The New Sudoku Players' Forum Search. Search Sponsored by Enjoy Sudoku The hardest sudokus (new thread) POSTREPLY & Search this topic... 1330 posts • Page 80 of 89 • 1 ... 77 78 79 80 81 82 83 QUOTE Re: The hardest sudokus (new thread) by **mith** » Wed Mar 16, 2022 6:33 pm Posts: 862 Joined: 14 July 2020 Further analysis of the 11.9 morph: After the first 11.8 step, there are five 11.8 steps: -3r2c1 (325 nodes) +3r1c1 (326 nodes) -3r1c7 (331 nodes) these are all equivalent in terms of eliminations - the result is a 3 in r1c1, eliminating 3 from the other two cells. -2r1c8 (340 nodes) - this is the elimination found in the other puzzle, but now at 340 nodes instead of 320; this could be the result of pruning? I don't really have any other explanation for this -2r5c7 (343 nodes) - this is equivalent to the pointing elimination in the other puzzle these are again equivalent; the first leads to pointing eliminating the second, while the second leads to claiming eliminating the first. After the single, we have the following 11.9 steps: -7r2c3 (418 nodes) -9r1c3 (439 nodes) - incidentally, this is the second 11.9 step but goes up to 446 nodes after the first -9r2c3 (451 nodes) -2r1c8 (504 nodes) -2r5c7 (506 nodes) That's a huge jump, very nearly to 12.0 range. I think any further understanding of this is going to require a close look at the chain itself at each stage, or study of the code. QUOTE □ by **mith** » Wed Mar 16, 2022 6:40 pm Posts: 862 Joined: 14 July 2020 **66** 1to9only wrote: This is probably related to an SE bug first found in 2010: http://forum.enjoysudoku.com/help-with-sudoku-explainer-t6677.html#p201789 Aha, good to know. So a bug after all, and not pruning related. Also interesting that the steps after digit 30 are not the 11.8/11.9 step that is causing the SE difference, but rather the second and third 11.9 steps now rated at 11.8 which still doesn't explain the -2r1c8 step not being found at a lower node count (but this may be due to the partial nature of the fix?). I may try re-rating all the 11.8+ expanded forms with the Iksudoku fix to see if there are any other changes. (Incidentally, I've been using your fork of SE for node count analysis, and I noticed that in the case of Loki - or at least the morph used here - there is a DFC+DFC+FC 61 node chain found. I'm assuming you are rating these as if they were DFC+DFC with the same node count, rather than adding additional 0.5 for base rating levels, since it's showing up as an 11.3. QUOTE by **1to9only** » Wed Mar 16, 2022 7:03 pm Posts: 4075 Joined: 04 April 2018 **66** mith wrote: I may try re-rating all the 11.8+ expanded forms with the Iksudoku fix to see if there are any other changes. AFAIK None of the released SEs have the Iksudoku fix, apart from Iksudoku fix itself but this is slow and based on the old single-threaded SE code. QUOTE Re: The hardest sudokus (new thread) Dby mith » Wed Mar 16, 2022 8:51 pm Posts: 862 Joined: 14 July 2020 rangsk has added a T&E depth tool (as part of https://github.com/dclamage/SudokuClassicMinLex), so I was able to check all expanded forms of 11.6+ puzzles currently in the database. I found a total of 88 expanded puzzles with depth 3; Denis, these *should* match your not-T&E(2) findings, but here's the list for checking: CODE: SELECT ALL1...2....3..45.16.23...27.81.6..3.87.61...32.67..81.7.8....68......;291....2.....3..45..6.....71.8....32..67..8.6..23....837..1..7.281.6..;11.9;1.2;1.2;26;mith;49449811....2.....3..45..1.23....2671.8..73.6.81...8......2.3.86..761..7....;11.9;1.2;1.2;27;mith;4786070
......1....2.....3..45.16.23...27.8.61..3.871.6...32.68..718..7....6.7.....;291....2.....3..45..6......71.8....23..67..8.827..1..6...23...7.381.6..;11.9;1.2;1.2;26;mith;Loki1....2.....3..45..1.23....267.81..73.61.8...17.6....8......2.3.87..6;11.8;1.2;1.2;27;mith;46910761....2.34.23...5....6.78.5..5823.....7.6.5....67.....25.2..78..83..267.5;311....2.34.23...5....6.78.5...823....7.6.5....67....25.2...78..83...67..;11.8;1.2;1.2;28;mith;36861431....2.34.23...5....6.78.5...823....7.6.5...67....25....78..83...267..;11.8;1.2;1.2;28;mith;36862201....2.34.23...5....6.78....5823.....7.6.5....67.....25....78..83..267.5;11.8;1.2;1.2;29;mith;34574661....2.34.23...5....6.78....5823.....7.6.5....67....25.2..78..83...67.5;11.8;1.2;1.2;29;mith;34574671....2.34.23...5...5623....2.7.86.5.38.7.5....78.....5.2..86..63...78.5;311....2.34....562....1.25....267.18..75.68.1...87......5.2.67..861.....;11.8;1.2;1.2;29;mith;34573471....2.34....562....7.25....5867.1..62.8.17...16.....2.5.68..787......;11.8;1.2;1.2;29;mith;34573481....2.34.23...5....6.78.5...823....37.6.5....67.....5.2..78..83...67.5;11.8;1.2;1.2;29;mith;34573491....2.34.23...5....623....7.8.5...2.8.76.5..87.....5.2..76..63...87.5;11.8;1.2;1.2;29;mith;34573501....2.34.23...5...5623....2.7.86.5.38.7.5....78.....5.2...86..63..278.5;321....2.34....562....7......52.67..816...8...8..25...2.67.18..57.6..1..;11.8;1.2;1.2;28;mith;36826891.....234...2.315.6....652...2.1.4..3.4.3..15...4...6...6...53...7.8..6...;11.8;1.2;1.2;28;mith;36860681....2.34.35......62.....7.3.25..885...67...7853....32..68...5.62.7.8.;3o1....2.34..2.3156....5....4...6...78..6......651..1..2.43..4..3...25;11.8;1.2;1.2;26;mith;48880401....2.34..2.3156....5.....4...6...78...6......65.4.1...2.43...4...31...25;11.8;1.2;1.2;27;mith;46983731.....2.34.35.......62......7.3.25..885...67...8753....3.62.8...52..67.8.;301....2.34..2.3156.....56.1..1.2.43.6.4.3...2.....6.....4....5.7.8..5...;11.8;1.2;1.2;26;mith;49454381....2.34..2.3156.....564...1.2.43.6.4.31..2.....6.....4....5.7.8..5...;11.8;1.2;1.2;27;mith;47866991....2.34235...6...26...78...3.8...7.657........52.78.6.68.23....7.35.6...;31
.....1....2.34....562....567.1...628.17..7...258...87.....52.6...76.1....;11.8;1.2;1.2;28;mith;36826971....2.34....562....1.257...267.18...5.68.1...87.....5.2.6...861.....;11.8;1.2;1.2;28;mith;36859611....2.34235...6.....78.6..8.23....7.35.6....26..78..3.8...7.657......;11.8;1.2;1.2;28;mith;36859621....2.34235...6....2.78.6...8.23....7..5.6....26..78..3.8...7.657......;11.8;1.2;1.2;28;mith;3685963 $\dots \dots 1 \dots 2.34235 \dots 6 \dots 72 \dots 65 \dots 78 \dots 8.3.257 \dots 6.8653 \dots 3.72 \dots 6.