

The hardest sudokus (new thread)

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Re: The hardest sudokus (new thread)

by denis_berthier » Sat Mar 19, 2022 7:06 am

mith wrote:
The pattern can certainly exist with guardians in opposing boxes:

CODE: SELECT ALL
67..8...8.4..9...5946.....5.47..89.75...6..8.6..5.....48.....7..93...9...2. ED=9.0/1.2/1.2

CODE: SELECT ALL
Resolution state after Singles and whips[1]:
+-----+-----+-----+
6 7 123	123 8 1235	1234 1345 9
8 123 4	7 1235 9	1236 135 1256
123 5 9	4 6 123	1237 8 127
+-----+-----+-----+		
123 6 5	123 4 7	9 13 8
9 1234 7	5 123 8	1234 6 124
1234 8 123	6 9 123	5 1347 1247
+-----+-----+-----+		
12357 9 1236	123 1235 4	6 157 1567
1245 124 126	8 7 1256	146 9 3
13457 134 8	9 135 1356	1467 2 14567
+-----+-----+-----+
153 candidates.

CODE: SELECT ALL
extended tridagon for digits 1, 2 and 3 in blocks:
b4, with cells: r5c2, r4c1, r6c3
b5, with cells: r5c5, r4c4, r6c8
b1, with cells: r2c2, r3c1, r1c3
b2, with cells: r2c5, r3c6, r1c4
==> tridagon-link(n4r5c2, n5r2c5)

denis_berthier
2010 Supporter

Posts: 3334
Joined: 19 June 2007
Location: Paris



Re: The hardest sudokus (new thread)

by eleven » Sat Mar 19, 2022 4:44 pm

These patterns are impossible (easy to prove with 2 case distinctions).
Note, that there are 2 rectangles, one with the cell in c7, which only sees one other in the line, and the other with the "edge" cell in box 5.

CODE: SELECT ALL
+-----+-----+-----+
123 . .	123 . .	123 . .
. 123 .	. 123 .	. 123 .
. . 123	. . 123	. . 123
+-----+-----+-----+		
123 . .	. 123 .	. 123 .
. 123 .	. . 123	. 123 .
. . 123	. . 123	. 123 .
+-----+-----+-----+		
123 . .	. 123 .	. 123 .
. 123 .	. . 123	. 123 .
. . 123	. . 123	. 123 .
+-----+-----+-----+

It can be used in Denis' #13

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eleven

Posts: 2820
Joined: 10 February 2008

Re: The hardest sudokus (new thread)

by marek_stefanik » Sat Mar 19, 2022 5:36 pm

Nice observation!

It reduces all of the 8.9 and 9.0 puzzles on the list to 6.6 and all of the 8.3s to singles (with basics in between, I haven't checked if they were necessary).
You can also fix the permutation in b4 and then reach a contradiction with singles.

Marek

marek_stefanik

Posts: 269
Joined: 05 May 2021

Re: The hardest sudokus (new thread)

by eleven » Sat Mar 19, 2022 6:05 pm

Thanx, so let's call it "eleven's hammer"

eleven

Posts: 2820
Joined: 10 February 2008

Re: The hardest sudokus (new thread)

by mith » Sat Mar 19, 2022 7:25 pm

After running my various scripts, I've settled on 664 expanded forms with 1064 minimals (of which 680 are not currently in the database, and another 140 are unrated by SER). I've rated all of the expanded forms, as well as producing the solution-minlex forms, and in the short term (before I make all the database changes that aren't yet finalized) I will get these lists up in a google doc.

I'm doing a final SE run on high skfr puzzles generated recently, and then I will do one more check for depth > 2 puzzles in the latest batch of 11.4+ (and run the scripts on any new ones found) before posting the results. (After which I'll be backing everything up and working on the computer for a bit.)

