The hardest sudokus (new thread)

Re: The hardest sudokus (new thread)

Posted: **denis_berthier** » Sat Nov 12, 2022 9:34 am

> *jc4ever wrote:*
> 2+2 or 4+0. 0+4 is not a dead pattern, while 1+2 or 3+1 is a dead pattern.

I'll have to check this part about diagonals and anti-diagos, but I hold to the content of the special cell and on the eliminations rather than assertion view

denis_berthier
2010 Supporter
Joined: 22 Jun 2007
Location: Paris

Re: The hardest sudokus (new thread)

Posted: **denis_berthier** » Sat Nov 12, 2022 10:56 am

I tried this case:

```
CODE: SELECT ALL
+-------------------------------------------------------------------------------+
| 123456789 123456789 123456789 | 123456789 123456789 123456789 | 123456789 123456789 |
| 123456789 123456789 123456789 | 123456789 123456789 123456789 | 123456789 123456789 |
| 123456789 123456789 123456789 | 123456789 123456789 123456789 | 123456789 123456789 |
| 123       123456789 123456789 | 123       123456789 123456789 | 123456789 123456789 |
| 123       123456789 123456789 | 123       123456789 123456789 | 123456789 123456789 |
| 123       123456789 123       | 123       123456789 123       | 123456789 123456789 |
| 123       123456789 123       | 123       123456789 123       | 123456789 123456789 |
| 123       123456789 123       | 123       123456789 123       | 123456789 123456789 |
+-------------------------------------------------------------------------------+
```

It doesn't work in TdZ(NX2, 2), so, finally, there might be additional conditions on the pattern of cells. However, it can't be restricted to only diags or anti-diags, because this is not invariant under isomorphisms.

> *jc4ever wrote:*
> The arrangement of three cells in each box is divided into diagonal or anti-diagonal arrangement. If the arrangement of 4 boxes is 2+diagonal + 1*anti-diagonal or 2*anti-diagonal + 1*diagonal, then such an arrangement of 12 cells is considered sdoiagon.

Considered sdoiagon by whom? This doesn't have anything to do with sdoiagon, which are defined as chains of odd length and are totally unrelated to any diagonal conditions.

> *jc4ever wrote:*
> The rules of diagonal and anti-diagonal are: find the two cells in the box where the row and column coordinates differ by 1, and the direction of the line between the two cells.

denis_berthier
2010 Supporter
Joined: 22 Jun 2007
Location: Paris

I can't make any sense of this.

Re: The hardest sudokus (new thread)

Posted: **jc4ever** » Sat Nov 12, 2022 12:49 pm

> *denis_berthier wrote:*
> The rules of diagonal and anti-diagonal are: find the two cells in the box where the row and column coordinates differ by 1, and the direction of the line between the two cells.
>
> I can't make any sense of this.

```
CODE: SELECT ALL
diagonal arrangement
  123
  123
  123

  123
  123
  123

  123
  123
  123

  123
  123
  123

  123
  123
  123

  123
  123
  123
anti-diagonal arrangement
  123
  123
  123

  123
  123
  123

  123
  123
  123

  123
  123
  123

  123
  123
  123

  123
  123
  123
```

jc4ever
2010 Supporter
Joined: 22 April 2010

> *denis_berthier wrote:*
> The arrangement of three cells in each box is divided into diagonal or anti-diagonal arrangement. If the arrangement of 4 boxes is 2+diagonal + 1*anti-diagonal or 2*anti-diagonal + 1*diagonal, then such an arrangement of 12 cells is considered sdoiagon.
>
> Considered sdoiagon by whom? This doesn't have anything to do with sdoiagon, which are defined as chains of odd length and are totally unrelated to any diagonal conditions.