\dots 52 \dots 78 \dots 6.33$1....2.34....562....1.257...267.18...5.68.1...87.....5.2.68..761...7..;11.8;1.2;1.2;30;mith;29174771....2.34235...6.....78.6...8.53....3.72.6....72......65...78...8.3.257.6;11.8;1.2;1.2;30;mith;29176771....2.34....562....56..1...627.18..8...257...7......52..68..76.1..7...;11.8;1.2;1.2;28;mith;36767581....123...1.245.6..3...6...6...52...7.8..6....1..654...3.2...5..4.1.3..2;11.6;1.2;1.2;28;mith;36800091.....2.34.35...6...72......65...78..8.3.257.6.8653....3.72.6...52..78.6.;321....2.34....562....7......61..8...25...67..8.7...25.....856..1...6.28.17...;11.8;1.2;1.2;28;mith;36758041....2.34..2.3156.....56.1..1.2.43...4.3...26..4....5..5...63...7.8..5...;11.6;1.2;1.2;28;mith;36749421....2.34....562....1.25....267.18...75.68.1...8......5.2.68...761...7...;11.8;1.2;1.2;29;mith;34448551...2.34...2.3156....564...1.2.43...4.31..26..4...5..5...563...7.8..5...;11.6;1.2;1.2;29;mith;34444671....2.34235...6...26...78...3.8.2.7.657...........52.78.6.68.23....7.35.6...;321....2.34....562....56..1...627.18..8...257...7.......52..6...86.1..8...;11.8;1.2;1.2;27;mith;47932401....234...2.3.5.6..4...6...6...53...7.8..6....1..652...2.1.4..3.4.3...5.;11.6;1.2;1.2;27;mith;47951691..2....34.56.14.78...73.94....8.91.37...98......17.......4.3.19.8.;281..2....34.56.14.78...73.94....8.9..37...98......17.......4.3.19.8.;11.7;1.2;1.2;27;mith;481504612.34.13..42.5....6..4.....789.3...5......5.....9.291...5.34.9...21;11.7;1.2;1.2;27;mith;464658112.34.13..42.5....6.54.....789.3...5......5.....9.291.....34.9...21;11.7;1.2;1.2;27;mith;464670612.34.13..45.2....6..45.....789.3...5......291...5.1.5.....934.9....21;2912.34.13..45.2....6..4.....789.3...5......5.....9.291...5.34.9...21;11.7;1.2;1.2;27;mith;464797312.34.13..45.2....6..45....789.3...5......5.....9.291.....34.9...21;11.7;1.2;1.2;27;mith;46479761......23......45.6....45......478.96...95...678....69..48....4...97....878....5....;291.....23.....45.6...45.....478.96..95..678...69.48...4..97....78...5...;11.7;1.5;1.5;28;monh;3543047forum-202202231....23....45.6...45....478.96..95..678...69.4...4..97...878...5...;11.7;1.2;1.2;28;monh;3543097forum-202202231......23....456.7...6.4....45.897..86.75.9...7849....4..5.8..959..6....;301.....23....456.7...6.4....45.897..86.75.9...7849....4....8...59..6....;11.7;1.2;1.2;28;monh;3543127forum-202202231.....23....456.7...6.4....45.897..86.75.9...784.....4....8..959..6....;11.7;1.2;1.2;28;monh;3543148forum-202202231.....23...2456.....7.4.....4.827.6..756.8...46.27...25.6.8...7.845..6.;311.....23...2456.....7.4.....4.827.6..756.8...46.27...25...8...7.8...6.;11.7;1.2;1.2;28;mith;36906741.....23...2456.....7.4.....4.827.6..756.8...46..7...25...8...7.8.5..6.;11.7;1.2;1.2;28;mith;36908091....23...2456....7.4....4.827.6..756.8...46..7...25.6.8...7.8.5...;11.7;1.2;1.2;28;mith;36908101....23...2456....7.4....4.827.6..756.8...46.27...25.6.8...7.8....;11.7;1.2;1.2;28;mith;36908111......23...2456.....7.4.....5.827.6.7.56.8...8745..6.46..27...5.26.8...;311.....23...2456.....7.4.....5.827.6.7..6.8...87.5..6.46...7...5.2..8...;11.7;1.2;1.2;27;mith;48017191.....23...2456.....7.4.....5.827.6.7..6.8...87.5....46...7...5.26.8...;11.7;1.2;1.2;27;mith;48017541....23...2456....7.4....5.827.6.7.56.8...87....6.46..27...5.2..8...;11.7;1.2;1.2;28;mith;36906731.....23...2456.....7.4.....5.827.6.7.56.8...87......46..27...5.26.8...;11.7;1.2;1.2;28;mith;36907861....2.....3..45.16.....72.3.76..878......276.81..63.71.8..8.1.23...;291....2.....3..45..1.23....267.81..73.61.8...17.....6.8......2.3.67..8;11.7;1.2;1.2;27;999/mith;47235201....2.....3..45..6.....71....823..87..6.827.61..6...23...7.381.6..;11.7;1.2;1.2;27;999/mith;47235211....2.....3..45..1.23....267.81..73.61.8...17.....62.3..7..868.....;11.7;1.2;1.2;27;999/mith;47235231....2.....3..45..6.23....3781.6..82.7.61...68.....3.2..7..671.....8;11.7;1.2;1.2;27;999/mith;47235241....2.....3..45.16.23...27.8.61..3.871.6...32.78..618..6...76.7.....;301....2.....3..45..6.....71.6...823..87..6.827..1..6...23...7.381.6..;11.7;1.2;1.2;27;999/mith;47235221....2.....3..45..6.23....3781.6..82.7..1...68.....3.2..7..671..6...8;11.7;1.2;1.2;27;999/mith;47235251...2....3.45.16.23...27.81.6..3.87.61...32.67..81.7.8...668......;301....2.....3..45..6.....23.78..618..6...7.7..23...2.861.7..36.8..1..;11.7;1.2;1.2;27;mith;47869461....2.3.....4.56......7.....481.2..19..248...89..1..742..78..97.1.9....;281....2.3.....4.56.....7....481.2..19..248...89..1..742..78..97.1.9....;11.7;8.5;2.6;28;mith;34917281....2.3.....4.56.....7....18.2497.4.791.2...42.79..817..8....8.9..1..7;301....2.3....4.56.....7....8.249...4791.2...1.8....89..1..74.2.79..8;11.7;1.2;1.2;27;mith;46464741....2.3.....4.56.....7.....481.2...9..2487..89..1..742..78..97.1.9....;11.7;1.2;1.2;28;mith;34917261....2.3.....4.56....7.....18.2497.4.791.2...42.79..817..8....8.9..1..7;301....2.3.....4.56....7.....8.249...4791.2...1..8....89..1..74.2.79..8;11.7;1.2;1.2;27;mith;46463541....2.3.....4.56....7......8.249...4791.2...89..1..74.2...9..871..8...;11.7;1.2;1.2;27;mith;46463551....2.3.....4.56.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$\dots \dots 1 \dots 2.3 \dots 45.3 \dots 26 \dots 734 \dots 861.46.52 \dots 24 \dots 16.13.2 \dots 545.6 \dots 2.3; 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$\dots \dots 1 \dots 23 \dots 24 \dots 35 \dots 46 \dots 67.28 \dots 4283 \dots 7.682.4.7.23 \dots 87 \dots 4.736 \dots ; 31$1....23....24....35....46.....67..8...4283...7.3..8......682.4.7.4.7.6....;11.7;1.2;1.2;27;mith;47905041....23....24....35....46....4273...8.6.8.27...863.4...2.3.87...47.26..8.;311...23...24...35...46...4273...8.6.8..7...7.26..8..86..4...2.3..7...;11.7;1.2;1.2;27;999/mith;4723528.....1...23...24...35...46...273...8.6.8..7...86..4...2.3..7...47.26..8.;11.7;1.2;1.2;27;999/mith;47235311..2..1.3..3..45.26....5216....46.2.32....3.45..7...35...8...61.42.5.....;301..2..3.2..41.56....65..2...12.54....3....1..72......84.3...51....6..;11.7;1.2;1.2;25;mith;40122101..2..3.2..41.56....2.54....3....11...65..2..72......84.3...51....6..;11.7;1.2;1.2;25;mith;40122111..2..1.3..3..45.26....5216....46.2.32....3.45..7...35...8...61.42.5.6...;311...2...3.2...41.56....2.54....3....11...65..2..7..3.....82.6...51....6.4;11.7;1.2;1.2;26;mith;48472241..2..3.2..41.56....2.54....3.4..11...65..2..7..3.....82.....51....6.4;11.7;1.2;1.2;26;mith;48472251....2..3....3.45...3...26..728.....61..2378..81.6....32...7..67.6..1...;11.7;1.2;1.2;28;mith;34730871..2..3.4..4.56..2.....36..4...25..3.2..4.1.65..7...31...8...45.62.3.....;11.7;1.2;1.2;28;mith;34730881..2..3.4..4.56..23....362.4...25.13.2..4.1.65..7...31...8...45.62.3.5...;321....2..3....3.45...3...26..728.....61..23.8...6..1....81.6...732...7..6;11.7;1.2;1.2;27;mith;46318321..2..3.4..4.56..2.....2..3....3.5..42...41.56..7...31...8...4..52..36...;11.7;1.2;1.2;27;mith;46318531..2.13.4..4.56..23...3.52.4...62.13.2...4..56..7...31...8...46.52...6...;311....2..3....3.45...1.6...7...6..1...23...87....83...26.16...23.8.7.28.....;11.7;1.2;1.2;27;mith;46343951..2.13.4..4.56..2....2.13....3.5..42...4..56..7...31...8...4..52...6...;11.7;1.2;1.2;27;mith;463443212.....3.4....1567...8.9...6.51.67...69...8....75.89.6.8...65....9.67.1...;3012.....3.4.....256...478.....273.9...98.......3849...724......7.92.8..3;11.7;1.2;1.2;28;mith;356381812.....3.4.....256...478.....273.9...98..2.....3849...724......7.9..8..3;11.7;1.2;1.2;28;mith;356486512.....3.4....1567...8.9...6.51.76...69...8....75.89.6.8...65....9.67.1...;3012.....3.4.....256...478.....273.9...98...2.....38.9...724......7.94.8...3;11.7;1.2;1.2;28;mith;35690991...23....24....35....46....4.73...8.6.8.27...863.4...2.3.87...47.26..8.;301....23....24....35....46......73...8.6.8.27...863.4...2.3..7...47..6..8.;11.7;1.2;1.2;27;999/mith;47235291....23....24....35....46......73...8.6.8.27...86..4...2.3..7...47.26..8.;11.7;1.2;1.2;27;999/mith;47235361.....2.34.23..156......46....5......6..78....56....4.24.1..3..3.14...25;11.6;1.2;1.2;27;999/mith;47235261....2.34.23..156.....46....5.....6..78....56...1..24.1..3..3.14...25;11.6;1.2;27;999/mith;47235271...2....34.56..47.3....17.89...93..4.8...79......