Re: The hardest sudokus (new thread)

by mith » Sat Mar 19, 2022 7:26 pm

eleven wrote:
Thanx, so let's call it "eleven's hammer"

I'd push for calling something "The Texas Hammer", but I might get sued: <https://www.al.com/news/2021/08/mike-al...liver.html>

Re: The hardest sudokus (new thread)

by mith » Sun Mar 20, 2022 2:26 am

Last batch of 11.6-11.7 before I pause for database changes:

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mith

Posts: 862
Joined: 14 July 2020

Re: The hardest sudokus (new thread)

by mith » Sun Mar 20, 2022 2:27 am

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mith

Posts: 862
Joined: 14 July 2020

Re: The hardest sudokus (new thread)

by mith » Sun Mar 20, 2022 12:49 pm

Glad I checked. The latest high rated batch had a significant number of depth 3 puzzles, some expanding all the way to 36 clues:

CODE: SELECT ALL
.....12..1.2345.25..413.6...3.1.51.6578...5...9...65...4331...52.4.23..6.1
.....12..1.2345.25..413.6...3.1.51.6578...5...9...65...2331...54.4.23..6.1
.....12..1.2345.24..513.6...3.1.41.6478...4...9...64...2331...54.5.23..6.1
.....12..3.124.512..4536...413..16378...3..9...514..62.34...5.16.2...43

May take a bit longer to run through all of these. (And there are almost certainly more in the database at lower ratings; I have so far limited this exploration to the currently 58995 11.4+ minimals, and just going to 11.3 bumps that up to 200k.)

Re: The hardest sudokus (new thread)

by marek_stefanik » Sun Mar 20, 2022 1:51 pm

All of them only reduce to 9.2 skfr with the TH, but with a small extension they collapse to singles.
The first one after TH (-789r1c1) and basics:

CODE: SELECT ALL
+-----+-----+-----+
6 34 34	789 589 57	#789 1 2
x789 y789 1	6 2 3	4 5 z789
2 5 2789	789 4 1	3 y789 6
+-----+-----+-----+		
789 24789 4789	24 3 46	1 6789 5
1 2349 6	5 7 8	29 39 49
5 23478 3478	124 16 9	278 3678 478
+-----+-----+-----+		
#789 6 5	1789 x89 2	#789 4 3
3 1 #789	4789 689 46	5 2 #789
4 #789 2	3 589 57	6 #789 1
+-----+-----+-----+

Chaining through three anti-diagonal boxes (b793), vertical parity in b3 is opposite to horizontal parity in b1 (permutation xyz). With z second the permutation must be xzy.

CODE: SELECT ALL
+-----+-----+-----+
6 34 34	789 589 57	x789 1 2
x789 y789 1	6 2 3	4 5 z789
2 5 2789	a789 4 1	3 y789 6
+-----+-----+-----+		
789 24789 4789	24 3 46	1 6789 5
1 2349 6	5 7 8	29 39 49
5 23478 3478	124 16 9	278 3678 478
+-----+-----+-----+		
789 6 5	1789 x89-1 2	789 4 3
3 1 789	4789 689 46	5 2 789
4 789 2	3 589 57	6 789 1
+-----+-----+-----+

In b2, x is forced into r3c4, then in r7 into r7c5 => -1r7c5, 9.1 skfr

CODE: SELECT ALL
+-----+-----+-----+
6 34 34	789 589 57	x789 1 2
x789 y789 1	6 2 3	4 5 z789
2 5 2789	x789 4 1	3 y789 6
+-----+-----+-----+		
#789 24789 4789	24 3 6	1 #789 5
1 249 6	5 7 8	29 3 49
5 23478 3478	124 3 9	278 6 478
+-----+-----+-----+		
#789 6 5	1 x89 2	789 4 3
3 1 789	789 6 4	5 2 789
4 789 2	3 589 57	6 #789 1
+-----+-----+-----+

skyscraper zc18v47b9 => -zr7c7

HS zb9 (r9c8), xb9 (r8c9), xb6 (r4c8), xb7 (r9c2), xb4 (r6c3)

x must appear in both r6c3 and r7c5 => x=8, stte

Marek

marek_stefanik

Posts: 269
Joined: 05 May 2021

Re: The hardest sudokus (new thread)