12 cells construct a trivalue oddagon. See here: http://forum.enjoysudoku.com/the-hardest-sudokus-new-thread-6539-910.html#p306966

Re: The hardest sudokus (new thread)

Posted: **denis_berthier** » Sat Nov 12, 2022 3:34 pm

denis_berthier
2010 Supporter
Joined: 22 Jun 2007
Location: Paris

> *jc4ever wrote:*
> CODE: SELECT ALL
> diagonal arrangement
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> anti-diagonal arrangement
> 123
> 123
> 123
>
> 123
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> 123
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> 123
> 123
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> 123
> 123
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>
> 123
> 123
> 123
>
> All these blocks are equivalent to the first under the proper isomorphisms.
>
> > *denis_berthier wrote:*
> > > *jc4ever wrote:*
> > > The arrangement of three cells in each box is divided into diagonal or anti-diagonal arrangement. If the arrangement of 4 boxes is 2+diagonal + 1*anti-diagonal or 2*anti-diagonal + 1*diagonal, then such an arrangement of 12 cells is considered sdoiagon.
> > >
> > > Considered sdoiagon by whom? This doesn't have anything to do with sdoiagon, which are defined as chains of odd length and are totally unrelated to any diagonal conditions.
> >
> > 12 cells construct a trivalue oddagon. See here: http://forum.enjoysudoku.com/the-hardest-sudokus-new-thread-6539-910.html#p306966
>
> I don't think that an occasional remark can in any way justify saying "it is considered...".

jc4ever
2010 Supporter
Joined: 22 April 2010

Re: The hardest sudokus (new thread)

Posted: **denis_berthier** » Sat Nov 12, 2022 3:46 pm

denis_berthier
2010 Supporter
Joined: 22 Jun 2007
Location: Paris

> *jc4ever wrote:*
> CODE: SELECT ALL
> diagonal arrangement
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> 123
> 123
> 123
>
> anti-diagonal arrangement
> 123
> 123
> 123
>
> 123
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> 123
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> 123
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> 123
> 123
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>
> 123
> 123
> 123
>
> All these blocks are equivalent to the first under the proper isomorphisms.
>
> > *denis_berthier wrote:*
> > > *jc4ever wrote:*
> > > The arrangement of three cells in each box is divided into diagonal or anti-diagonal arrangement. If the arrangement of 4 boxes is 2+diagonal + 1*anti-diagonal or 2*anti-diagonal + 1*diagonal, then such an arrangement of 12 cells is considered sdoiagon.
> > >
> > > Considered sdoiagon by whom? This doesn't have anything to do with sdoiagon, which are defined as chains of odd length and are totally unrelated to any diagonal conditions.
> >
> > 12 cells construct a trivalue oddagon. See here: http://forum.enjoysudoku.com/the-hardest-sudokus-new-thread-6539-910.html#p306966

Do you mean that there must be a global isomorphism such that:
- either 3 blocks are diagonal and 1 block is anti-diagonal
- or 1 block is diagonal and 3 blocks are anti-diagonal
and no other case (such as 4/0, 2/2 , 1/1...)

Re: The hardest sudokus (new thread)

Posted: **hewick_ownard** » Sat Nov 12, 2022 3:49 pm

hewick_ownard
Joined: 01 April 2021

Another 17.5 from the tuto family?
6..17.85.....1.2.3.2.87.....7.98.9.1.....6.....9.714..25..1..8.29. 11.901.201.2

Re: The hardest sudokus (new thread)

Posted: **jc4ever** » Sat Nov 12, 2022 3:51 pm

jc4ever
2010 Supporter
Joined: 22 April 2010

> *denis_berthier wrote:*
> Do you mean that there must be a global isomorphism such that:
> - either 3 blocks are diagonal and 1 block is anti-diagonal
> - or 1 block is diagonal and 3 blocks are anti-diagonal
> and no other case (such as 4/0, 2/2 , 1/1...)
>
> ?

```
CODE: SELECT ALL
+-------------------------------------------------------------------------------+
| 123       123456789 123456789 | 123       123456789 123456789 | 123456789 123456789 |
| 123456789 123       123456789 | 123456789 123       123456789 | 123456789 123456789 |
| 123456789 123456789 123       | 123456789 123456789 123       | 123456789 123456789 |
| 123       123456789 123456789 | 123456    123456789 123456789 | 123456789 123456789 |
| 123456789 123       123456789 | 123456789 123       123456789 | 123456789 123456789 |
| 123456789 123456789 123       | 123456789 123456789 123       | 123456789 123456789 |
| 123       123456789 123456789 | 123       123456789 123456789 | 123456789 123456789 |
| 123456789 123       123456789 | 123456789 123       123456789 | 123456789 123456789 |
| 123456789 123456789 123       | 123456789 123456789 123       | 123456789 123456789 |
+-------------------------------------------------------------------------------+
```