18......4.3.17.9.;11.6;1.2;1.2;26;mith;49532791.23.45..214.3.6......45..5...46.1.6..51.32.4......7....2...8.9.36...;281....23...2456.....7.4..5..5.827.6.7.56.8...874...6.46...7...5.26.8...;301.....23...2456.....7.4..5..5.827...7..6.8...87....6.46...7...5.2..8...;11.6;1.2;1.2;26;mith;49499241.....23...2456.....7.4..5..5.827.6.7..6.8...87......46...7...5.26.8...;11.6;1.2;1.2;27;mith;47977591.....23...2456.....7.4..5..756.8...54.827.6.784...6.4.6..7...52.6.8...;311.....23...2456.....7.4..5..4.827....756.8...46..7...25...8...7.8....6.;11.6;1.2;1.2;27;mith;48017361.....23...2456.....7.4..5..4.827.6..756.8...46..7...25.6.8...7.8.....;11.6;1.2;1.2;28;mith;36907871....2....3...245....36.....67.8.9..3892..67.698.3...3.726....82..79...;301....2....3...245....36.....67.8.9..3892..67..7.6.....698.3...82..79...;11.6;1.2;1.2;28;mith;36754981....2....3...245....36.....67.8.9..3892..67.698.37..3.726....82..79...;311....2....3...245....36.....67.8.9..3892..67..7.6.....698.37..82...9...;11.6;1.2;1.2;28;mith;36748751....2.3.....45..6.15..7...2.4.58..778.......2758.1..1.8.24...54.7.18..;301....2.3.....45..6..7......51..8...24..57..8.7..24....825..1..5.48.17..;11.6;1.2;1.2;27;mith;47869251....2.3.....45..6..1.24....457.18..72.58.1...8......4.2.58..751...7...;11.6;1.2;1.2;28;mith;36731221....2.3.....45..6.15..7...2.4.58..778.......4758.1..1.8.24...52.7.18..;301....2.3.....45..6..7......51..8...24...57..8.7..24....845..1..5.28.17..;11.6;1.2;1.2;27;mith;47877171....2.3.....45..6..1.24....257.18..74.58.1...8......4.2.58..751...7...;11.6;1.2;1.2;28;mith;36745251....2.3.....4567.....8....18.249..4.591.2...42.89...1...5....5.9....8;11.6;1.2;1.2;27;mith;46512231....2.3.....4567.....8....18.249...4.59...2....42.89...1...5....5.9..1...8;11.6;1.2;1.2;27;mith;46586821....2.34....56....16.....2.5.67..878.......2768.1..1.8.257..65.7.18..;301....2.34....56.....1.257...2.68.1...567.18...87......5.2.67..861.....;11.6;1.2;1.2;28;mith;36908121....2.34....56.....267.1...658.17..7...258...87......52..68..76.1.....;11.6;1.2;1.2;28;mith;36908131....2.34....56....16..7...2.5.68..787.......2867.1..1.7.258..65.8.17..;311....2.34....56....26..1...657.18..8...257...7......52..67..86.1..8...;11.6;1.2;1.2;27;mith;48019601....2.34....56....17.....2.8......56..27..8.2578.1..17..65...8.62.17..;291.....2.34....56....17.....2.8......56...27...8.25.8.1...17...65...8.62.17..;11.6;1.2;1.2;28;mith;36398131.....2.34....56.....1.65....672.18...25.87.1...72......18.......6.5.28..7;11.6;1.2;1.2;28;mith;36398141....2.34....56....17......2.8......56...27...8.2678.1...17...65...8.52.17...;291....2.34....56....1.65....572.18...26.87.1...72.....18......6.5.28...7;11.6;1.2;1.2;28;mith;36454411....2.34....56...17....2.8.....56...27...8.26.8.1..17...65...8.52.17..;11.6;1.2;1.2;28;mith;36454421.....2.34....56....17......2.8......65..27..8.2578.1..17..65...8.62.17..;291....2.34....56....1.65....672.18...25.87.1...72.....18......5.6.28..7;11.6;1.2;1.2;28;mith;36550771....2.34....56....17.....2.8.....65..27..8.25.8.1..17..65...8.62.17..;11.6;1.2;1.2;28;mith;36551841....2.34.35......6.27....2.6.8....7835.....62.....57.32.56.885...67..;291....2.34..2.3156.....53.....4......781.6......65...1..2.43.64..3...25;11.6;1.2;1.2;27;mith;46988861....2.34..2.3.56.....53.....4.......781.6......65...1..2.43.64..31..25;11.6;1.2;1.2;27;mith;46993281....2.34.35......6.27....2.6.8.7..7835.....62.....75...68..8.32.56.7;291....2.34..2.3156.....56....1.2.43.6.4.31..2.....63.....4....5.7.8..5...;11.6;1.2;1.2;27;mith;47868141.....2.34.35.......6.27.8..2.6.8....7835.....62.....7.32.56.885...67..;291....2.34..2.3156.....53.....4...6...78..6......65...1..2.43..4..31..25;11.6;1.2;1.2;27;mith;47009781....2.34.35......56......7.3..58.682...67...7825..6.3.26.7...56..38...;301....2.34.35......6.....7.3..58..82...67...7825..6.3.26.7...5...38...;11.6;1.2;1.2;27;mith;47593121....2.34.35......36....7625..8.3.28.7....58......62...87..7.3..56..;11.6;1.2;1.2;27;mith;47598791....2.34.35......56......7.3..58.682...67...7825..6.3.26.8...56..37...;301.....2.34.35.........36....6725..8.3.28.7....58......6.3..57..72...86..;11.6;1.2;1.2;27;mith;47738931.....2.34.35......6;1.2;1.2;27;mith;47739541....2.34.35......56.....7.3..58.682...67...8725..6.3.26.7...56..38...;301....2.34.35......36....6725..8.3.28.7....58.....62...87..7.3..56..;11.6;1.2;1.2;27;mith;47662611.....2.34.35......6;1.2;1.2;27;mith;47663071....2.34.35...6....7.26....2.7.8.6...8635.....72.....565...78..8.32.57.6;311.....2.34..2.3156.....56....1.2.43...4.3...26..4....5..5..63...7.81.....;11.6;1.2;1.2;27;mith;47885981....2.34..2.3.56.....56....1.2.43...4.31..26..4....5..5..63...7.81....;11.6;1.2;1.2;27;mith;47891331....2.34..2.3156.....56....1.2.43.5.4.3...26..4......5..63...7.81.5...;11.6;1.2;1.2;28;mith;36758031....2.34..2.3.56.....56....1.2.43.5.4.31..26..4......5..63...7.81.5...;11.6;1.2;1.2;28;mith;36758061....2.34.35...6...26...78...3.8..57.657.......52.78.6.7.35.6...86.23....;311.....2.34.35...6....2.78.6.7..5.6...8..23.....26..78..3.8..57.657......;11.6;1.2;1.2;28;mith;36910271....2.34....562....267.1...658.1...7...258...87.....52..68..76.1.....;11.6;1.2;1.2;28;mith;36910711....2.34.35...6....7.5.....2.8.7.6.3.8..6....82......65..387..7..2.5..6;11.6;1.2;1.2;27;mith;47882691....2.34.35...6...7.5....3.8..6...52.8.7.6..82.....6...387..7..2.5..6;11.6;1.2;1.2;27;mith;47882721....2.34235......26..78..3.8..57.657.......52.78.6.7.35.6...86.23....;311....2.34235..........67.8.6.35.8...7..23.....28..67..3.7..56.856......;11.6;1.2;1.2;28;mith;36907981....2.34235......2.67.8.6..5.8...7..23.....28..67..3.7..56.856......;11.6;1.2;1.2;28;mith;36908141....2.34235......26..78..3.8.257.657.......52.78.6.7.35.6...86.23....;321....2.34235...6...26...78...3.8.2.7.657......2.5...78.6.68.23....7...5.6...;311....2.34235...6.....78.6..8.23....7..5.6....26..78..3.8...7..57......2;11.6;1.2;1.2;27;mith;47901571....2.34235...6.....78.6..8.23....7..5.6.....6..78..3.8.2.7..57.....2;11.6;1.2;1.2;27;mith;47931781....2.34235...6.....78...68.23....7..5.6....26...78...3.8...7.657......2;11.6;1.2;1.2;28;mith;36767751....2.34235...6....78...68.23....7..5.6....6..78..3.8.2.7.657.....2;11.6;1.2;1.2;28;mith;36800101....234...5..36.2....7..36....894....46......125...6.4.31..52.56....1..;281....23...1..4.56..2....43.7..56...89......1..623.42..3.5...6...1...5;11.6;1.2;1.2;26;mith;48560061....234...5.136.2....7..36....894....46......125...6.4.3...52.56....1..;28 ...1.....23...1..4.56..2....4..7..56...89...3....1..623.42..3.5...6...1...5;11.6;1.2;1.2;26;mith;48560861....234..35......62.....7.3.25.6885...6.7..7853....3.62.8...52..678..;311....2.34..2.3156.....56.1..1.2.43...4.3...26..4....5...7.63...8....5...;11.6;1.2;1.2;27;mith;47877101....2.34..2.3156.....564...1.2.43...4.31..26..4....5...7.63...8....5...;11.6;1.2;1.2;28;mith;3674524 $\dots \dots 1 \dots 234 \dots 35 \dots \dots 62 \dots \dots 7.3.25.6885 \dots 6.7 \dots 8753 \dots 3.62.8 \dots 52 \dots 678 \dots ; 