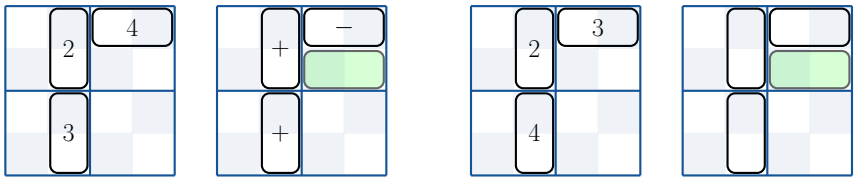
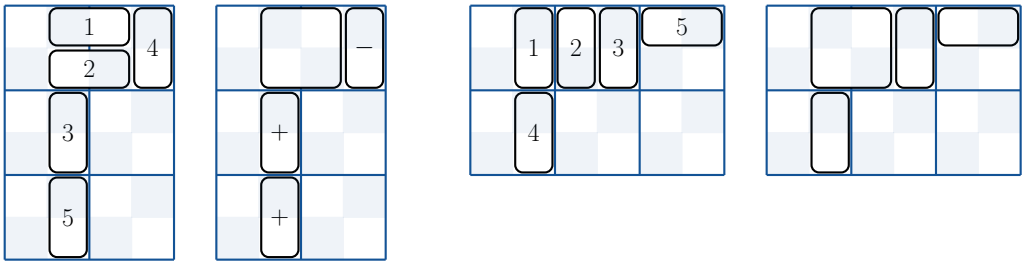
Continuing where we left off:

- Here *gpos* and *dgpos* are both Z, and both *position* and *dualPosition* are horizontal. In this situation, we have broken a cycle into two, on both sides. There are two overall possibilities.

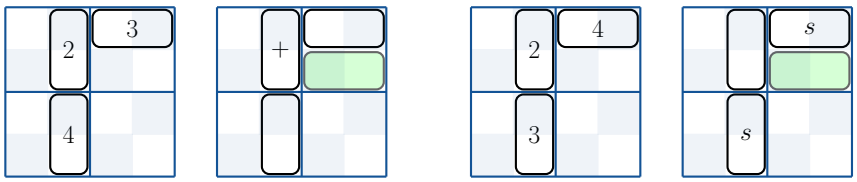
  ▷ In this case, on one side, the column is all (+) signs. We'll add the domino there, with a − sign, box up, and then continue down with a plus sign.



goes to



  ▷ In this case, the side with a blank corner has a sign in the row of interest. Otherwise said, the side with a sign in the corner has a blank in its side column. We'll be moving the blank up to the corner. If the blank initially was in a bottom corner, we'll need to call `prepareForSign()` to place the corner's sign there. After this exchange, on the dual side the corner will have a sign. We'll match that sign, box things up, and then add the opposite sign below (on the dual side). Here are two examples.



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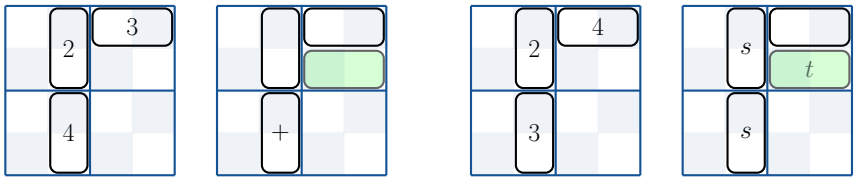

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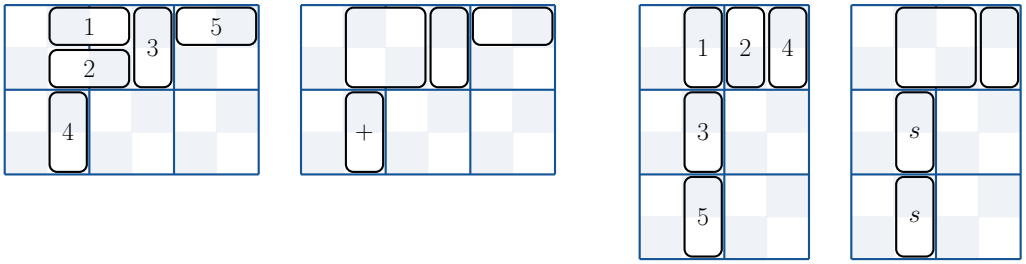
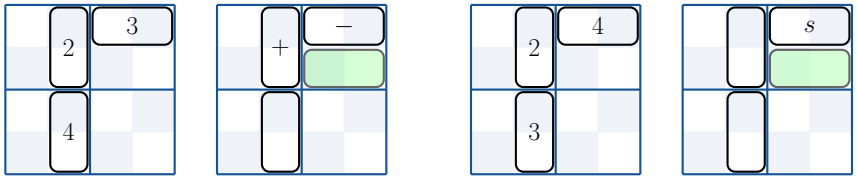


Here's the second example.



