Cellular Automata Maximal Cycle Length Results (Updated)

Summary Table

N (Cells)	Max Cycle Length	2^N - 1	Achieved Theoretical Max?	Configurations with Max Length	Total Configurations	Percentage
4	15	15	Yes	4	16	25.0%
5	31	31	Yes	12	32	37.5%
6	63	63	Yes	12	64	18.75%
7	127	127	Yes	36	128	28.125%
8	255	255	Yes	32	256	12.5%

Key Findings

All values of N achieve the theoretical maximum of 2^N - 1!

combinations of Rules 90 and 150 with null boundaries

Detailed Configurations

N = 4 (Max Cycle Length: 15 = 2^4 - 1)

Config #	Rule Pattern
1	150 90 150 90
2	90 150 90 150
3	150 150 90 150
4	150 90 150 150

N = 5 (Max Cycle Length: 31 = 2^5 - 1)

Config #	Rule Pattern
1	150 90 90 90 90
2	150 150 90 90 90
3	90 150 150 90 90
4	150 150 150 90 90
5	90 90 150 150 90
6	150 150 150 150 90
7	90 90 90 90 150
8	150 150 90 90 150
9	90 90 90 150 150

Config #	Rule Pattern
10	150 90 90 150 150
11	90 90 150 150 150
12	90 150 150 150 150

N = 6 (Max Cycle Length: 63 = 2^6 - 1)

Config #	Rule Pattern
1	150 90 90 90 90 90
2	90 150 150 90 90 90
3	150 90 150 90 150 90
4	90 150 150 90 150 90
5	90 90 90 150 150 90
6	90 150 90 150 150 90
7	150 90 150 150 150 90
8	90 90 90 90 90 150
9	150 90 150 90 90 150
10	150 90 90 150 90 150
11	90 150 90 150 90 150
12	90 150 150 150 90 150

N = 7 (Max Cycle Length: 127 = 2^7 - 1)

Config #	Rule Pattern
1	90 90 150 90 90 90 90
2	150 90 90 150 90 90 90
3	150 150 90 150 90 90 90
4	90 150 150 150 90 90 90
5	90 90 90 90 150 90 90
6	90 150 90 90 150 90 90
7	150 90 150 90 150 90 90
8	150 150 150 90 150 90 90
9	150 90 90 90 90 150 90
10	90 90 150 90 90 150 90
11	90 150 150 90 90 150 90
12	150 150 90 150 90 150 90
13	90 150 150 150 90 150 90
14	90 150 90 90 150 150 90
15	150 150 150 90 150 150 90
16	90 90 90 150 150 150 90
17	90 150 90 150 150 150 90
18	150 90 150 150 150 150 90

Config #	Rule Pattern
19	90 150 90 90 90 90 150
20	150 90 150 90 90 90 150
21	150 150 150 90 90 90 150
22	90 90 90 150 90 90 150
23	150 90 150 150 90 90 150
24	150 90 90 90 150 90 150
25	90 90 150 90 150 90 150
26	150 90 90 150 150 90 150
27	150 150 90 150 150 90 150
28	90 150 150 150 150 90 150
29	90 90 90 150 90 150 150
30	90 150 90 150 90 150 150
31	150 90 150 150 90 150 150
32	150 150 150 150 90 150 150
33	150 90 90 90 150 150 150
34	90 90 150 90 150 150 150
35	90 150 150 90 150 150 150
36	150 150 90 150 150 150 150

N = 8 (Max Cycle Length: 255 = 2^8 - 1)

Config #	Rule Pattern
1	90 150 150 90 90 90 90 90
2	150 150 150 150 90 90 90 90
3	90 150 90 150 90 150 90 90
4	150 90 150 150 90 150 90 90
5	90 150 150 90 150 150 90 90
6	150 90 90 150 150 150 90 90
7	150 90 150 90 90 90 150 90
8	150 150 90 150 90 90 150 90
9	90 90 150 90 150 90 150 90
10	150 150 90 150 150 90 150 90
11	150 90 150 150 150 90 150 90
12	150 150 150 150 150 90 150 90
13	90 90 90 90 90 150 150 90
14	90 90 150 150 90 150 150 90
15	150 150 150 90 150 150 150 90
16	150 150 90 90 150 90 90 150
17	90 90 150 150 150 90 90 150
18	90 150 90 90 90 150 90 150
19	150 150 90 150 90 150 90 150
20	90 90 150 90 150 150 90 150

Config #	Rule Pattern
21	90 150 90 150 150 150 90 150
22	150 90 90 150 90 90 150 150
23	150 150 90 150 90 90 150 150
24	90 150 90 90 150 90 150 150
25	150 150 90 90 150 90 150 150
26	150 90 150 90 150 90 150 150
27	90 150 90 150 150 90 150 150
28	90 150 150 150 90 150 150 150
29	150 150 150 150 90 150 150 150
30	90 90 90 90 150 150 150 150
31	150 150 150 90 150 150 150 150
32	90 150 90 150 150 150 150 150