31$1....2.34..2.3156.....56.1..1.2.43.6.4.3...2...4....5...7.63...8....5...;11.6;1.2;1.2;27;mith;47871881....2.34..2.3156.....564...1.2.43.6.4.31..2...4....5...7.63...8....5...;11.6;1.2;1.2;28;mith;36745271....234..35..4.62....78.3....39.4.6..36......125..6..3.41..25.56.....1.;301.....123......4.56..1.623.4.2.3.5....6..1...5..7.56.....89......21.....43;11.6;1.2;1.2;27;mith;46484361....234...35.14.62....78.3....39.4.6..36......125...6...3.4...25..56.....1.;301.....23......4.56..1.623.4.2.3.5....6..1...5..7.56....89..3...21.....4.;11.6;1.2;1.2;26;mith;485600712.....134...4..35.6....24.53...31.26.23.5.6.....1...6..7.61.5...89.6.....;301....2.34....4.56....2478...41.....728.9....81.....24...7..97.9..1...;11.6;1.2;1.2;26;mith;48439201....2.34....4.56.....2478...28.9.....417.....79..1...42...7...98.1......;11.6;1.2;1.2;26;mith;48441791....234.....51.62....2578...21......7589.....81......52..7...97.9.....;11.6;1.2;1.2;26;mith;48441801....234.....51.62....2578...21.7....589....79.....25..7...98.1.....;11.6;1.2;1.2;26;mith;48441811....23.45.25...36.....51.....2.4.1.4..36..2..78...6..1...6.....6.9....3.;11.6;1.2;1.2;26;mith;484418212.....134...4...5.6....16.5..2.78.....3.9.....15.4.63.34.1.....6.2.....;11.6;1.2;1.2;26;mith;48441831....23.45.25...36.....51.....2.4...4..36..2..78...6..1...6.....6.9...13.;11.6;1.2;1.2;26;mith;484418412.....3.4..1..256.....4.5..46.75....5.89.....6513....3.2.....641......;11.6;1.2;1.2;26;mith;484418512.....134...4..35.6....24.63...31.25.23.6.5.....1.....57.51.6...89.5....;301....2.34....4.56.....2478...41......728.9....81......42...7..97.9..1...;11.6;1.2;1.2;26;mith;48387551...23.45.25...36.....51.....2.4.1.4..63..2..78...6..1...6.9....3.;11.6;1.2;1.2;26;mith;48387561....234.....51.62....2578...21......7589.....81......25..7...97.9.....;11.6;1.2;1.2;26;mith;48387571....23.45.25...36.....51.....2.4...4..63..2..78...6..1...6....6.9...13.;11.6;1.2;1.2;26;mith;48387581....2.34....4.56....2478...28.9....417....79..1...24...7...98.1.....;11.6;1.2;1.2;26;mith;483875912.....134...4...5.6....15.6..2.7......3.89.....16.4..2524.1.....5.3.....;11.6;1.2;1.2;26;mith;48387601....234.....51.62....2578...21.7.....589.....79......52..7...98.1......;11.6;1.2;1.2;26;mith;483876112.....3.4..1..256......46...45.76....6.89.....5613....3.2.....541......;11.6;1.2;1.2;26;mith;4838762 Some of these expanded forms will be related (sub-puzzles where a non-singles digit can be added without going down to T&E(2), or puzzles which are the same except for an unavoidable set flipped - I haven't yet done a full search for the latter type, but I have the code for it and will include this when I generate expanded forms for the whole database). It will also be feasible with this tool to just check all possible added digits for whether the puzzle still has depth>3, rather than relying only on singles expansion, so I'll add that check in as well. QUOTE Re: The hardest sudokus (new thread) by mith » Thu Mar 17, 2022 12:32 am Posts: 862 Joined: 14 July 2020 Just finished running the 11.4-11.5 batch, there was exactly one more found: CODE: SELECT ALL1....2.3.....45..6.15..7...4.2.58..778.......4758.1..52.7.18..8.1.24...;301....2.3.....45..6..7......51..8...42..57..8.845..1..5.28.17..7...24...;11.5;1.2;1.2;27;mith;46987761....2.3.....45..6..1.24....4758.1..52.7.18...15..7....8......4.2.58..7;11.5;1.2;1.2;28;mith;3574420 Then I tested adding a digit at a time to the 30c and keeping any resulting grids that remained depth 3; all of the following are also depth 3: CODE: SELECT ALL $\dots \dots 1 \dots 234 \dots 35 \dots \dots 62 \dots \dots 7.3.25.6885 \dots 6.7 \dots 7853 \dots 32 \dots 68 \dots 5.62.78 \dots ; 31$1....2.3.....45..6.15..7..84.2.58..778.......4758.1..52.7.18..8.1.24...;311....2.3.....45..6.15..7...4.2.58..778.......4758.1..52.7.18..8.1.247..;311....234..35....6..72......65...7.8.8.3.25.76.8653....32..76...5.72.86..;321....23....24...35.....46.....67.2.8..4283..67.673.4...23...78...4.826.7..;321....234.235......62.....7.3.25.6885...6.7..7853....32..68...5.62.78..;321....23.4..25...36.....57.....74.2.8..5283..74.743.5...23..48...5.827.4..;331.....234.235....6..72......65...7.8.8.3.25.76.8653....32..76...5.72.86..;331...2345.234......26.....7.3.6..8.84..32.67.783.4...36.28.7..4.2.76...;331....2345.234....6..27......6.3.7...8.84...32.76.683.4....37.28.6...4.2.67....;34 There are 8 total minimals (all minimals of the 34c, on which the others converge): CODE: SELECT ALL1....2.34..2.3156.....651...1.2.43...4.3...25..4...6....7.53...8....6... ED=11.3/1.2/1.2 27c1.....2.3.....45..6..7......51..8...42..57..8.845..1..5.28.17..7...24... ED=11.5/1.2/1.2 27c (see above)1....2.34..2.3156.....65.4..1.2.43...4.31..25..4...6....7.53...8....6... ED=11.3/1.2/1.2 28c1....2.3....45..6..1.24....4758.1..52.7.18...15..7...8......4.2.58..7 ED=11.5/1.2/1.2 28c (see above)1....234.235..........67....8.53....5.62.87...62.....7....6.8.8.3.25.67 new 28c1....2.3.....45..6..45..1...527.18...8..247...78.....24..58..75.1..7... new 28c1....234.235.......6.278...7.35....3..6.8....62.....7.32.5.6885...6.7. new 29c1....2.3.....45..6..1.247...4.58.1..52.7.18...15..7...4.2.58..778....... new 29c Will run this on the 11.6+ expanded forms as well, now that I've got the kinks worked out. QUOTE Re: The hardest sudokus (new thread) by **mith** » Thu Mar 17, 2022 1:47 am Posts: 862 Joined: 14 July 2020 Ok, here are the results - I've gone from 88 expanded puzzles to 246: CODE: SELECT ALL1..2....34.56.14.78...73.94....8.91.37...98.....17......4.3.19.8.;281....2.3.....4.56......7.....481.2..19..248...89..1..742..78...97.1.9....;281....2.3....4.56....7.8....491.2..17..249...97..1..842..89...8.1.7....;281....2.3.....4.56....7.8.....491.2..18..249...98..1..742..79...7.1.8....;281..2....34.56.17......34..18.9.9.8......9314.7..47.8.3...8.1.79...;281.23.45..214.3.6......45..5...46.1.6..51.32.4.......7....2...8.9.36...;281.....234...5..36.2....7..36....894....46......125...6.4.31..52.56....1..;281....234...5.136.2....7..36....894....46.....125...6.4.3...52.56....1..;28
.....1...2....3..45.16.23...27.81.6..3.87.61...32.67..81.7.8...68.....;291....23.....45.6...45.....478.96...95...678...69.48...4...97...878...5...;29
.....1....2.....3...45.16.....72.3.76...878.......276.81...63.71.8...8.1.23...;291....2.3.....4567....5.8.....491.2..15..249...95..1..842..89...8.1.5....;291....2.3.....4567....5.8.....491.2..18..249...98..1..542..59...5.1.8....;291.....2.34..2...56...578.....276.9...98..2.....6829.7..25.......7.95.86..;291....2.34..2...56...578.....276.9...98..2.....6859.7..25......7.92.86..;291.23.45.2456.13.....45.21...3.2.6.2..61...3.7.....4.89....563......;291....2.34....56....17.....2.8.....56...27...8.2578.1..17...65...8.62.17...;291....2.34....56....17.....2.8.....56...27...8.2678.1...17...65...8.52.17...;291....2.34....56....17....2.8.....65..27..8.2578.1..17..65...8.62.17..;291.....2.34.35.......6.27....2.6.8....7835.....62.....57.32.56.885...67..;291....2.34.35......6.27....2.6.8.7..7835.....62.....75...68...8.32.56.7;291....2.34.35......6.27.8..2.6.8....7835.....62.....7.32.56.885...67..;291....23.....4..5..........67..67..6.784.9..7..918..49...8.616.8..79.7.8....14;291..2....34.56.14.78...73.94....8.91.37...98......17..8....4.3.19.8.;291....2.3.....4.562.....7.....481.2..19..248...89..1..742..78..97.1.9....;291....2.3.....4.562...7.8.....491.2..17..249...97..1..842..89...8.1.7....;291