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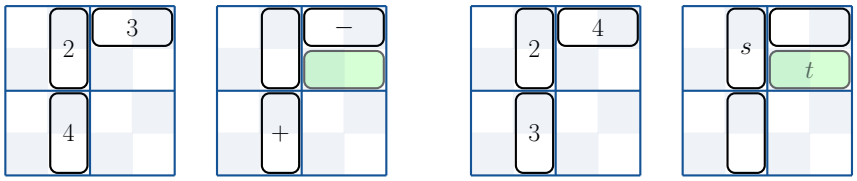

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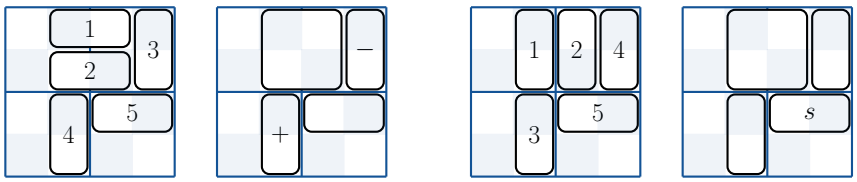
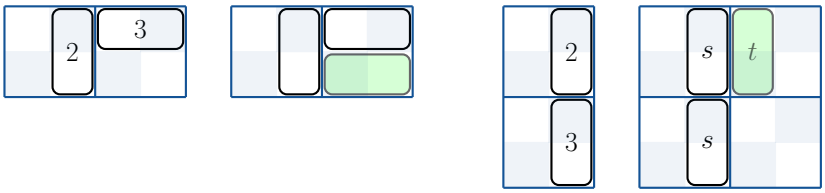


- Here $gpos = Z$ and $dgpos = X$ and *position* is horizontal. Here we are contracting a Type I cycle which is just one row/column. Here are the cases:

  ▷ Here the column on the dual side is filled with (s) signs. We place a t sign on the dual side, box up, and move down on the dual side with an s sign.



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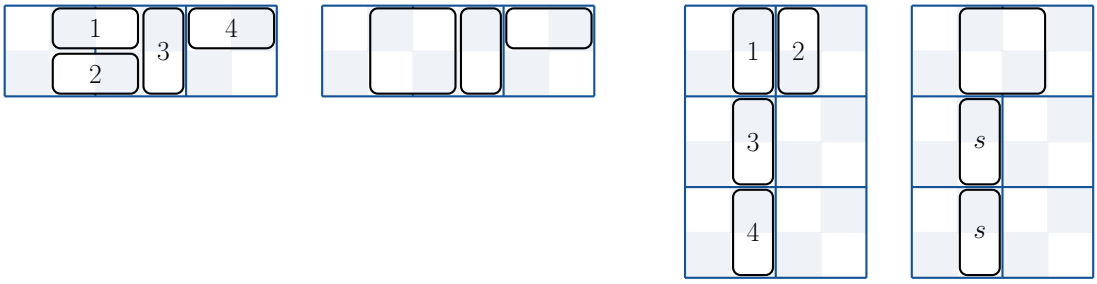
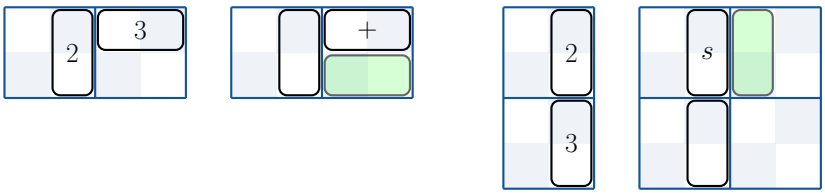


  ▷ Here the column on the dual side has a blank in it. If the top corner on the dual side has an s sign in it, we use `findRowToAddSignX()` on the dual side, where the sign is s, to move the blank up to the top corner. At this point, the top corner on the original side has a $(+)$ sign in it, so we add a $-$ sign, box up, and move down with a $+$ sign.



