

## Blackjack Cards Analysis – May 2026

### The Directors

Entain Plc

This confirms that iTech Labs has examined the game logs for blackjack games from **May 1, 2026 to May 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	11.01	0.85598
2	17	18.26	0.37283
3	17	9.67	0.91674
4	17	16.21	0.50897
5	17	27.55	0.05046
6	17	23.18	0.14339
7	17	11.05	0.85421
8	17	12.73	0.75379
9	17	16.24	0.50664
10	17	21.64	0.19879
11	17	17.00	0.45420
12	17	12.92	0.74182
13	17	12.14	0.79181

Test No.	DOF	ChiSqr	P-Value
14	17	8.12	0.96384
15	17	18.96	0.33078
16	17	10.24	0.89309
17	17	13.18	0.72415
18	17	13.45	0.70532
19	17	18.64	0.34950
20	17	14.91	0.60221
21	17	10.95	0.85937
22	17	20.18	0.26522
23	17	14.29	0.64676
24	17	11.96	0.80285
25	17	19.21	0.31686
26	17	18.12	0.38119
27	17	16.25	0.50596
28	17	15.60	0.55224
29	17	19.69	0.29056
30	17	10.58	0.87737
31	17	10.31	0.88992
32	17	15.95	0.52713
33	17	18.12	0.38137
34	17	21.87	0.18984
35	17	21.31	0.21254
36	17	15.41	0.56616
37	17	27.71	0.04839
38	17	12.90	0.74268
39	17	13.03	0.73386
40	17	20.92	0.22966
41	17	18.74	0.34391
42	17	27.54	0.05061
43	17	22.50	0.16620
44	17	12.51	0.76813

Test No.	DOF	ChiSqr	P-Value
45	17	12.16	0.79026
46	17	8.46	0.95570
47	17	14.12	0.65892
48	17	15.01	0.59487
49	17	17.11	0.44693
50	17	16.41	0.49496
51	17	11.74	0.81543
52	17	13.13	0.72739
53	17	12.98	0.73776
54	17	7.90	0.96855
55	17	15.67	0.54743
56	17	18.48	0.35940
57	17	8.87	0.94420
58	17	25.60	0.08210
59	17	16.41	0.49519
60	17	21.99	0.18498
61	17	8.30	0.95968
62	17	16.84	0.46528
63	17	13.64	0.69251
64	17	27.30	0.05379
65	17	21.06	0.22377
66	17	15.54	0.55687
67	17	9.19	0.93416
68	17	21.57	0.20183
69	17	21.35	0.21103
70	17	13.64	0.69219
71	17	10.19	0.89546
72	17	15.07	0.59033
73	17	9.37	0.92786
74	17	8.12	0.96388
75	17	18.13	0.38075

Test No.	DOF	ChiSqr	P-Value
76	17	7.66	0.97325
77	17	19.16	0.31947
78	17	12.82	0.74793
79	17	17.68	0.40944
80	17	25.98	0.07491
81	17	20.58	0.24565
82	17	18.52	0.35700
83	17	14.85	0.60636
84	17	8.23	0.96139
85	17	13.58	0.69648
86	17	21.30	0.21297
87	17	18.44	0.36160
88	17	12.61	0.76163
89	17	13.27	0.71788
90	17	20.69	0.24067
91	17	15.34	0.57117
92	17	11.07	0.85267
93	17	15.43	0.56451
94	17	36.65	0.00375
95	17	20.34	0.25704
96	17	16.47	0.49075
97	17	31.92	0.01538
98	17	19.68	0.29095
99	17	12.22	0.78651
100	17	12.44	0.77253
Combined P-Value for 100 tests (Using KS method)			0.34755

**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	18.12	0.38122
2	17	14.54	0.62859
3	17	18.79	0.34045
4	17	27.17	0.05565
5	17	14.28	0.64738
6	17	20.83	0.23402
7	17	16.09	0.51753
8	17	24.80	0.09926
9	17	13.73	0.68636
10	17	17.02	0.45271
11	17	14.74	0.61390
12	17	10.25	0.89297
13	17	33.38	0.01007
14	17	21.84	0.19089
15	17	22.14	0.17925
16	17	19.03	0.32698
17	17	14.61	0.62350
18	17	9.81	0.91128
19	17	16.84	0.46546
20	17	10.10	0.89950
21	17	28.66	0.03780
22	17	27.64	0.04929
23	17	9.01	0.93979
24	17	13.66	0.69127
25	17	16.09	0.51729
26	17	16.05	0.52049
27	17	19.97	0.27587
28	17	17.32	0.43305
29	17	27.12	0.05633
30	17	18.90	0.33406