....2.3.....4.562...7.8....491.2..18..249...98..1..742..79...7.1.8....;291....23.....4..5.........67..67..67.849...7..91.8.49...68.16.8..7.97.8....14;291.23....45.67.23....8987....2.69.68..37..92......3.8......76..9..32;291..2....34.56.17.8....34..19.8.8.9......8314.7..47.9.3...9.1.78...;291.23.45.2456.13....3.2...2..61...36...45.21.7.....4.89....563......;291....234...35...4.62.....7.4.6.....89.3....36......125...6...3.41...25.56......1.;291....234...5.136.2....7..36....894....46......125...6.4.31..52.56....1..;291....234...5..36.2....784....49..36..46.....125...6.4.31..52.56....1..;291....234..35.14.62....7.4.6....89.3...36......125..6..3.4...25.56.....1.;291...2.3....45.67.18.....2.9.....54..28.1..52.91...18.2.49..9.485.1..;301....2.3....4.56......7....18.2497.4.791.2...42.79..817..8....8.9..1..7;301....2..3....45.67.1425.8..58.9.41..9.2.81....28.....1.9......45..29.1.;301..2.13....415.6......27.....8.9.298..41..78...9.221..7..849.4...17.;301....2.3.....4567.....8....18.249..4.591.28..42.89..518.......5.9..1..8;301....234...35.14.62....78.3....39.4.6..36......125..6...3.4...25.56.....1.;301....2.34.35......62.....7.3.25..885...67...7853....32..68...5.62.7.8.;301....2.34.35.....62.....7.3.25..885...67...8753...3.62.8...52..67.8.;301....23...456.7...6.4...45.897..86.75.9...7849...4..5.8..959..6...;301...2....3..45.16.23...27.8.61..3.871.6...32.78..618..6...76.7....;301....2.....3...45.16.23...27.81.6..3.87.61...32.67..81.7.8...668......;301....2.3.....4.56....7.....18.2497.4.791.2...42.79..817..8...8.9..1..7;301....2.3..45.3..26....734.....861..6.52....24...16.13.2...545.6...2.3;301....2.34..2...5.6...23.....278.9.4.93..47.8..49.28...2..97...878...3...;301...12.3....45.67.....2589....9.....5918.2...48..1..95.2.98..491..4....;301...12.3....45.67....8.....2.498..4819.2...59..1..84.28.9..581.5....;301.2..1.3..3..45.26....5216....46.2.32....3.45..7...35...8...61.42.5....;3012....3.4...1567...8.9...6.51.67...69...8....75.89.6.8..65...9.67.1...;3012.....3.4....1567...8.9...6.51.76...69...8....75.89.6.8...65....9.67.1...;301...23....24....35....46....4.73...8.6.8.27...863.4...2.3.87...47.26...8.;301.....23...2456.....7.4..5..5.827.6.7.56.8...874...6.46...7...5.26.8...;301....2.....3...245....36.....67.8.9..3892..67.698.3...3.726....82..79...;301....2.3.....45..6.15..7...2.4.58..778.......2758.1..1.8.24...54.7.18..;301....2.3.....45..6.15..7...2.4.58..778.......4758.1..1.8.24...52.7.18..;301....2.3.....4567.....8....18.249..4.591.28..42.89...18..5....5.9..1..8;301....2.34.35......56.....7.3..58.682...67...7825..6.3.26.7...56..38...;301....2.34.35......56......7.3..58.682...67...7825..6.3.26.8...56...37...;301....2.34.35......56.....7.3..58.682...67...8725..6.3.26.7...56...38...;30 .234..35..4.62.. ...125..6..3.41..25.56.12.....134...4..35.6....24.53...31.26.23.5.6.....1...6..7.61.5...89.6.....;3012.....134...4...35.6....24.63...31.25.23.6.5.....1.....57.51.6...89.5.....;301....2.....3...45.16.23...27.8.61..3.871.6...32.68..718..7...66.7......;301....2.3.....45672...5.8.....491.2..15..249...95..1..842..89...8.1.5....;301....2.3.....45672...5.8.....491.2..18..249...98..1..542..59...5.1.8....;301....2.34.25...67...6.58....28...79...5.92......98.657...6.2......75.92.8...;301....2.34.25...67..6.58....28..79...5.92......98.257..6.2......75.96.8..;301....2.34....56....17...8...2.8......56...27...8.2578.1...17...65...8.62.17...;301....2.34....56....17.....2.8.....756...27...8.2578.1...17...65...8.62.17...;301....2.34....56....17..8...2.8......56..27..8.2678.1..17..65...8.52.17..;301....2.34....56....17.....2.8.....756..27..8.2678.1..17..65...8.52.17...;301....2.34....56....17...8...2.8......65...27...8.2578.1...17...65...8.62.17...;301....2.34....56....17.....2.8.....765..27..8.2578.1..17...65...8.62.17...;301....2.34235......6.27....2.6.8....7835.....62.....57.32.56.885...67..;301....23....24....35....46.....67.28...4283.6.7.68..4.7.23...87...4.7.6....;301....2.34235......6.27....2.6.8.7..7835.....62.....75...68...8.32.56.7;301....23....24....35....46.....67.28...4283.6.7.67..4...23...78...4.8.6...7.;301....2.34235......6.27.8..2.6.8....7835.....62.....7.32.56.885...67..;301...23.....4..5.........67..67.84.9.47..918..78....144.9...8.661.8..79.;301....23.....4..5.........67..6.784.9..7.6918..49...8.616.8..79.7.8....14;301....23.....4..5.........67..67.849..47..91.8.78....144.9...68.61.8..7.9;301....23.....4..5..........67..67..6.7849...7.691.8.49...68.16.8..7.97.8....14;301....234...35.14.62....7.4.6....89.3...36......125...6...3.41...25..56.....1.;301....12.3....45678.....6......2.496..4619.2...59..1..64.26.9..561.5.....;311....12.3....45678.....2596....6.....5619.2...49..1..65.2.69..461..4....;311....2345.23...67...8.9...7.6723.....9.8.7....8962.7..63..78...7.2..9...;3112......3.4..1.2356.....14.53.1.2.54.6.4.36.12.1.......57...3....8.9.56...;311....2..3....45.67.18.....2.9.1....54..28.1..52.91...18.2.49...9.485.1..;311.12.34....561.7.......58......9.6.65.9.21..98...1.552.8..69.6.1....82;311..2.13....415.6.........78.287..14..7....2.9.97....122.4.9.78.81....9.4;311....2.3.....4.562.....7....18.2497.4.791.2...42.79..817..8....8.9..1..7;3112.....3.4..1.2356.....14.23.1.26.45..4.3.51.61.......57...3....8.9.56...;311....2..3....45.67.1425.8..58.9.41..9.2.81....28.1....1.9......45..29.1.;311.12.34....561.7.......58......9.6.65.9.21...98...6.55.18...9262....18.;31
......1..2.13....415.6......78.287..14..7....2.9.97....8221...9.7.48.4...91.;31
......1...2.3....45672....8....18.249...4.591.28...42.89..518......5.9..1...8;311....2.3.....4567.....8....18.249..4.591.28..42.89..518..5....5.9..1..8;311....234...35.14.62....78.3....39.4.6..36......125..6...3.41...25.56......1.;311....2.34.23...5....6.78.5..5823.....7.6.5....67.....25.2..78..83..267.5;311....2.34.23...5...5623....2.7.86.5.38.7.5....78.....5.2..86..63...78.5;311....2.34235...6...26...78...3.8...7.657........52.78.6.68.23....7.35.6...;311.....23...2456.....7.4.....4.827.6..756.8...46.27...25.6.8...7.845..6.;311.....23...2456.....7.4.....5.827.6.7.56.8...8745..6.46..27...5.26.8...;311....2.3.....4567....5.....18.2495.4.591.2...42.59..815..8....8.9..1..5;311....2.34.25...6.7.6.58....28..79...5.92....8.98.257...6.2......75.96.8..;311....23....24....35....46.....67.28...4283...7.682.4.7.23...87...4.736....;311....23....24....35....46....4273...8.6.8.27...863.4...2.3.87...47.26..8.;311..2..1.3..3..45.26....5216....46.2.32....3.45..7...35...8...61.42.5.6...;311..2..3.4..4.56..23....362.4...25.13.2..4.1.65..7...31...8...45.62.3.....;311..2.13.4..4.56..23...3.52.4...62.13.2...4..56..7...31...8...46.52...6...;311.....23...2456.....7.4..5..756.8...54.827.6.784...6.4.6..7...52.6.8...;311....2....3...245....36.....67.8.9..3892..67.698.37..3.726....82..79...;311....2.34....56....16...7...2.5.68..787.......2867.1..1.7.258..65.8.17..;311....2.34.35...6....7.26....2.7.8.6...8635.....72.....565...78...8.32.57.6;311....2.34.35...6...26...78...3.8..57.657.......52.78.6.7.35.6...86.23....;31