by denis_berthier » Sun Mar 20, 2022 1:54 pm

mith wrote:
CODE: SELECT ALL
.....12..1.2345.25..413.6...3.1.51.6578...5...9...65...4331...52.4.23..6.1
.....12..1.2345.25..413.6...3.1.51.6578...5...9...65...2331...54.4.23..6.1
.....12..1.2345.24..513.6...3.1.41.6478...4...9...64...2331...54.5.23..6.1
.....12..3.124.512..4536...413..16378...3..9...514..62.34...5.16.2...43

Like all the previous ones, these 4 are at most in T&E(W2, 2).
T&E(W2, 2) seems to be the new frontier.

Re: The hardest sudokus (new thread)

by eleven » Sun Mar 20, 2022 7:47 pm

4th puzzle.

After r1c2=6 (TH) and basics:

CODE: SELECT ALL
+-----+-----+-----+
45 6 45	789 38 379	789 1 2
789 789 3	6 1 2	4 789 5
1 2 789	789 4 5	3 6 789
+-----+-----+-----+		
25789 789 5789	25 26 4	1 3 6789
2459 1 6	3 7 8	29 59 49
24578 3 4578	125 9 16	278 578 4678
+-----+-----+-----+		
789 5	1 4 38 379	6 2 789
3 4 789	2789 26 679	5 789 1
6 789 2	1789 5 179	789 4 3
+-----+-----+-----+

Replacing 789 by XYZ in row 2, there is only one possibility for them in b3, and 2 in b79 (either left or right letters).
Then Y must be in r3c4 and r6c6, then 1 goes to r6c6, which gives 6r4c5.

(Same as Marek showed above)

CODE: SELECT ALL
+-----+-----+-----+
45 6 45	789 38 379
X Y 3	6 1 2	4 Z 5
1 2 Z	Y789 4 5	3 6 X
+-----+-----+-----+		
25789 X789 5-789	25 b26 4	1 3 Y789-6
2459 1 6	3 7 8	29 59 49
24578 3 4578	125 9 a16	278 578 4678
+-----+-----+-----+		
YZ 5 1	4 38 379	6 2 ZY
3 4 XY	2789 26 679	5 YX 1
6 2X 2	1789 5 Y179	XZ 4 3
+-----+-----+-----+

r5c2 can be X or Z, r4c9 Y or Z. Since both cannot be Z, they are XY and the left side in b79 is true. Now r4c3 cannot be XYZ and must be 5. In box 4, Y must be in r6c3. Since Y sees 8 and 9, it must be 7, stte.

Re: The hardest sudokus (new thread)

by mith » Mon Mar 21, 2022 12:21 am

After running the scripts again, I am now at 972 expanded forms with 2021 minimals. Rating the new expanded forms is under way, and I'll make the results available once that's done.

Re: The hardest sudokus (new thread)

by mith » Mon Mar 21, 2022 12:48 am

Denis, you were wanting one with guardian cells in opposing boxes:

CODE: SELECT ALL
.....1...1234.....352.6...2.5...4..7...6..89.....132..6..5.2...43.64.....12

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mith

Posts: 862
Joined: 14 July 2020

mith

Posts: 862
Joined: 14 July 2020

Re: The hardest sudokus (new thread)

by denis_berthier » Mon Mar 21, 2022 5:22 am

mith wrote:
Denis, you were wanting one with guardian cells in opposing boxes:
CODE: SELECT ALL
.....1...1234.....352.6...2.5...4..7...6..89.....132..6..5.2...43.64.....12

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denis_berthier
2010 Supporter

Posts: 3334
Joined: 19 June 2007
Location: Paris



Hi mith, thanks
You already gave an example here: <http://forum.enjaysudoku.com/the-hardest-sudoku-new-thread-16539-1215.html> and my implementation in SudoRules found the tridagon-link. That was a good answer to my question, with only two additional candidates, in diagonally opposite blocks.

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