Test No.	DOF	ChiSqr	P-Value
31	17	13.10	0.72936
32	17	7.23	0.98039
33	17	10.63	0.87510
34	17	21.01	0.22570
35	17	14.09	0.66076
36	17	21.79	0.19277
37	17	13.21	0.72194
38	17	16.54	0.48603
39	17	18.67	0.34778
40	17	14.28	0.64737
41	17	12.78	0.75074
42	17	10.06	0.90111
43	17	25.28	0.08861
44	17	11.79	0.81262
45	17	18.18	0.37775
46	17	9.15	0.93535
47	17	13.88	0.67575
48	17	25.71	0.07997
49	17	15.22	0.57935
50	17	23.45	0.13522
51	17	23.18	0.14346
52	17	16.84	0.46526
53	17	20.60	0.24470
54	17	27.93	0.04574
55	17	19.20	0.31694
56	17	7.01	0.98340
57	17	24.26	0.11257
58	17	8.12	0.96384
59	17	12.62	0.76149
60	17	16.43	0.49380

61	17	16.95	0.45749
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Test No.	DOF	ChiSqr	P-Value
62	17	8.26	0.96071
63	17	9.82	0.91102
64	17	14.99	0.59594
65	17	20.36	0.25611
66	17	13.35	0.71226
67	17	14.59	0.62494
68	17	19.05	0.32547
69	17	16.64	0.47866
70	17	22.60	0.16270
71	17	16.29	0.50324
72	17	27.28	0.05410
73	17	25.16	0.09110
74	17	10.72	0.87082
75	17	9.97	0.90475
76	17	15.28	0.57529
77	17	13.68	0.68992
78	17	17.13	0.44559
79	17	11.99	0.80056
80	17	10.33	0.88901
81	17	22.18	0.17799
82	17	22.51	0.16581
83	17	22.37	0.17074
84	17	24.64	0.10317
85	17	26.42	0.06709
86	17	14.17	0.65531
87	17	30.69	0.02177
88	17	14.21	0.65189
89	17	17.73	0.40626
90	17	17.47	0.42328
91	17	10.13	0.89803

92	17	17.43	0.42532
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Test No.	DOF	ChiSqr	P-Value
93	17	23.07	0.14710
94	17	13.43	0.70696
95	17	21.92	0.18795
96	17	30.10	0.02566
97	17	13.70	0.68832
98	17	22.29	0.17388
99	17	35.28	0.00571
100	17	19.92	0.27822
Combined P-Value for 100 tests (Using KS method)			0.41557

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	52.95	0.36085
2	50	86.63	0.00101
3	50	42.75	0.75673
4	50	51.36	0.42007
5	50	68.26	0.04395
6	50	44.12	0.70733
7	50	53.23	0.35093
8	50	38.89	0.87252
9	50	51.22	0.42564
10	50	56.43	0.24719
11	50	50.98	0.43491
12	50	31.73	0.97955
13	50	37.21	0.90987
14	50	44.02	0.71086

15	50	67.22	0.05244
16	50	42.77	0.75608

Test No.	DOF	ChiSqr	P-Value
17	50	65.74	0.06690
18	50	64.86	0.07701
19	50	65.25	0.07243
20	50	32.91	0.97033
21	50	55.96	0.26117
22	50	57.49	0.21757
23	50	36.72	0.91927
24	50	52.99	0.35959
25	50	58.70	0.18676
26	50	39.74	0.85036
27	50	60.39	0.14912
28	50	54.40	0.31050
29	50	77.15	0.00816
30	50	54.34	0.31254
31	50	44.33	0.69944
32	50	50.26	0.46313
33	50	52.44	0.37964
34	50	48.40	0.53760
35	50	50.65	0.44793
36	50	62.63	0.10839
37	50	36.15	0.92919
38	50	68.30	0.04366
39	50	57.82	0.20875
40	50	49.32	0.50058
41	50	44.00	0.71172
42	50	40.44	0.83064
43	50	53.31	0.34810
44	50	50.42	0.45670
45	50	48.54	0.53211