......1....2.34.35...6...67.5...3.8.26...52.8.7.6..82.....65..387..7.32.5..6;311....2.34235......26..78..3.8..57.657.......52.78.6.7.35.6...86.23....;311....2.34235...6...26...78...3.8.2.7.657......2.5...78.6.68.23....7...5.6...;311....234..35......62.....7.3.25.6885...6.7..7853....3.62.8...52..678..;311....234..35......62.....7.3.25.6885...6.7..8753....3.62.8...52..678..;311...23...24....35....46.....67.28...4283...7.673.4...23...78...4.826...7.;311....2.3.....4.562...7.....18.2497.4.791.2...42.79..817..8....8.9..1..7;311...12.3....45.672....2589....9.....5918.2...48..1..95.2.98..491..4....;311...12.3....45.672....8......2.498..4819.2...59..1..84.28.9..581.5.....;3112.....3.4....1567...8.9...6.51.67...69...8....75.89.6.8...65...9.9.67.1...;3112.....3.4....1567...8.9...6.51.76...69...8....75.89.6.8...65...9.9.67.1...;311....2.34....56..7.16..8...2.5.69..889.......5869.1..1.9.258..62.8.1...;311....2....34...256....37....4382..79.7.9.4.8..874.3...39.27....4.2.98...;311....2.3....45..6.15..7..82.4.58..778......2758.1..1.8.24...54.7.18..;311....2.3....45..6.15..7...2.4.58..778......2758.1..1.8.247..54.7.18..;311....2.3.....45..6.15..7..82.4.58..778.......4758.1..1.8.24...52.7.18..;311....2.3.....45..6.15..7...2.4.58..778.......4758.1..1.8.247..52.7.18..;311....2.3.....45672.....8....18.249..4.591.28..42.89...18..5....5.9..1..8;311...23....24....35....62.....273.8.6..68.47...6734....24...87.6.3.82.6...;311....2.34.35......56.....7.3.258.682...67...7825..6.3.26.7...56..38...;311....23....24....35....62.....273.8.6..68.47...6834....24..87.6.3.72.6...;311....2.34.35......56.....7.3.258.682...67...7825..6.3.26.8...56...37...;311....23....24....35....62.....273.8.6..68.47...6734....24..78.6.3.82.6...;311....2.34.35......56.....7.3.258.682...67...8725..6.3.26.7...56..38...;3112..3.145.6.516..34....16..53...2.5..45...43.2..7....4...89...2..1.5..6...;3112.....134...4...35.6....24.53.4.31.26.32.5.6.....1...6....761.5...89.6.....;3112..3.145.6.516..34.....45.2....16..535..2.3..4.7....4...89...2..1.5..6...;3112.....134...4..35.6....24.63.4.31.25.32.6.5.....1.....5.751.6...89.5.....;31 23.45.2456.13....3.2.6.2..61...36...45.21.7.....43.......489....1....2.34....56....17..8...2.8.....756..27..8.2578.1..17..65...8.62.17..;311....2.34....56....17..8...2.8.....756..27..8.2678.1..17..65...8.52.17..;311....2.34....56....17...8...2.8.....765...27...8.2578.1...17...65...8.62.17...;311....23.45234......2.67.8..683.4....7.28.....27......64..327.88.3.7.6..;311....23.45234......2.67....683.4....7.28..6..27......6.3.7.8..84..327.6;311....23.....4..5..........67..67..6.784.9.47.6918..78....144.9....8.661.8..79.;311....23.....4..5..........67..67..6.7849..47.691.8.78....144.9...68.61.8..7.9;311....23..4....56.78.12......3.9.1....65..32.1..63.91...12.3.59...9.526.1..;3212.....3.4..1.2356.....14.53.1.2.54.6.4.36.12.1.......57.8.56...95..3....;321....23..4....56.78.12......3.9.1....65..32.1..23.91...1.536.9..96.2.51..;3212.....3.4..1.2356.....14.23.1.26.45..4.3.51.61.......57.8.56...95..3....;321....2345.23...67...8.9...7.6723.....9.8.7....8962.7..63..78...7.2..98..;321....2.34235...6....726.....2..87.6..685.3....72.....565..7.8..8.3.257.6;321....2.3...4...256....47.....73.8.9..4892..73.798.43..4.327....82..39...;321.....234..35....6..6735....3.8.26...52.8.76...82......65...8.7.7.32.5.86;321.....234..35....6..72......65...7.8.8.3.25.76.8653....3.72.6...52..786..;321...12.3....456782....6......2.496..4619.2...59..1..64.26.9..561.5.....;321...12.3....456782....2596....6.....5619.2...49..1..65.2.69..461..4....;3212.....13.4..1.2356.....14.53.1.2.54.6.4.36.12.1.......57...3....8.9.56...;321.12.34....561.7........86..8...5.9.65.8.12..89....1552.9..86.6.1...9.2;3212.....13.4..1.2356.....14.23.1.26.45..4.3.51.61.......57...3....8.9.56...;321.12.34....561.7........86..8...5.9.65.8.12..89....655.19..8.262....91.;321....2.3.....45672.....8....18.249..4.591.28..42.89..518..5....5.9..1..8;321....2.34235...6...26...78..3.8.257.657.....2.5..78.6.68.23....7...5.6...;321....2.34235...6...26..78..3.8..57.657.......52.78.6.68.23....7.35.6...;321....2.34.23...5...5623....2.7.86.5.38.7.5....78.....5.2..86..63..278.5;321.....2.34235...6...26..78..3.8.2.7.657.......52.78.6.68.23....7.35.6...;321....2.34235...6...67.53...3.862....52.7.8.6..82......65.8..7..7.32..8.6;321.....23...2456.....7.4.....756.8...54.827.6.7845..6.4.6.27...52.6.8...;321....2.3.....45672...5.....18.2495.4.591.2...42.59..815..8....8.9..1..5;321..2..3.4..4.56..23....362.4...25.13.2..4.1.65..7...31...8...45.62.3.5...;321..2.13.4..4.56..23...3.52.4...62.13.2...4..56..7...31...8...46.52..36...;321....2345.23......62.789..73.2.9...9.863.....96..7.8.2.7......38..26.79;321....2....34...256....37....4382..79.7.9.4.8..874.39..39.27....4.2.98...;321....2.34235......26..78..3.8.257.657.......52.78.6.7.35.6...86.23....;321....2.34235...6....7.26....2.7.8.6...8635.....72.....565...78...8.32.57.6;321....2.34.35...6...26...78...3.8.257.657.......52.78.6.7.35.6...86.23....;321....23.4..25...3.6....57....5283...43.74.2.8..782.54..2...84...5.437....;321....2.34.35...6...67.5....3.8.26...52.8.7.6..82......65..387.27.32.5..6;321...23...24...35....46....67.2.8..4283..67.682.47..23..78...4.736....;321....234.235......62.....7.3.25.6885...6.7..7853....3.62.8...52..678..;321...23...24...35....46....67.2.8..4283..67.682.47..23..87...4.736...;321...234.235.....62....7.3.25.6885...6.7..8753....3.62.8...52..678..;321....2.34....56..7.16..8..92.5.69..889.......5869.1..1.9.258..62.8.1...;321....2.3.....45..6.15..7..82.4.58..778.......2758.1..1.8.247..54.7.18..;321....2.3.....45..6.15..7..82.4.58..778.......4758.1..1.8.247..52.7.18..;321...23...24...35....62.....67.48..4.283.7.6.6834....24..78.6.3.72.6...;321...23...24...35....62.....67.48..4.283.7.6.6734....24..78.6.3.82.6...;321....23....24....35....62.....67.48..4.283.7.6.6834....24...87.6.3.72.6...;3212..3.145.6.516..34....16..53...2.5..45...43.2..7....4...89...26.1.5..6...;3212..3.145.6.516..34.....45.2....16..535..2.3..4.7....4...89...26.1.5..6...;321....2.34.35...6...72......65...78..8.3.257.6.8653....3.72.6...52..78.6.;3212....1345..15.4.3.6.....75.....58926.5.613.....543...2.16.....342.3.....5;3312....1345..15.4.3.6.....75.....58926.5.613.....53....2.16.....342.43....5;3312....13.4..1.2356.....14.53.1.2.54.6.4.36.12.1......57...32...8.9.56...;33 $\dots \dots 12 \dots 13.4 \dots 12.356 \dots 14.53.1.2.54.6.4.36.12.1 \dots 57.8.56 \dots 95.3 \dots 33$12.....13.4..1.2356.....14.23.1.26.45..4.3.51.61.......57...32...8.9.56...;3312.....13.4..1.2356.....14.23.1.26.45..4.3.51.61.......57.8.56...95..3....;331....2.34235...6...67.53...3.862....52.7.8.6..82......65.8..7..7.32.58.6;331....23.4..25...367...2.8.....239..84..8.45.9..89.524..2.483....53.9.4...;331.....2345.23....6..67..8.9.2.8......39..27.86.72.896..6.973....83.2.6...;331....2.3..45...267....48....5492..83.8.3.5.9..985.43..43.28....5.2.39...;331....23.4..25...36.....57.....74.2.8..5283..74.782.54..23..84...5.437....;331....234.235....6..6735....3.8.26...52.8.76...82......65...8.7.7.32.5.86;331....23.4..25...36.....57.....74.2.8..5283..74.782.54..23..48...5.437....;331....234.235....6..72......65...7.8.8.3.25.76.8653....3.72.6...52..786..;331....2.34235...6...72......65...78..8.3.257.6.8653....3.72.6...52..78.6.;331....2.34235...6...26..78..3.8.257.657.......52.78.6.68.23...7.35.6...;331...23...24...356...2.7...4238..79.7..94.8..87.429..29.73...4.39.8...;331...23.4..25...3.6....57...5283...43.74.2.85.782.54..2...84...5.437...;331....2345.234......23.678..64.3.8...8.724.....82..6.7.3.6......47..32.68;331...2345.234......23.678..64.3.8...7.824.....82..6.7.3.6......47..32.68;3312.....13.4..1.2356.....14.53.1.2.54.6.4.36.12.1.......57.8.56...95..32...;3412.....13.4..1.2356.....14.23.1.26.45..4.3.51.61.......57.8.56...95..32...;3412..3.145.6.516..34....16..53...2.5..45...43.2..7....4..1.54.6...489...26.;3412..3.145.6.516..34.....45.2....16..535..2.3..4.7....4..1.54.6...489...26.;341....23.4..25...367....2.8.....8.45.9..5239..84.89.524..2.483....53.9.4...;341....23.4..25...367...2.8....5239..84.8..45.9..98.524..24.83....5.34.9...;341....2345.234....6...23.786...74.3.6...8.624.....62...7.8.3.7......48...32.76;341....2345.234....6..23.786..6.824....74.3.6....62..7.8.3.7......48..32.76;34 