The current state can use this technique to safely delete 5d5/p13/r9, without causing no solution, but deleting 8f8/p3/r9 will cause no solution.

Re: The hardest sudokus (new thread)

Posted: **eleven** » Sat Nov 12, 2022 3:49 pm

eleven
2010 Supporter
Joined: 23 February 2006

Denis,

maybe this sounds simpler for you:

If in 4 boxes of 2 bands and 2 stacks you have those 3 diagts in 3 cells each, where each cell in a box is single in row and column, there are just 3 cases (labeled | classes). The cells form 3 rectangles or no rectangle, or one.
In the first 2 cases exactly a solution can be found.
For the 1 rectangle case there are several points. that it is an impossible pattern.
All different shapes are just equivalents, which you can get by swapping rows in a band and columns in a stack (lebeled |), and switching the bands or stacks (it is obvious, that these equivalence transformations never can create or delete a rectangle).

Concerning the name trivalue oddagon, mhl gave an explanation above. However you place one digit, a bivalue oddagon for the other 2 digits remains.

Re: The hardest sudokus (new thread)

Posted: **denis_berthier** » Sat Nov 12, 2022 4:07 pm

denis_berthier
2010 Supporter
Joined: 22 Jun 2007
Location: Paris

Hi **eleven**,
Thanks for your explanations. I hadn't studied this pattern before and what I read recently didn't help much to make the conditions clear.

Do you now all agree that there may be more than one extra candidate in the target cell and that the rule is fundamentally an elimination rule (not an assertion one)?

What about making some of the candidates in the 3-valued cells optional?

mhl, do you have any precise reference to a Ryokusuka paper or post? I was unable to find any reference to this name on the web (except for a tea brand).
The idea of parity numbers is interesting but IMO overly complicated for this pattern.

eleven, I'm writing a systematic proof based on TdZ (admittedly very inelegant) and I find 3 and only 3 different cases. A rectangle appears in each case, but the 3 cases are not equivalent under isomorphisms. I'll make it clean and publish it soon.

BTW, it seems to me we are getting very far from the topic this thread with the discussion of this pattern. It would deserve a thread of its own in the "advanced solving techniques" section.

Re: The hardest sudokus (new thread)

Posted: **eleven** » Sun Nov 13, 2022 12:32 am

eleven
2010 Supporter
Joined: 23 February 2006

Whatever pattern with one rectangle you have, by switching rows and columns you can bring it to the center in each box.

```
CODE: SELECT ALL
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
```

E.g. for case a switch r12 and r23,r56, for case b r23,r45 and r23,45, for case c r56

```
CODE: SELECT ALL
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
```

In case b switch r1c3, if then in box 2 you have them in d switch r46.

```
CODE: SELECT ALL
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
```

In case b switch r46. In box 4 then you can't have case c with 3 rectangles.
i.e. all patterns with one rectangle are equivalent to this:

```
CODE: SELECT ALL
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
| . . . | . . . | . . . |
| . . . | . . . | . . . |
| . . . | . . . | . . . |
+-------+-------+-------+
```

For this pattern I showed here, that the 3 digits only are not possible.
This means, that if a puzzle has a solution, at least one other digit in these cells must be true (= the 3 digits must be false in at least one of the cells), wherever one is possible in a given candidates grid.

Last edited by eleven on Sun Mar 13, 2022 9:07 pm, edited 1 time in total.