



Blackjack Cards Analysis – August 2026

The Directors

Entain Plc

This confirms that iTech Labs has examined the game logs for blackjack games from **August 1, 2026 to August 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	15.87	0.53280
2	17	19.19	0.31777
3	17	18.34	0.36776
4	17	13.85	0.67734
5	17	16.37	0.49761
6	17	10.71	0.87132
7	17	15.88	0.53221
8	17	26.55	0.06502
9	17	27.63	0.04944
10	17	11.05	0.85380
11	17	19.56	0.29751
12	17	26.12	0.07226
13	17	30.27	0.02448

Test No.	DOF	ChiSqr	P-Value
14	17	17.82	0.40010
15	17	14.14	0.65743
16	17	16.59	0.48218
17	17	18.54	0.35558
18	17	18.27	0.37180
19	17	16.04	0.52077
20	17	14.21	0.65219
21	17	14.72	0.61589
22	17	15.49	0.56056
23	17	23.97	0.12037
24	17	8.12	0.96383
25	17	12.10	0.79419
26	17	15.78	0.53969
27	17	21.75	0.19444
28	17	18.84	0.33795
29	17	19.11	0.32232
30	17	17.39	0.42816
31	17	22.84	0.15467
32	17	8.32	0.95910
33	17	18.43	0.36206
34	17	14.25	0.64931
35	17	21.08	0.22279
36	17	20.30	0.25897
37	17	14.86	0.60524
38	17	12.71	0.75536
39	17	20.85	0.23312
40	17	11.63	0.82215
41	17	13.96	0.66994
42	17	11.85	0.80926
43	17	14.83	0.60784
44	17	22.57	0.16370

Test No.	DOF	ChiSqr	P-Value
45	17	11.45	0.83207
46	17	20.03	0.27274
47	17	16.21	0.50896
48	17	24.27	0.11226
49	17	6.98	0.98386
50	17	12.04	0.79789
51	17	28.87	0.03574
52	17	10.66	0.87386
53	17	16.53	0.48678
54	17	22.92	0.15195
55	17	17.61	0.41402
56	17	9.97	0.90468
57	17	23.40	0.13678
58	17	23.67	0.12881
59	17	17.17	0.44278
60	17	20.33	0.25790
61	17	28.43	0.04016
62	17	11.31	0.83987
63	17	15.88	0.53234
64	17	18.00	0.38868
65	17	13.26	0.71858
66	17	11.07	0.85309
67	17	34.01	0.00838
68	17	19.39	0.30641
69	17	15.35	0.57052
70	17	18.71	0.34548
71	17	14.08	0.66113
72	17	8.29	0.95989
73	17	29.16	0.03312
74	17	24.71	0.10145
75	17	9.91	0.90751

Test No.	DOF	ChiSqr	P-Value
76	17	14.99	0.59640
77	17	22.03	0.18347
78	17	24.27	0.11234
79	17	18.78	0.34109
80	17	13.46	0.70495
81	17	5.97	0.99340
82	17	21.91	0.18830
83	17	10.01	0.90303
84	17	10.37	0.88752
85	17	9.75	0.91372
86	17	31.97	0.01520
87	17	13.43	0.70706
88	17	19.03	0.32673
89	17	18.13	0.38064
90	17	31.60	0.01689
91	17	18.50	0.35786
92	17	17.66	0.41080
93	17	20.78	0.23650
94	17	15.60	0.55259
95	17	14.37	0.64063
96	17	15.27	0.57585
97	17	13.15	0.72580
98	17	15.26	0.57674
99	17	13.44	0.70624
100	17	20.49	0.24973
Combined P-Value for 100 tests (Using KS method)			0.92369

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	27.47	0.05148
2	17	9.51	0.92306
3	17	25.38	0.08656
4	17	12.08	0.79511
5	17	7.94	0.96777
6	17	11.12	0.85037
7	17	13.73	0.68642
8	17	19.38	0.30692
9	17	11.41	0.83452
10	17	11.72	0.81653
11	17	14.92	0.60114
12	17	7.30	0.97938
13	17	24.44	0.10803
14	17	11.00	0.85631
15	17	15.38	0.56805
16	17	12.83	0.74740
17	17	18.96	0.33104
18	17	19.08	0.32368
19	17	21.13	0.22068
20	17	11.72	0.81702
21	17	27.84	0.04690
22	17	11.91	0.80576
23	17	18.59	0.35268
24	17	8.95	0.94172
25	17	21.47	0.20586
26	17	12.70	0.75581
27	17	20.12	0.26832
28	17	15.78	0.53934
29	17	25.87	0.07693
30	17	17.81	0.40080