Running minimals, but that will take a while. (Also still need to look for cases that allow for givens in an unavoidable set pattern to be swapped; some of those are already covered, but probably not all.) QUOTE Re: The hardest sudokus (new thread) □ by **mith** » Thu Mar 17, 2022 2:32 am Posts: 862 I won't do this for the whole list yet, but I rated the 34c puzzles by SE: **CODE: SELECT ALL**12.....13.4..1.2356.....14.53.1.2.54.6.4.36.12.1......57.8.56...95..32... ED=11.6/11.6/2.612.....13.4..1.2356.....14.23.1.26.45..4.3.51.61.......57.8.56...95..32... ED=11.6/11.6/2.612..3.145.6.516..34....16..53...2.5..45...43.2..7....4..1.54.6...489...26. ED=10.4/4.5/2.612..3.145.6.516..34.....45.2....16..535..2.3..4.7....4..1.54.6...489...26. ED=10.4/4.5/2.61....23.4..25...367...2.8.....8.45.9..5239..84.89.524..2.483....53.9.4... ED=11.0/11.0/3.41....23.4..25...367...2.8....5239..84.8..45.9..98.524..24.83....5.34.9... ED=11.0/11.0/3.41....2345.234....6..23.786..74.3.6...8.624.....62..7.8.3.7......48..32.76 ED=10.9/10.9/2.61....2345.234....6..23.786..6.824....74.3.6....62..7.8.3.7......48..32.76 ED=10.9/10.9/2.61....2345.234....6..27......6..3.7..8.84..32.76.683.4...37.28.6..4.2.67... ED=11.0/11.0/2.6 10.4 is quite a bit lower than I would have expected to get while not in T&E(2), but uniqueness throws a wrench in things as usual. [edit]Rated one of these with uniqueness disabled, it's 11.7.[/edit] Last edited by mith on Thu Mar 17, 2022 4:09 am, edited 1 time in total. QUOTE Re: The hardest sudokus (new thread) by **mith** » Thu Mar 17, 2022 3:03 am Posts: 862 Joined: 14 July 2020 526 minimals from the 246 expanded forms; I started with 218 rated minimals. Some of these have lower skfr and haven't been rated by SE yet, but most are new to the database. [edit]Missed a step in checking for minimals, corrected number above.[/edit] The minimals range from 24c to 29c, with only a single 24c found: **CODE: SELECT ALL**1....2.34....4.56.....24.7...418.....8.7.9.....9..1....71.....824......9 ED=10.4/1.2/1.2 This puzzle has three guardian cells for the pattern, so it may be an interesting one to explore advanced applications of the trivalue oddagon. QUOTE **Re: The hardest sudokus (new thread)** marek stefanik by marek stefanik » Thu Mar 17, 2022 8:44 am Posts: 269 Joined: 05 May 2021 Interesting puzzle! It seems that TH, as we know it, is not very effective here, yet still the puzzle can be solved in elegant ways. My own solution, using uniqueness: Show Xsudo's solution, without using uniqueness: After a two-string kite (-2r1c3), a short AIC (-2r3c3) and basics: **CODE: SELECT ALL** 4 23569 #3567 | 3569 #3567 #3567 | 279 8 1
 569
 569
 5678
 5689
 1
 2
 79
 3
 4

 139
 1239
 378
 389
 4
 378
 5
 6
 27

 7
 #356
 4
 1
 8
 #356
 236
 9
 2356

 #356
 8
 2
 7
 #356
 9
 14
 14
 356
 8 #356 9 | 24 7-356 1 | 3467 245 367 #356 7 1 | 24 9 #356 | 346 245 8 2 4 #356 |#3568 #3567 #35678 | 1367 15 9 Xsudo uses the marked cells as truths. The eliminations in r7c5 reduce the rating to 6.6. Can anyone explain this pattern by human means? TL solution: Show Another puzzle which may require some research is this one, posted by mith here on June 24, 2021: CODE: SELECT ALL12.34..1.3..25..672.5...17..6...52..81.67.75.68...18.2....66.217..5. ED=10.4/1.2/1.2 It is also solvable by Xsudo, but I can't make a lot of sense of its findings. Edit: We can explain it using the parity argument: Suppose 356r7c5. **CODE: SELECT ALL** 4 23569xy3567 | 3569 z3567 z3567 | 279 8 1
 569
 5678
 5689
 1
 2
 79
 3
 4

 139
 1239
 378
 389
 4
 378
 5
 6
 27
 19 19 #356 | #356 2 4 | 8 7
 | 7
 #356
 4
 | 1
 8
 x356
 | 236
 9
 2356

 |#356
 8
 2
 | 7
 y356
 9
 | 14
 14
 356
 -------8 #356 9 | 24 x356 1 | 3467 245 367 l#356 7 24 9 y356 346 245 8 2 4 #356 |z3568 z3567 z35678 | 1367 15 9 In b8, each minirow contains one of 356. We can fix its vertical permutation as in the diagram. Chaining through antidiagonal boxes 745, the horizontal parity in b5 is opposite to it, therefore the minicolumn containing x is directly to the right of the one containing y. There is only one option. r1c56 form a 7z naked pair, restricting r1c3 to xy. Whichever digit appears in r1c3 is completely eliminated from either (y) c1 or (x) c2, ie. contra. Therefore -356r7c5. Edit2: Got some understanding of the other one. It is far from solving the puzzle, but it should reduce it to T&E(1). The breakthrough found by Xsudo: Show Marek Last edited by marek stefanik on Thu Mar 17, 2022 3:12 pm, edited 1 time in total QUOTE denis berthier Re: The hardest sudokus (new thread) 2010 Supporte by denis_berthier » Thu Mar 17, 2022 11:40 am Posts: 3334 Joined: 19 June 2007 **66** mith wrote: Location: Paris rangsk has added a T&E depth tool (as part of https://github.com/dclamage/SudokuClassicMinLex), so I was able to check all expanded forms of 11.6+ puzzles currently in the database. I found a total of 88 expanded puzzles with depth 3; Denis, these *should* match your not-T&E(2) findings, but here's the list for checking: That's where we seriously need to apply some conventions for the database. I don't see the point of checking lists of puzzles that I've probably already checked in part but am unable to relate easily to their new versions; we really need a unique, easy to read name for the minlexed expanded forms. Also, only minlexed expanded forms are of relevance to such checking. That being said, T&E(2) is very easy to program; I don't see how one could make an error in this. Last edited by denis berthier on Thu Mar 17, 2022 12:04 pm, edited 1 time in total. "QUOTE Re: The hardest sudokus (new thread) by mith » Thu Mar 17, 2022 8:15 pm Posts: 862 Joined: 14 July 2020 Yeah, I don't expect there is an error or anything, but never hurts to have independent checks. I would also be interested if there are any classification differences between puzzles (we are currently only checking T&E with singles). I'm planning to start working on the revised schema for tracking expanded forms directly by this weekend; will post a draft of that for comment before implementing. An overview of objectives: 1. Determine singles-expanded forms for all minimals in the database, and store these (gsf-minlex form, probably, but if it makes sense for speed or for usefulness may consider maxlex or solution-minlex) in the new database (with various stats TBD, but certainly including T&E depth). This will entail splitting the current expander script into two parts: a. Singles expansion, minlex, store to expansion.db b. Generate minimals from the expanded form for inclusion in the current databases. It would be useful here to go ahead and check the singles expansion of each minimal, which will not always match the starting expanded form this can inform which expanded forms to prioritize later (e.g. I start with an 11.6 32c expanded form, generate some minimals, some have a 30c expanded form, the 30c will be at least 11.6 so prioritize rating it), and these expanded forms also don't need to generate minimals again. 