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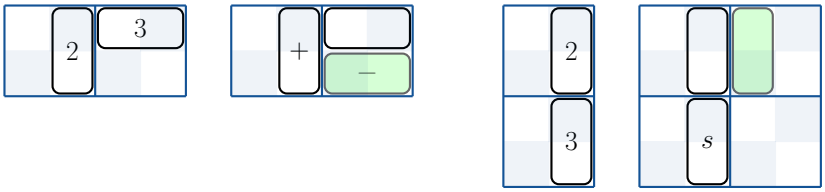

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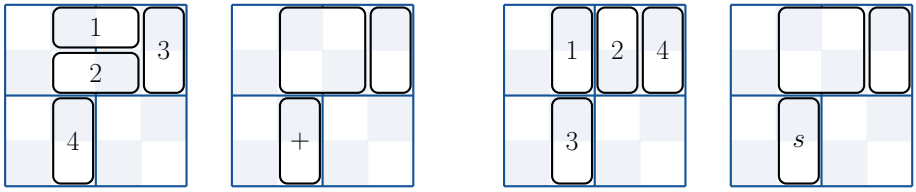
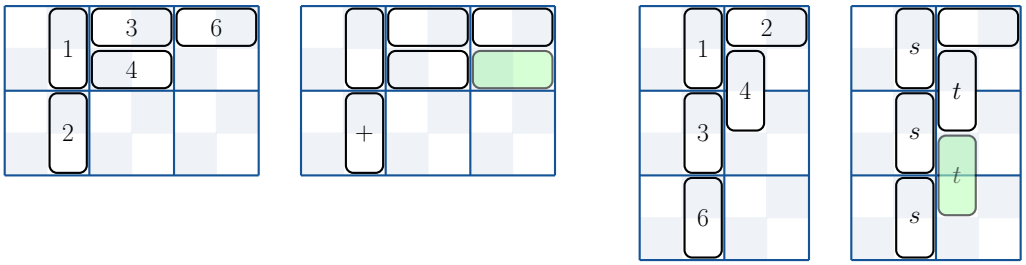


- Here $gpos = Z$ and $dgpos = Z$ and *position* is horizontal and the pair domino (occupying square $(x-1, y-1)$) is also horizontal. So, we are extending a boxed Type II cycle. The pair domino is currently unpaired, so it must be the cycle top. The domino to the right of the pair domino will become the new cycle top. Here are the cases.
  - ▷ Here the pair domino and all the dominoes in its row are blank. We match the sign (s) in the corresponding column on the dual side with a t, and then go down on the dual side with an s.



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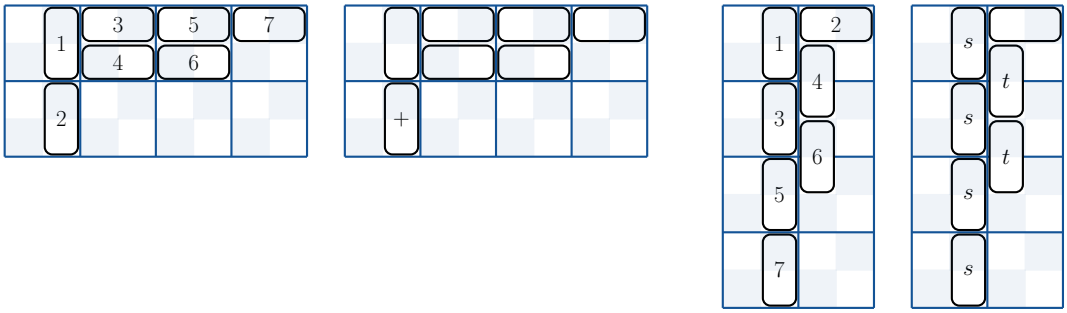
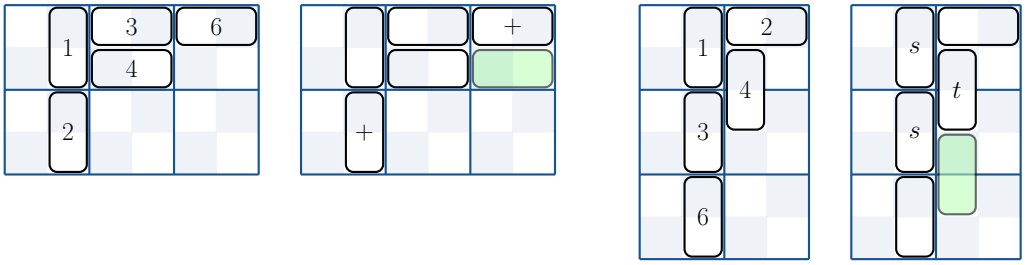


▷ Here the pair domino is blank and one of the dominoes in the pair domino's row has a sign (+) in it. We swap its sign into the pair domino, first calling `prepareForSign()` on the dual side. We give the newly-added domino a − sign, and then blank the + and − signs. (This is philosophical. Concretely, we carry this out in fewer steps.) We then go down with a + sign.