Test No.	DOF	ChiSqr	P-Value
31	17	23.81	0.12480
32	17	11.41	0.83421
33	17	11.66	0.82039
34	17	16.28	0.50433
35	17	10.58	0.87764
36	17	13.30	0.71607
37	17	13.36	0.71147
38	17	20.56	0.24645
39	17	13.84	0.67823
40	17	15.27	0.57629
41	17	22.28	0.17417
42	17	6.41	0.98994
43	17	16.93	0.45913
44	17	22.24	0.17575
45	17	18.85	0.33743
46	17	26.29	0.06931
47	17	12.91	0.74199
48	17	21.17	0.21862
49	17	6.18	0.99192
50	17	26.54	0.06521
51	17	15.63	0.54997
52	17	12.46	0.77176
53	17	16.28	0.50399
54	17	23.31	0.13932
55	17	9.25	0.93209
56	17	13.21	0.72223
57	17	16.64	0.47915
58	17	6.93	0.98443
59	17	18.28	0.37114
60	17	17.17	0.44276
61	17	20.68	0.24104

Test No.	DOF	ChiSqr	P-Value
62	17	17.70	0.40808
63	17	20.34	0.25729
64	17	14.14	0.65682
65	17	17.46	0.42355
66	17	10.04	0.90207
67	17	18.74	0.34394
68	17	16.33	0.50032
69	17	8.27	0.96038
70	17	15.63	0.55028
71	17	20.33	0.25769
72	17	8.84	0.94513
73	17	17.38	0.42923
74	17	12.73	0.75433
75	17	17.63	0.41225
76	17	15.64	0.54965
77	17	12.21	0.78756
78	17	18.87	0.33591
79	17	8.24	0.96108
80	17	23.08	0.14654
81	17	27.37	0.05285
82	17	14.66	0.62029
83	17	15.34	0.57120
84	17	9.95	0.90579
85	17	8.75	0.94773
86	17	17.73	0.40584
87	17	16.16	0.51259
88	17	17.41	0.42707
89	17	14.31	0.64524
90	17	19.81	0.28384
91	17	22.01	0.18452
92	17	10.50	0.88129

Test No.	DOF	ChiSqr	P-Value
93	17	13.70	0.68837
94	17	14.39	0.63966
95	17	14.13	0.65823
96	17	18.06	0.38524
97	17	11.34	0.83842
98	17	16.60	0.48171
99	17	13.39	0.70959
100	17	12.63	0.76033
Combined P-Value for 100 tests (Using KS method)			0.46868

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	27.52	0.99593
2	50	59.10	0.17728
3	50	48.23	0.54448
4	50	54.16	0.31874
5	50	55.63	0.27119
6	50	65.30	0.07187
7	50	38.03	0.89268
8	50	53.15	0.35378
9	50	49.25	0.50357
10	50	69.11	0.03792
11	50	43.33	0.73636
12	50	33.69	0.96277
13	50	58.20	0.19912
14	50	36.52	0.92275
15	50	48.05	0.55179
16	50	33.46	0.96512

Test No.	DOF	ChiSqr	P-Value
17	50	47.36	0.57989
18	50	40.16	0.83878
19	50	50.70	0.44571
20	50	54.13	0.31973
21	50	41.79	0.78907
22	50	41.22	0.80706
23	50	40.01	0.84287
24	50	41.66	0.79334
25	50	46.09	0.63102
26	50	52.27	0.38598
27	50	36.74	0.91878
28	50	52.80	0.36655
29	50	56.72	0.23880
30	50	40.38	0.83242
31	50	42.11	0.77837
32	50	66.24	0.06170
33	50	45.44	0.65682
34	50	51.97	0.39707
35	50	47.54	0.57252
36	50	56.07	0.25780
37	50	62.95	0.10334
38	50	54.69	0.30095
39	50	47.21	0.58621
40	50	59.91	0.15919
41	50	41.06	0.81229
42	50	43.14	0.74313
43	50	56.14	0.25558
44	50	50.38	0.45845
45	50	32.33	0.97522
46	50	46.99	0.59509
47	50	64.90	0.07661

