

## Blackjack Cards Analysis – April 2026

### The Directors

Entain Plc

This confirms that iTech Labs has examined the game logs for blackjack games from **April 1, 2026 to April 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	22.13	0.17959
2	17	9.28	0.93122
3	17	12.56	0.76533
4	17	11.27	0.84206
5	17	8.22	0.96153
6	17	9.99	0.90406
7	17	15.92	0.52940
8	17	24.04	0.11827
9	17	12.27	0.78348
10	17	19.85	0.28192
11	17	26.68	0.06289
12	17	10.30	0.89034
13	17	28.18	0.04292

Test No.	DOF	ChiSqr	P-Value
14	17	23.55	0.13209
15	17	20.03	0.27264
16	17	19.34	0.30928
17	17	16.37	0.49794
18	17	24.24	0.11314
19	17	17.89	0.39602
20	17	19.90	0.27962
21	17	12.83	0.74753
22	17	21.07	0.22339
23	17	18.80	0.34030
24	17	14.49	0.63186
25	17	13.00	0.73649
26	17	17.81	0.40110
27	17	17.86	0.39784
28	17	20.56	0.24653
29	17	13.57	0.69751
30	17	8.51	0.95435
31	17	14.71	0.61601
32	17	25.01	0.09443
33	17	20.19	0.26455
34	17	11.92	0.80501
35	17	15.77	0.54023
36	17	16.51	0.48818
37	17	16.37	0.49780
38	17	11.89	0.80694
39	17	21.00	0.22612
40	17	22.29	0.17378
41	17	6.94	0.98428
42	17	25.35	0.08720
43	17	17.27	0.43604
44	17	9.92	0.90685

Test No.	DOF	ChiSqr	P-Value
45	17	20.20	0.26415
46	17	22.64	0.16137
47	17	16.76	0.47056
48	17	23.47	0.13458
49	17	18.82	0.33909
50	17	15.61	0.55195
51	17	32.76	0.01210
52	17	9.94	0.90630
53	17	13.99	0.66784
54	17	14.73	0.61475
55	17	7.94	0.96785
56	17	18.17	0.37817
57	17	17.55	0.41768
58	17	11.35	0.83753
59	17	13.20	0.72270
60	17	12.31	0.78123
61	17	7.82	0.97034
62	17	10.55	0.87881
63	17	18.34	0.36780
64	17	22.75	0.15750
65	17	17.50	0.42117
66	17	24.70	0.10167
67	17	5.36	0.99654
68	17	12.02	0.79902
69	17	22.03	0.18375
70	17	13.77	0.68347
71	17	21.48	0.20544
72	17	9.36	0.92812
73	17	12.36	0.77802
74	17	22.37	0.17098
75	17	9.45	0.92520

Test No.	DOF	ChiSqr	P-Value
76	17	25.16	0.09125
77	17	25.09	0.09272
78	17	7.24	0.98016
79	17	15.07	0.59058
80	17	13.53	0.70026
81	17	11.37	0.83688
82	17	12.45	0.77229
83	17	14.64	0.62151
84	17	9.51	0.92304
85	17	18.20	0.37644
86	17	21.21	0.21692
87	17	13.54	0.69929
88	17	22.19	0.17762
89	17	20.74	0.23816
90	17	31.78	0.01604
91	17	16.28	0.50391
92	17	15.68	0.54651
93	17	4.03	0.99945
94	17	21.83	0.19126
95	17	14.96	0.59805
96	17	21.20	0.21727
97	17	8.46	0.95576
98	17	15.20	0.58141
99	17	16.04	0.52093
100	17	13.14	0.72667
Combined P-Value for 100 tests (Using KS method)			0.79362

*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	16.25	0.50595
2	17	20.31	0.25876
3	17	14.68	0.61823
4	17	17.24	0.43795
5	17	23.14	0.14480
6	17	19.83	0.28311
7	17	16.74	0.47199
8	17	19.00	0.32856
9	17	16.33	0.50049
10	17	18.93	0.33280
11	17	8.65	0.95064
12	17	16.53	0.48652
13	17	12.59	0.76306
14	17	7.52	0.97575
15	17	17.22	0.43954
16	17	25.20	0.09031
17	17	18.34	0.36778
18	17	20.66	0.24197
19	17	15.87	0.53296
20	17	9.84	0.91030
21	17	12.50	0.76909
22	17	23.33	0.13875
23	17	11.56	0.82614
24	17	15.34	0.57136
25	17	17.56	0.41687
26	17	15.44	0.56372
27	17	17.24	0.43820
28	17	10.13	0.89818
29	17	25.53	0.08339
30	17	15.36	0.56931