46	50	50.01	0.47285
47	50	62.00	0.11876

Test No.	DOF	ChiSqr	P-Value
48	50	43.59	0.72675
49	50	42.58	0.76249
50	50	41.27	0.80549
51	50	52.44	0.37951
52	50	42.41	0.76844
53	50	36.59	0.92156
54	50	51.53	0.41355
55	50	55.28	0.28215
56	50	37.11	0.91171
57	50	67.23	0.05240
58	50	46.90	0.59839
59	50	53.92	0.32685
60	50	39.81	0.84837
61	50	57.99	0.20433
62	50	56.00	0.25977
63	50	44.11	0.70760
64	50	41.44	0.80034
65	50	37.29	0.90814
66	50	41.87	0.78652
67	50	54.10	0.32079
68	50	56.86	0.23498
69	50	57.85	0.20792
70	50	50.09	0.46991
71	50	46.32	0.62196
72	50	54.42	0.31000
73	50	45.19	0.66639
74	50	55.13	0.28699
75	50	55.03	0.29020
76	50	38.93	0.87143

77	50	33.60	0.96374
78	50	62.33	0.11327

Test No.	DOF	ChiSqr	P-Value
79	50	47.19	0.58685
80	50	46.26	0.62409
81	50	44.75	0.68338
82	50	51.64	0.40966
83	50	60.27	0.15148
84	50	68.16	0.04469
85	50	27.51	0.99595
86	50	50.85	0.43989
87	50	70.19	0.03126
88	50	41.50	0.79833
89	50	59.68	0.16416
90	50	39.63	0.85334
91	50	64.58	0.08045
92	50	62.17	0.11588
93	50	44.03	0.71057
94	50	54.55	0.30553
95	50	52.57	0.37467
96	50	73.43	0.01710
97	50	51.26	0.42414
98	50	40.69	0.82345
99	50	60.65	0.14378
100	50	38.42	0.88362
Combined P-Value for 100 tests (Using KS method)			0.28726

**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	11.12	0.51894
2	12	17.82	0.12135
3	12	19.69	0.07322
4	12	8.34	0.75816
5	12	20.49	0.05832
6	12	7.64	0.81286
7	12	8.67	0.73083
8	12	8.51	0.74371
9	12	3.79	0.98697
10	12	14.08	0.29547
11	12	12.42	0.41289
12	12	11.45	0.49118
13	12	18.16	0.11078
14	12	2.76	0.99699
15	12	4.07	0.98221
16	12	13.39	0.34148
17	12	14.39	0.27667
18	12	11.81	0.46126
19	12	12.64	0.39549
20	12	9.47	0.66240
21	12	17.81	0.12159
22	12	17.93	0.11790
23	12	5.89	0.92167
24	12	10.07	0.61013
25	12	7.39	0.83098
26	12	14.06	0.29688
27	12	12.93	0.37407
28	12	14.87	0.24888

29	12	18.82	0.09301
30	12	8.19	0.77035

Test No.	DOF	ChiSqr	P-Value
31	12	5.46	0.94072
32	12	8.09	0.77780
33	12	9.32	0.67539
34	12	12.58	0.40056
35	12	12.30	0.42183
36	12	9.35	0.67291
37	12	19.05	0.08739
38	12	21.54	0.04297
39	12	20.36	0.06050
40	12	7.34	0.83421
41	12	9.69	0.64305
42	12	10.64	0.56043
43	12	20.70	0.05488
44	12	12.33	0.41952
45	12	8.16	0.77218
46	12	4.40	0.97499
47	12	8.42	0.75146
48	12	17.38	0.13595
49	12	19.79	0.07110
50	12	3.04	0.99526
51	12	11.70	0.46983
52	12	11.23	0.50914
53	12	18.95	0.08975
54	12	12.47	0.40869
55	12	12.43	0.41194
56	12	21.30	0.04611
57	12	11.69	0.47086
58	12	8.73	0.72604

59	12	11.95	0.44968
60	12	7.86	0.79589
61	12	4.63	0.96926

Test No.	DOF	ChiSqr	P-Value
62	12	10.16	0.60178
63	12	12.28	0.42373
64	12	8.09	0.77815
65	12	10.19	0.59903
66	12	6.18	0.90678
67	12	8.75	0.72401
68	12	9.88	0.62608
69	12	10.36	0.58451
70	12	6.54	0.88643
71	12	17.35	0.13705
72	12	6.96	0.85995
73	12	18.05	0.11420
74	12	16.43	0.17220
75	12	6.05	0.91372
76	12	14.39	0.27662
77	12	23.57	0.02324
78	12	19.36	0.08022
79	12	7.32	0.83604
80	12	11.91	0.45287
81	12	11.36	0.49809
82	12	10.13	0.60477
83	12	14.32	0.28053
84	12	11.66	0.47315
85	12	7.64	0.81295
86	12	7.42	0.82879
87	12	9.00	0.70265
88	12	8.62	0.73533
89	12	14.56	0.26653