2. Check T&E depth for expanded forms (probably as they are added). 3. For puzzles with depth > 2, run a new script to generate further expanded forms by adding givens or by swapping digits in "deadly patterns" per 999_Springs' algorithm. 4. Tweak the minimal generating scripts to take into account the expanded forms; currently, the minimals are treated independently, so the scripts may modify a whole bunch of 11.6 puzzles which have the same expanded form, likely running into the same puzzles more often. It would be better to reference script-usage per expanded form and choose from the minimals of the least-used expanded form with that rating. Since removing the filters on puzzle generation, the number of SE-rated 11.6+ puzzles is growing faster than the generating scripts can keep up with, so spreading them across more dissimilar puzzles should help get out of stale neighborhoods faster. 5. It's probably also worth considering running the generating scripts, or some version of them, directly on the expanded forms. 6. Rate the expanded forms directly. Infrequently occurring bugs aside, the expanded form should rate the same as all minimals with that form. For the highest ratings (and those with depth > 2), will rate the minimals anyway, but reducing the number of puzzles that need to run through SE is very important. (Much like the generating scripts can't keep up with all the new SE 11.6+ rated puzzles, the number of unrated-by-SE puzzles with skfr>=11.0 is already far too large to ever hope for the rating script to catch up with the generating scripts.) QUOTE Re: The hardest sudokus (new thread) mith by **mith** » Fri Mar 18, 2022 12:04 am Posts: 862 Joined: 14 July 2020 Today's batch of 11.6-11.7: **Hidden Text: Show Hidden Text: Show** QUOTE Re: The hardest sudokus (new thread) denis berthier 2010 Supporter by denis_berthier » Fri Mar 18, 2022 5:15 am Posts: 3334 Joined: 19 June 2007 Location: Paris Hi mith, Until recently, problems of redundancy (puzzles with the same Singles-expansion) in the hardest collection hadn't appeared. I don't know if it's because most of the puzzles don't have Singles at the start or because nobody had looked into the problem before or because in such cases only the first found puzzle was kept. Now that this problem is taking huge proportions, you have introduced a separate database, with contains only the Singles-expansions (most of which will not be minimal puzzles, but that's irrelevant to rating them). This is an interesting step forward. However, there seems to appear another problem. Puzzles in the collection of Singles-expansions maybe extensions of one another, as you have already noticed. This is another kind of redundancy. It remains interesting to keep all of them in the Singles-expansions collection, but, in order to avoid redundant calculations every time one tries to use it, we also need a means of marking which is a subset of which. QUOTE Re: The hardest sudokus (new thread) denis berthier 2010 Supporter by denis_berthier » Fri Mar 18, 2022 11:34 am Posts: 3334 Joined: 19 June 2007 Location: Paris 66 denis_berthier http://forum.enjoysudoku.com/the-hardest-sudokus-new-thread-t6539-1048.html 2022, March 1st wrote: Here is probably **the breakthrough of the year** in Sudoku. THE FOLLOWING TWO PUZZLES FOUND BY MITH ARE NOT IN T&E(2): CODE: SELECT ALL1....2.....3..45..6......71.8....23..67..8.827..1..6...23...7.381.6.. ED=11.9/1.2/1.21....2.....3..45..1.23....267.81..73.61.8...17.6....8......2.3.87..6 ED=11.8/1.2/1.2 Second consequence: this opens a totally new approach to the search for the really hardest puzzles. Instead of searching for high SER, search for puzzles not in T&E(2). This implies trying billions or trillions of puzzles but very fast generators already exist and a very fast T&E(2) procedure can be written (contrary to the SER test). The only disadvantage of this approach would be it can't produce any of the already known 'hardest" (except the above two). One clear advantage is, my T&E(n) classification is intrinsic and stable under Sudoku isomorphisms. Since I published [PBCS1, 2012] and its BpB classification of hard puzzles, there have been 10 years of intensive search for puzzles harder than those known at that time. There had been almost as many years before. During all the time since [PBCS1], I've been systematically rating all the new 11.8s and 11.9s, but none has surpassed the B7B barrier already reached in 2012. Notice that I never check directly that a puzzle belongs to T&E(2): this is implied by it being in some BpB. As usual, when Mith published his new 11.9 (the 10th known 11.9, Loki,1...2.....3..45..6......71.8...23...67..8.827..1..6...23...7.381.6.. ED=11.9/1.2/1.2) on Feb. 28th, I tried to find its BpB classification. But computations for membership in B7B lasted much longer than expected. That's what made me check if it was in T&E(2). I've already told my surprise when I found the negative answer. One important point here is, the T&E(n) broad classification is able to detect differences that the SER can't. When I wrote about the second consequence of this discovery 18 days ago, I didn't imagine the new approach would be applied so fast and so many puzzles not in T&E(2) would be found in so short time. It's true that most of them are closely related and new seeds should be searched for, but nevertheless I'm glad to see how productive this new approach is. ٥ QUOTE Re: The hardest sudokus (new thread) denis_berthier 2010 Supporter by denis_berthier » Fri Mar 18, 2022 11:38 am Posts: 3334 Joined: 19 June 2007 66 mith wrote: Location: Paris Ok, here are the results - I've gone from 88 expanded puzzles to 246: CODE: SELECT ALL1....2.3....4.56.....7....481.2..19..248...89..1..742..78...97.1.9....;28 I haven't checked whether these puzzles are indeed not in T&E(2), but I've checked if any is harder than the new known hardest. The answer is negative: all of them are (at most) in T&E(W2, 2) = T&E(B2, 2); Considering the way they were generated (very close to each other), I'm not really surprised. 0 Display posts from previous: All posts ✓ Sort by Post time ✓ Ascending ✓ Go Previous Next * 1330 posts • Page 80 of 89 • 1 ... 77 78 79 80 81 82 83 ... 89 POSTREPLY ⊭ Return to General Jump to: General **∨** Go Powered by phpBB® Forum Software © phpBB Group PHPBB SEO.COM