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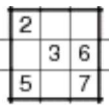
Intersection Removal

From sudokuwiki.com, the puzzle solver's site



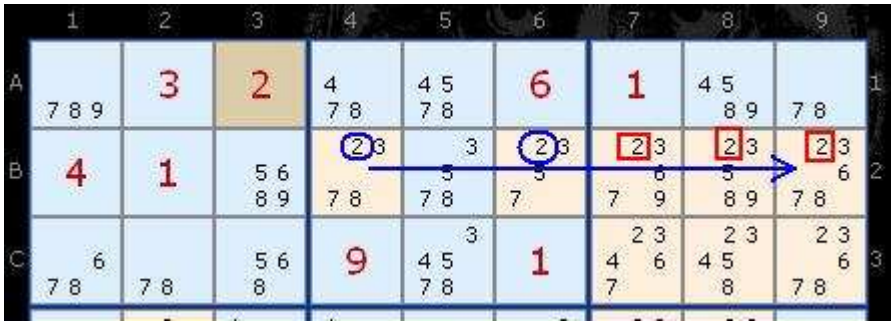
If any one number occurs twice or three times in just one **unit** (any row, column or box) then we can remove that number from the intersection of another unit. There are four types of intersection:

- A Pair or Triple in a box - if they are aligned on a row, n can be removed from the rest of the row.
- A Pair or Triple in a box - if they are aligned on a column, n can be removed from the rest of the column.
- A Pair or Triple on a row - if they are all in the same box, n can be removed from the rest of the box.
- A Pair or Triple on a column - if they are all in the same box, n can be removed from the rest of the box.

Rules 1 and 2 are also called **Pointing Pairs/Triples** Rules 3 and 4 are also called **Box/Line Reduction**

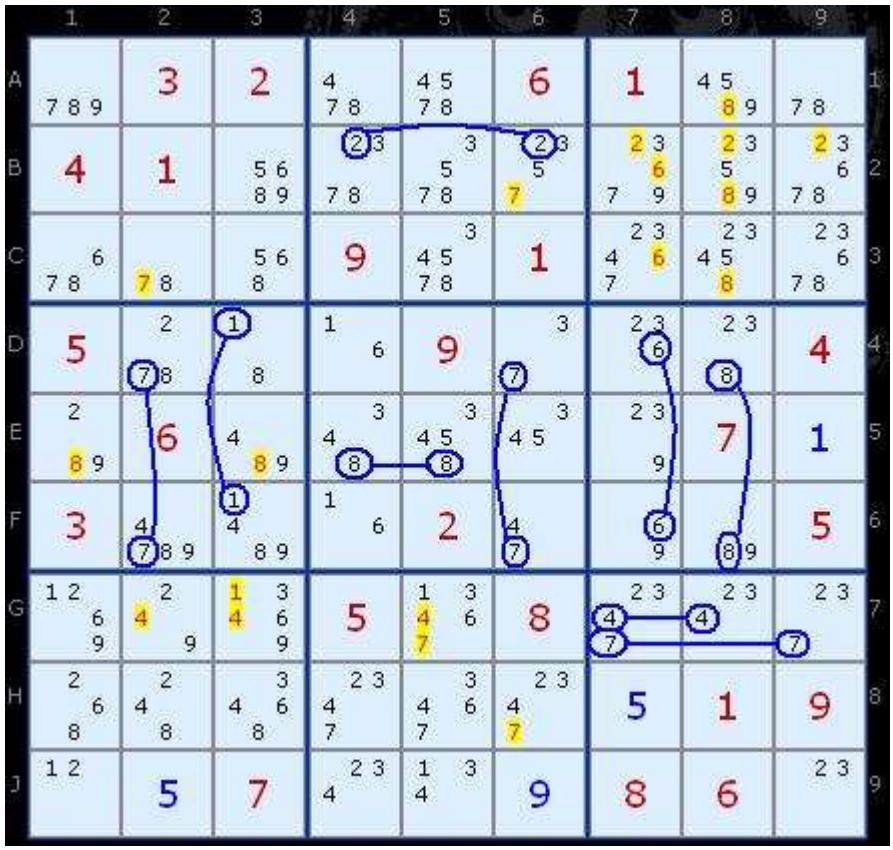
Type 1 - Pointing Pairs/Triples Strategy (a.k.a. Intersection Removal)

Looking at each box in turn there may be two or three occurrences of a particular number.
If these numbers are aligned on a single row or column (as a pair or a triple) then we know that number MUST occur on that line. Therefore, if the number occurs anywhere else on the row or column outside the box WHICH THEY ARE ALIGNED ON then it can be removed. The pair or triple *points* along the line at any numbers which can be removed.



Consider the top third of the puzzle board above. We are looking at the number 2 in the center box and using the solver all the cells with 2 remaining have been highlighted. 2 can only be found in the centre row at **B4** and **B6**. The 2's in the rest of the row can be removed (red squares).

Now this is a rather special puzzle and a little extreme, but if we look at the whole board you can see I have highlighted a whole cluster of Pointing Pairs. It is obviously not necessary to spot everyone to progress the board but there are so many good examples it is worth looking at. The eliminations are highlighted in yellow. You should be able to see which eliminations belong to which Pointing Pair.



Pointing Pairs Example 2: Load Example

Type 2 - Box Line Reduction Strategy (a.k.a. Intersection Removal)

This strategy involves careful comparison of rows and columns against the content of boxes (3 x 3 squares). If we find numbers in any row or column that are grouped together in just one box, we can exclude those numbers from the rest of the box. For example:

Consider the right hand box in this center row of the board. We can see five squares with 9s marked as possible numbers. The 9s that exist in cells **A** and **B** are the only 9s in that whole row. Either **A** or **B** MUST contains a 9 in the final solution. We can therefore safely remove the 9s from **C**, **D** and **E**.

Comments...

Wednesday 20-Jan-2010

... by: Patrick Barnaby

These pairs are easy to spot if you first look at a box then ask is there a single line in a box? But to spot the sevens and eitghts you have to see the two X-Wings first.

There is an X-Wing for sevens and an X-Wing for eights.

Friday 20-Nov-2009

... by: Clell

It would have been much easier to understand if you had made the point of alternatives. I did not understand why the double 2s could not eliminate the triple 2s and vice versa until I figured out that what matters is whether or not there is an alternative choice. GAR.

I had looked at this and also could not see the relationship until I reread the above and saw there were no other alternatives in the pointing pair box that forced the others to be eliminated. thanks

Thursday 17-Sep-2009

... by: grosenthal08@cox.net

It would have been much easier to understand if you had made the point of alternatives. I did not understand why the double 2s could not eliminate the triple 2s and vice versa until I figured out that what matters is whether or not there is an alternative choice. GAR.

Sunday 21-Jun-2009

... by: moses

please explain more on box line reduction and show some examples thanks

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