Test No.	DOF	ChiSqr	P-Value
31	17	19.05	0.32574
32	17	11.54	0.82688
33	17	15.85	0.53457
34	17	18.04	0.38605
35	17	13.68	0.68930
36	17	22.40	0.16981
37	17	9.16	0.93510
38	17	11.16	0.84817
39	17	8.49	0.95491
40	17	17.70	0.40822
41	17	26.46	0.06655
42	17	19.69	0.29064
43	17	25.04	0.09391
44	17	11.75	0.81499
45	17	20.15	0.26670
46	17	18.29	0.37051
47	17	27.48	0.05140
48	17	15.83	0.53584
49	17	30.85	0.02083
50	17	25.25	0.08929
51	17	15.19	0.58178
52	17	14.13	0.65818
53	17	18.29	0.37079
54	17	16.73	0.47271
55	17	9.36	0.92836
56	17	16.34	0.49993
57	17	17.07	0.44945
58	17	12.70	0.75589
59	17	12.33	0.77957
60	17	16.08	0.51808
61	17	7.62	0.97399

Test No.	DOF	ChiSqr	P-Value
62	17	10.91	0.86142
63	17	10.33	0.88911
64	17	13.90	0.67421
65	17	14.32	0.64405
66	17	18.09	0.38345
67	17	15.51	0.55869
68	17	14.85	0.60622
69	17	23.98	0.11997
70	17	17.05	0.45120
71	17	17.79	0.40216
72	17	10.78	0.86787
73	17	13.57	0.69733
74	17	14.50	0.63114
75	17	27.70	0.04858
76	17	15.33	0.57189
77	17	13.69	0.68864
78	17	13.00	0.73628
79	17	5.42	0.99632
80	17	16.40	0.49550
81	17	16.72	0.47364
82	17	15.11	0.58734
83	17	18.76	0.34274
84	17	9.75	0.91364
85	17	21.52	0.20377
86	17	16.54	0.48601
87	17	15.60	0.55246
88	17	16.50	0.48890
89	17	15.72	0.54359
90	17	22.03	0.18356
91	17	17.10	0.44793
92	17	31.68	0.01648

Test No.	DOF	ChiSqr	P-Value
93	17	9.83	0.91061
94	17	25.17	0.09098
95	17	20.93	0.22948
96	17	26.59	0.06434
97	17	13.64	0.69242
98	17	21.86	0.19031
99	17	14.06	0.66291
100	17	20.55	0.24712
Combined P-Value for 100 tests (Using KS method)			0.56386

*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	58.18	0.19954
2	50	66.82	0.05605
3	50	33.54	0.96436
4	50	66.90	0.05536
5	50	31.35	0.98196
6	50	63.32	0.09777
7	50	49.38	0.49835
8	50	60.18	0.15344
9	50	44.44	0.69511
10	50	36.20	0.92842
11	50	50.34	0.46012
12	50	56.04	0.25878
13	50	43.47	0.73111
14	50	67.43	0.05061
15	50	58.11	0.20125
16	50	55.77	0.26696

Test No.	DOF	ChiSqr	P-Value
17	50	32.61	0.97295
18	50	44.83	0.68019
19	50	46.89	0.59903
20	50	35.93	0.93284
21	50	45.02	0.67286
22	50	34.47	0.95372
23	50	61.38	0.12985
24	50	46.71	0.60634
25	50	53.49	0.34196
26	50	41.56	0.79632
27	50	35.88	0.93362
28	50	38.83	0.87391
29	50	52.51	0.37701
30	50	55.25	0.28318
31	50	52.42	0.38036
32	50	47.28	0.58327
33	50	54.69	0.30111
34	50	43.78	0.71993
35	50	43.85	0.71712
36	50	47.87	0.55912
37	50	54.55	0.30577
38	50	51.58	0.41174
39	50	38.75	0.87589
40	50	38.33	0.88585
41	50	50.35	0.45951
42	50	41.84	0.78740
43	50	55.31	0.28119
44	50	42.55	0.76377
45	50	56.09	0.25732
46	50	60.68	0.14323
47	50	53.92	0.32679