Test No.	DOF	ChiSqr	P-Value
48	50	85.63	0.00127
49	50	50.68	0.44669
50	50	50.06	0.47101
51	50	52.76	0.36771
52	50	46.61	0.61003
53	50	57.53	0.21635
54	50	35.12	0.94522
55	50	35.56	0.93864
56	50	58.39	0.19430
57	50	49.72	0.48476
58	50	77.12	0.00822
59	50	55.87	0.26386
60	50	59.02	0.17904
61	50	50.96	0.43547
62	50	37.37	0.90664
63	50	42.85	0.75313
64	50	57.61	0.21446
65	50	53.13	0.35459
66	50	45.90	0.63871
67	50	49.02	0.51256
68	50	58.37	0.19493
69	50	49.48	0.49411
70	50	35.10	0.94539
71	50	46.58	0.61146
72	50	70.13	0.03164
73	50	58.50	0.19155
74	50	48.20	0.54597
75	50	61.08	0.13554
76	50	56.01	0.25964
77	50	44.52	0.69223
78	50	43.13	0.74340

Test No.	DOF	ChiSqr	P-Value
79	50	45.22	0.66518
80	50	48.27	0.54319
81	50	30.86	0.98475
82	50	39.15	0.86600
83	50	45.80	0.64235
84	50	58.37	0.19474
85	50	51.19	0.42689
86	50	38.28	0.88684
87	50	64.61	0.08013
88	50	80.58	0.00396
89	50	42.97	0.74909
90	50	39.26	0.86310
91	50	55.19	0.28485
92	50	48.38	0.53877
93	50	36.01	0.93162
94	50	41.44	0.80023
95	50	40.72	0.82255
96	50	59.64	0.16495
97	50	44.06	0.70963
98	50	51.89	0.39999
99	50	45.59	0.65062
100	50	55.17	0.28568
Combined P-Value for 100 tests (Using KS method)			0.96501

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	9.46	0.66355
2	12	15.40	0.22037
3	12	10.40	0.58098
4	12	9.77	0.63588
5	12	10.03	0.61307
6	12	6.23	0.90399
7	12	8.79	0.72079
8	12	11.83	0.45949
9	12	9.89	0.62541
10	12	10.60	0.56346
11	12	12.68	0.39262
12	12	9.10	0.69443
13	12	12.84	0.38097
14	12	10.04	0.61235
15	12	13.85	0.31022
16	12	8.30	0.76095
17	12	7.59	0.81629
18	12	7.68	0.80953
19	12	6.11	0.91041
20	12	12.35	0.41768
21	12	12.28	0.42313
22	12	5.67	0.93165
23	12	13.72	0.31901
24	12	13.25	0.35140

Test No.	DOF	ChiSqr	P-Value
25	12	9.97	0.61898
26	12	16.98	0.15032
27	12	21.77	0.04023
28	12	20.00	0.06712
29	12	8.91	0.71018
30	12	9.94	0.62095
31	12	7.74	0.80491
32	12	5.51	0.93854
33	12	14.25	0.28491
34	12	8.52	0.74366
35	12	22.70	0.03034
36	12	11.65	0.47382
37	12	15.23	0.22895
38	12	3.40	0.99196
39	12	12.11	0.43713
40	12	13.12	0.36005
41	12	4.47	0.97339
42	12	11.67	0.47217
43	12	15.21	0.23019
44	12	6.57	0.88459
45	12	18.97	0.08937
46	12	16.07	0.18801
47	12	18.26	0.10800
48	12	8.93	0.70877
49	12	7.86	0.79592
50	12	8.82	0.71789
51	12	8.17	0.77159
52	12	7.40	0.83044
53	12	13.14	0.35921

Test No.	DOF	ChiSqr	P-Value
54	12	6.77	0.87236
55	12	23.14	0.02660
56	12	8.88	0.71349
57	12	7.49	0.82364
58	12	7.45	0.82663
59	12	21.60	0.04220
60	12	6.29	0.90063
61	12	7.00	0.85790
62	12	10.10	0.60696
63	12	5.92	0.92017
64	12	22.83	0.02923
65	12	10.23	0.59618
66	12	15.68	0.20635
67	12	11.20	0.51151
68	12	8.23	0.76676
69	12	4.18	0.97990
70	12	16.24	0.18060
71	12	14.80	0.25234
72	12	12.38	0.41566
73	12	18.10	0.11258
74	12	19.80	0.07105
75	12	16.13	0.18552
76	12	9.47	0.66211
77	12	17.52	0.13115
78	12	14.39	0.27641
79	12	9.45	0.66376
80	12	15.08	0.23700
81	12	4.30	0.97745
82	12	22.94	0.02825