90	12	7.68	0.80954
91	12	16.94	0.15182
92	12	14.48	0.27093

Test No.	DOF	ChiSqr	P-Value
93	12	15.90	0.19567
94	12	16.24	0.18067
95	12	7.87	0.79492
96	12	5.83	0.92464
97	12	14.40	0.27570
98	12	16.54	0.16793
99	12	11.42	0.49320
100	12	8.85	0.71552
Combined P-Value for 100 tests (Using KS method)			0.90976

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	9.48	0.66127
2	12	17.94	0.11753
3	12	13.35	0.34393
4	12	20.49	0.05836
5	12	15.26	0.22748
6	12	13.43	0.33891
7	12	12.85	0.38035
8	12	5.87	0.92243
9	12	5.57	0.93625
10	12	10.63	0.56093
11	12	10.00	0.61632
12	12	16.98	0.15029
13	12	14.74	0.25570

14	12	7.95	0.78915
15	12	23.21	0.02598
16	12	10.39	0.58166

Test No.	DOF	ChiSqr	P-Value
17	12	8.60	0.73641
18	12	13.06	0.36468
19	12	14.91	0.24619
20	12	6.97	0.85967
21	12	11.27	0.50602
22	12	13.41	0.33968
23	12	14.32	0.28078
24	12	5.99	0.91663
25	12	24.76	0.01599
26	12	17.63	0.12731
27	12	10.26	0.59311
28	12	16.68	0.16223
29	12	14.74	0.25602
30	12	10.10	0.60744
31	12	12.38	0.41548
32	12	10.50	0.57225
33	12	3.43	0.99164
34	12	14.43	0.27416
35	12	14.05	0.29746
36	12	15.97	0.19264
37	12	13.39	0.34135
38	12	9.40	0.66846
39	12	11.48	0.48792
40	12	10.54	0.56853
41	12	8.87	0.71419
42	12	6.87	0.86630
43	12	15.34	0.22342
44	12	8.58	0.73864

45	12	9.05	0.69828
46	12	15.22	0.22981
47	12	8.41	0.75242

Test No.	DOF	ChiSqr	P-Value
48	12	9.00	0.70334
49	12	9.21	0.68455
50	12	4.74	0.96607
51	12	13.78	0.31515
52	12	8.39	0.75359
53	12	14.70	0.25805
54	12	10.79	0.54660
55	12	13.30	0.34727
56	12	7.43	0.82763
57	12	10.18	0.60005
58	12	16.94	0.15192
59	12	5.16	0.95259
60	12	15.75	0.20279
61	12	7.87	0.79527
62	12	10.12	0.60563
63	12	24.39	0.01798
64	12	10.52	0.57081
65	12	12.53	0.40408
66	12	17.91	0.11841
67	12	5.93	0.91935
68	12	12.88	0.37789
69	12	10.53	0.56987
70	12	11.87	0.45636
71	12	32.60	0.00112
72	12	16.58	0.16627
73	12	9.44	0.66481
74	12	15.25	0.22807
75	12	11.88	0.45548

76	12	7.87	0.79499
77	12	17.31	0.13815
78	12	11.74	0.46667

Test No.	DOF	ChiSqr	P-Value
79	12	11.66	0.47330
80	12	9.51	0.65919
81	12	14.53	0.26838
82	12	22.83	0.02919
83	12	16.12	0.18596
84	12	9.43	0.66543
85	12	11.14	0.51667
86	12	19.48	0.07761
87	12	14.42	0.27446
88	12	8.22	0.76759
89	12	6.83	0.86892
90	12	15.21	0.23024
91	12	7.59	0.81594
92	12	11.52	0.48474
93	12	11.66	0.47345
94	12	24.49	0.01743
95	12	7.46	0.82563
96	12	19.15	0.08502
97	12	18.26	0.10789
98	12	15.16	0.23285
99	12	8.76	0.72348
100	12	25.58	0.01231
Combined P-Value for 100 tests (Using KS method)			0.64936

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)	0.34755	1.00000
Opening Score (Dealer)	0.41557	1.00000
Dealer's Final Score	0.28726	1.00000
Player Cards Rank	0.90976	1.00000
Dealer Cards Rank	0.64936	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: 23 06 2026**

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