Test No.	DOF	ChiSqr	P-Value
48	50	52.58	0.37442
49	50	52.82	0.36554
50	50	45.35	0.66023
51	50	35.98	0.93201
52	50	60.57	0.14542
53	50	62.65	0.10795
54	50	39.12	0.86654
55	50	57.35	0.22133
56	50	43.46	0.73149
57	50	50.46	0.45510
58	50	53.94	0.32609
59	50	57.42	0.21955
60	50	67.93	0.04652
61	50	49.13	0.50836
62	50	57.62	0.21414
63	50	48.10	0.54986
64	50	53.64	0.33668
65	50	41.61	0.79475
66	50	37.70	0.89971
67	50	54.73	0.29982
68	50	40.98	0.81446
69	50	41.17	0.80871
70	50	58.20	0.19911
71	50	56.54	0.24388
72	50	55.02	0.29048
73	50	45.99	0.63497
74	50	34.12	0.95798
75	50	54.05	0.32260
76	50	52.73	0.36880
77	50	39.61	0.85384
78	50	55.59	0.27242

Test No.	DOF	ChiSqr	P-Value
79	50	54.14	0.31939
80	50	47.80	0.56230
81	50	81.51	0.00323
82	50	58.81	0.18418
83	50	59.43	0.16967
84	50	50.35	0.45969
85	50	42.09	0.77914
86	50	38.22	0.88836
87	50	51.82	0.40263
88	50	43.52	0.72923
89	50	35.60	0.93802
90	50	60.65	0.14387
91	50	54.04	0.32282
92	50	66.94	0.05496
93	50	45.04	0.67235
94	50	49.12	0.50856
95	50	47.83	0.56077
96	50	46.50	0.61471
97	50	30.28	0.98762
98	50	51.46	0.41651
99	50	43.73	0.72159
100	50	35.62	0.93786
Combined P-Value for 100 tests (Using KS method)			0.93320

*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	23.77	0.02187
2	12	9.63	0.64847
3	12	18.22	0.10920
4	12	10.50	0.57218
5	12	6.61	0.88258
6	12	11.38	0.49666
7	12	4.06	0.98242
8	12	10.61	0.56286
9	12	4.21	0.97938
10	12	23.07	0.02717
11	12	18.51	0.10106
12	12	15.47	0.21694
13	12	8.12	0.77568
14	12	20.86	0.05248
15	12	21.52	0.04324
16	12	20.29	0.06180
17	12	15.20	0.23089
18	12	19.84	0.07027
19	12	21.23	0.04706
20	12	3.27	0.99335
21	12	7.26	0.83982
22	12	11.17	0.51432
23	12	13.45	0.33692
24	12	17.13	0.14474
25	12	11.84	0.45845
26	12	12.17	0.43244
27	12	6.13	0.90944
28	12	9.58	0.65267
29	12	12.05	0.44167
30	12	5.03	0.95707

Test No.	DOF	ChiSqr	P-Value
31	12	10.32	0.58782
32	12	13.59	0.32758
33	12	20.53	0.05772
34	12	11.48	0.48804
35	12	14.08	0.29550
36	12	6.35	0.89737
37	12	11.21	0.51144
38	12	14.66	0.26050
39	12	8.25	0.76498
40	12	6.37	0.89646
41	12	7.44	0.82722
42	12	8.27	0.76393
43	12	14.96	0.24358
44	12	13.44	0.33782
45	12	5.83	0.92427
46	12	8.63	0.73408
47	12	8.17	0.77163
48	12	18.43	0.10335
49	12	13.86	0.30974
50	12	8.48	0.74700
51	12	19.05	0.08742
52	12	8.43	0.75036
53	12	5.91	0.92075
54	12	8.00	0.78515
55	12	13.03	0.36677
56	12	9.44	0.66535
57	12	13.57	0.32904
58	12	12.30	0.42164
59	12	13.23	0.35285
60	12	9.42	0.66669
61	12	14.88	0.24795

Test No.	DOF	ChiSqr	P-Value
62	12	10.13	0.60423
63	12	8.07	0.78001
64	12	15.21	0.23038
65	12	7.82	0.79928
66	12	5.81	0.92526
67	12	4.82	0.96375
68	12	8.26	0.76451
69	12	5.84	0.92380
70	12	20.51	0.05798
71	12	27.70	0.00613
72	12	7.75	0.80447
73	12	17.22	0.14143
74	12	9.28	0.67847
75	12	11.33	0.50122
76	12	17.00	0.14968
77	12	14.73	0.25648
78	12	7.21	0.84322
79	12	7.74	0.80519
80	12	11.74	0.46687
81	12	8.57	0.73924
82	12	4.91	0.96078
83	12	7.37	0.83209
84	12	11.17	0.51426
85	12	10.09	0.60829
86	12	6.46	0.89126
87	12	9.98	0.61758
88	12	3.43	0.99162
89	12	16.06	0.18864
90	12	14.69	0.25891
91	12	16.10	0.18691
92	12	21.82	0.03960