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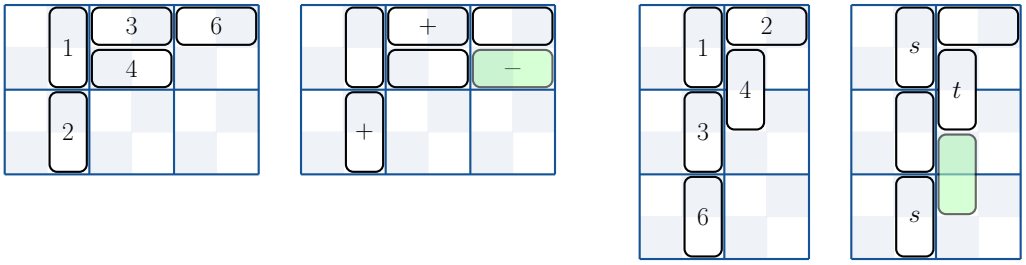

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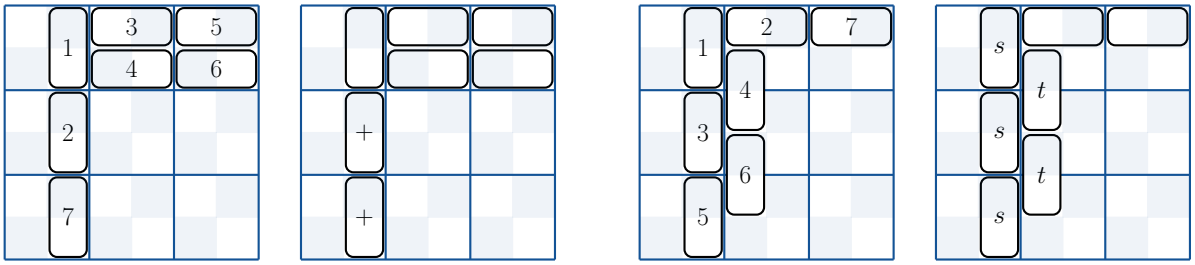
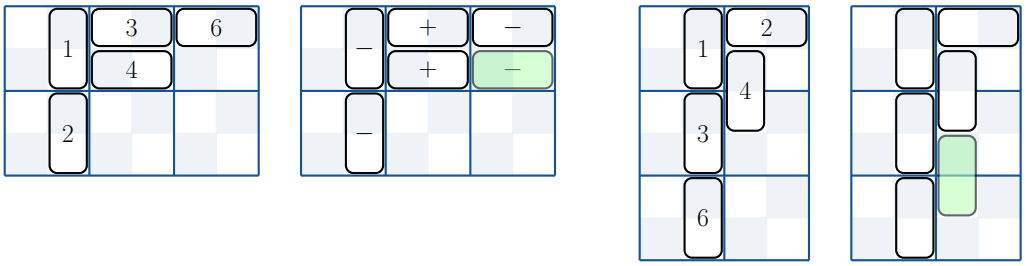


▷ Here the pair domino has a (+) sign. Recall, the pair domino is currently the cycle top. The domino to the right of the pair domino (called the top domino) will become the new cycle top. There are two possible complications. One is that the cycle is currently in the difficult situation, namely that the paired dominoes in the cycle are blank on this side. The other is that the top domino is blank. So, we have four cases. In all the cases, we will effectively add a − sign and then go down with a + sign.

∗ Here the paired dominoes in the cycle have signs and the top domino has a sign (which must be −). This is the easy case. We put a − sign in the new domino.



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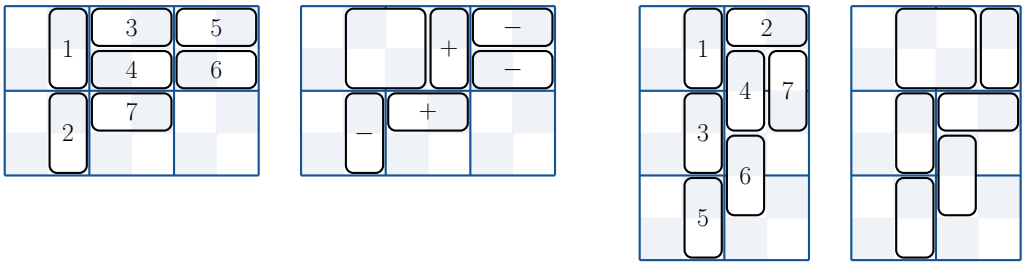
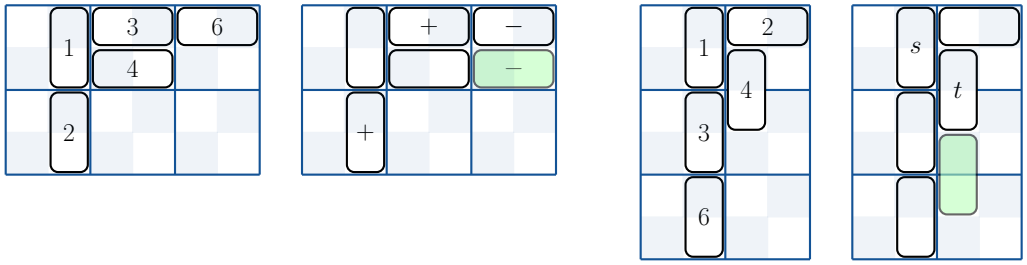


