0.42432
29	12	19.47	0.07784
30	12	6.30	0.90021
31	12	11.14	0.51670
32	12	17.19	0.14263
33	12	9.86	0.62850
34	12	15.62	0.20951
35	12	10.90	0.53716
36	12	8.70	0.72793
37	12	12.06	0.44067
38	12	15.59	0.21070
39	12	8.00	0.78485
40	12	6.92	0.86265
41	12	12.73	0.38912
42	12	5.11	0.95407
43	12	6.75	0.87393
44	12	13.10	0.36212
45	12	6.55	0.88560
46	12	25.24	0.01373
47	12	11.90	0.45368

Test No.	DOF	ChiSqr	P-Value
48	12	8.17	0.77207
49	12	14.79	0.25336
50	12	8.07	0.77986
51	12	9.95	0.62070
52	12	17.11	0.14556
53	12	3.63	0.98923
54	12	9.53	0.65696
55	12	15.41	0.21964
56	12	11.51	0.48581
57	12	15.42	0.21905
58	12	8.43	0.75083
59	12	19.97	0.06758
60	12	18.38	0.10470
61	12	11.03	0.52658
62	12	6.93	0.86252
63	12	12.98	0.37055
64	12	8.50	0.74513
65	12	8.71	0.72785
66	12	14.75	0.25511
67	12	11.79	0.46253
68	12	5.95	0.91836
69	12	19.03	0.08779
70	12	15.51	0.21458
71	12	10.20	0.59807
72	12	9.07	0.69705
73	12	14.77	0.25424
74	12	10.96	0.53252
75	12	15.75	0.20311
76	12	7.13	0.84882
77	12	6.86	0.86675
78	12	8.11	0.77674

Test No.	DOF	ChiSqr	P-Value
79	12	10.59	0.56400
80	12	16.28	0.17877
81	12	14.82	0.25151
82	12	8.05	0.78130
83	12	6.34	0.89800
84	12	10.54	0.56903
85	12	10.24	0.59528
86	12	8.62	0.73533
87	12	9.58	0.65250
88	12	11.63	0.47574
89	12	8.32	0.75977
90	12	11.02	0.52707
91	12	8.73	0.72542
92	12	16.39	0.17410
93	12	11.73	0.46734
94	12	2.51	0.99813
95	12	9.50	0.66015
96	12	12.08	0.43952
97	12	6.26	0.90248
98	12	13.26	0.35067
99	12	11.51	0.48589
100	12	14.54	0.26768
Combined P-Value for 100 tests (Using KS method)			0.13668

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)	0.14206	0.68338
Opening Score (Dealer)	0.94943	1.00000
Dealer's Final Score	0.99842	1.00000
Player Cards Rank	0.96138	1.00000
Dealer Cards Rank	0.13668	0.68338
Combined P-Value using Holm's Method		0.68338

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
Managing Director EMEA
Executive
Date: 04 May 2026