Test No.	DOF	ChiSqr	P-Value
93	12	5.37	0.94435
94	12	19.28	0.08193
95	12	23.50	0.02377
96	12	9.27	0.67955
97	12	14.37	0.27760
98	12	10.99	0.52971
99	12	14.63	0.26203
100	12	19.64	0.07419
Combined P-Value for 100 tests (Using KS method)			0.46252

*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	12.52	0.40495
2	12	13.28	0.34895
3	12	11.81	0.46122
4	12	13.08	0.36311
5	12	7.91	0.79243
6	12	10.89	0.53828
7	12	18.95	0.08979
8	12	9.85	0.62886
9	12	14.82	0.25126
10	12	14.96	0.24369
11	12	8.69	0.72907
12	12	6.05	0.91334
13	12	23.49	0.02386
14	12	18.86	0.09209
15	12	13.78	0.31524
16	12	7.11	0.85012

Test No.	DOF	ChiSqr	P-Value
17	12	12.75	0.38740
18	12	8.48	0.74691
19	12	12.64	0.39559
20	12	9.07	0.69711
21	12	27.38	0.00681
22	12	5.52	0.93853
23	12	19.16	0.08467
24	12	7.63	0.81319
25	12	6.40	0.89436
26	12	22.24	0.03488
27	12	13.26	0.35022
28	12	7.37	0.83208
29	12	7.28	0.83850
30	12	13.05	0.36520
31	12	4.29	0.97764
32	12	7.93	0.79073
33	12	12.91	0.37584
34	12	10.68	0.55670
35	12	7.07	0.85268
36	12	12.94	0.37320
37	12	5.63	0.93375
38	12	12.86	0.37967
39	12	7.73	0.80578
40	12	4.99	0.95844
41	12	11.11	0.51960
42	12	13.89	0.30798
43	12	11.44	0.49155
44	12	10.63	0.56130
45	12	7.35	0.83357
46	12	16.34	0.17611
47	12	12.13	0.43553

Test No.	DOF	ChiSqr	P-Value
48	12	13.88	0.30871
49	12	18.81	0.09315
50	12	10.60	0.56324
51	12	16.15	0.18445
52	12	13.40	0.34064
53	12	8.00	0.78537
54	12	13.42	0.33911
55	12	7.77	0.80308
56	12	6.41	0.89375
57	12	9.88	0.62645
58	12	7.14	0.84817
59	12	15.44	0.21837
60	12	11.79	0.46269
61	12	5.82	0.92504
62	12	5.24	0.94959
63	12	9.71	0.64096
64	12	19.90	0.06893
65	12	15.34	0.22329
66	12	9.28	0.67855
67	12	8.33	0.75852
68	12	19.34	0.08061
69	12	20.89	0.05206
70	12	10.53	0.56986
71	12	7.47	0.82505
72	12	5.76	0.92756
73	12	8.05	0.78107
74	12	19.97	0.06769
75	12	16.36	0.17529
76	12	9.60	0.65099
77	12	10.79	0.54671
78	12	11.09	0.52156

Test No.	DOF	ChiSqr	P-Value
79	12	8.92	0.70963
80	12	5.29	0.94744
81	12	13.51	0.33303
82	12	13.55	0.33054
83	12	8.82	0.71796
84	12	6.40	0.89436
85	12	5.34	0.94580
86	12	13.12	0.36011
87	12	13.81	0.31273
88	12	8.06	0.78046
89	12	26.93	0.00791
90	12	14.43	0.27395
91	12	21.49	0.04365
92	12	11.87	0.45595
93	12	15.05	0.23879
94	12	5.51	0.93893
95	12	8.56	0.73980
96	12	15.18	0.23191
97	12	9.99	0.61657
98	12	4.97	0.95909
99	12	7.70	0.80802
100	12	21.57	0.04263
Combined P-Value for 100 tests (Using KS method)			0.37035

*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)	0.79362	1.00000
Opening Score (Dealer)	0.56386	1.00000
Dealer's Final Score	0.93320	1.00000
Player Cards Rank	0.46252	1.00000
Dealer Cards Rank	0.37035	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.

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**Signed:**



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**James Boje**  
**Managing Director EMEA**  
**Executive**  
**Date: 25 May 2026**

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