Test No.	DOF	ChiSqr	P-Value
83	12	8.40	0.75279
84	12	7.01	0.85689
85	12	12.18	0.43122
86	12	12.04	0.44250
87	12	13.55	0.33052
88	12	12.66	0.39396
89	12	12.76	0.38704
90	12	20.65	0.05582
91	12	6.01	0.91534
92	12	7.46	0.82560
93	12	8.64	0.73347
94	12	13.54	0.33084
95	12	11.43	0.49268
96	12	13.73	0.31831
97	12	10.03	0.61318
98	12	7.23	0.84183
99	12	8.53	0.74210
100	12	15.89	0.19610
Combined P-Value for 100 tests (Using KS method)			0.41955

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	13.20	0.35476
2	12	15.62	0.20943
3	12	13.66	0.32291
4	12	7.72	0.80641
5	12	10.97	0.53148
6	12	26.16	0.01018
7	12	23.04	0.02743
8	12	3.01	0.99547
9	12	13.43	0.33864
10	12	10.76	0.54919
11	12	12.34	0.41881
12	12	7.29	0.83792
13	12	8.92	0.70955
14	12	10.86	0.54063
15	12	33.50	0.00081
16	12	20.38	0.06026
17	12	11.33	0.50072
18	12	14.03	0.29891
19	12	8.11	0.77646
20	12	7.00	0.85756
21	12	8.90	0.71186
22	12	6.89	0.86499
23	12	8.99	0.70343
24	12	9.91	0.62393
25	12	13.23	0.35248
26	12	11.77	0.46432
27	12	13.04	0.36594

Test No.	DOF	ChiSqr	P-Value
28	12	14.68	0.25950
29	12	15.31	0.22487
30	12	15.78	0.20157
31	12	11.34	0.50041
32	12	16.82	0.15639
33	12	8.40	0.75285
34	12	5.98	0.91730
35	12	13.77	0.31559
36	12	20.50	0.05818
37	12	8.82	0.71857
38	12	6.76	0.87325
39	12	3.24	0.99359
40	12	12.13	0.43537
41	12	9.59	0.65201
42	12	6.38	0.89573
43	12	10.83	0.54338
44	12	10.47	0.57478
45	12	8.65	0.73219
46	12	17.82	0.12142
47	12	6.76	0.87281
48	12	11.21	0.51121
49	12	8.30	0.76114
50	12	15.14	0.23396
51	12	16.37	0.17493
52	12	8.74	0.72457
53	12	9.24	0.68272
54	12	15.71	0.20486
55	12	18.03	0.11474
56	12	10.04	0.61256

Test No.	DOF	ChiSqr	P-Value
57	12	19.85	0.07004
58	12	14.10	0.29440
59	12	8.36	0.75635
60	12	32.95	0.00099
61	12	7.07	0.85271
62	12	6.42	0.89351
63	12	7.01	0.85704
64	12	14.80	0.25280
65	12	16.87	0.15438
66	12	7.46	0.82611
67	12	15.50	0.21505
68	12	8.14	0.77375
69	12	23.74	0.02208
70	12	9.79	0.63453
71	12	18.55	0.09998
72	12	9.41	0.66736
73	12	14.71	0.25772
74	12	20.03	0.06646
75	12	28.68	0.00439
76	12	11.12	0.51875
77	12	15.70	0.20526
78	12	10.05	0.61121
79	12	11.15	0.51653
80	12	9.30	0.67730
81	12	10.53	0.56953
82	12	8.13	0.77478
83	12	14.00	0.30092
84	12	5.66	0.93218

Test No.	DOF	ChiSqr	P-Value
85	12	15.71	0.20475
86	12	7.37	0.83246
87	12	10.16	0.60167
88	12	10.23	0.59618
89	12	13.48	0.33504
90	12	15.19	0.23138
91	12	8.97	0.70535
92	12	15.37	0.22164
93	12	12.62	0.39699
94	12	7.52	0.82131
95	12	22.04	0.03703
96	12	14.69	0.25887
97	12	3.18	0.99415
98	12	8.74	0.72506
99	12	10.43	0.57798
100	12	12.51	0.40560
Combined P-Value for 100 tests (Using KS method)			0.97836

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)	0.92369	1.00000
Opening Score (Dealer)	0.46868	1.00000
Dealer's Final Score	0.96501	1.00000
Player Cards Rank	0.41955	1.00000
Dealer Cards Rank	0.97836	1.00000
Combined P-Value using Holm's Method		1.00000

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

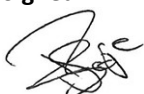
Analysis of actual data from game logs for 'player opening score', 'dealer opening score', 'dealer final score', 'player card rank' and 'dealer card rank' indicated statistical randomness. The results were satisfactory for 8 decks blackjack.

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: 25 September 2026