* Here the paired dominoes in the cycle are blank and the top domino has a sign (which must be −). We put a − sign in the new domino and then blank its sign and the sign of the pair domino.



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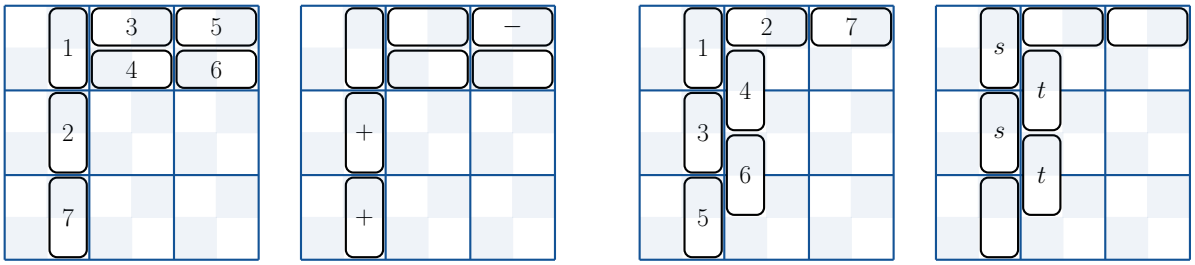
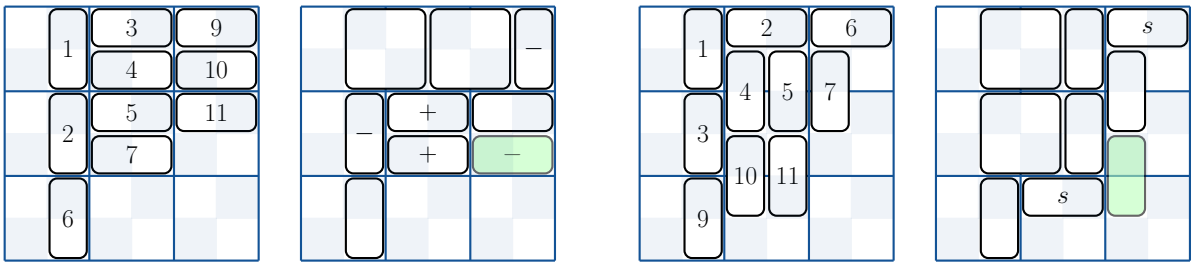


* Here the paired dominoes in the cycle have signs and the top domino is blank (with s in the corresponding domino). As before, we give the new domino a − sign. After, we need to make the signs in the cycle compatible with the new cycle top. That is, we call `putSignInCycleBottom()` on the s domino.



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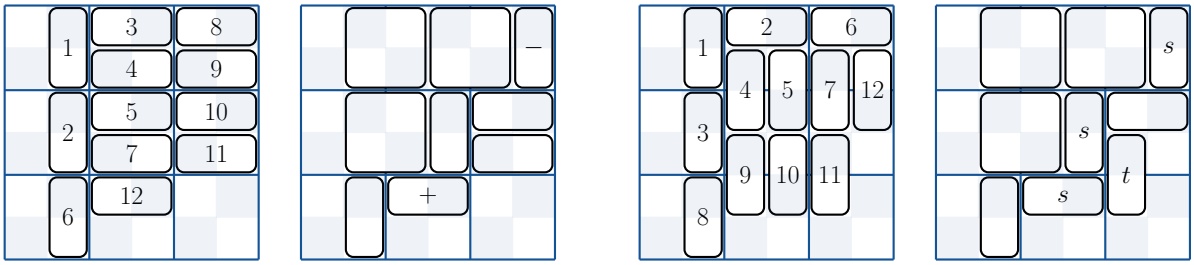
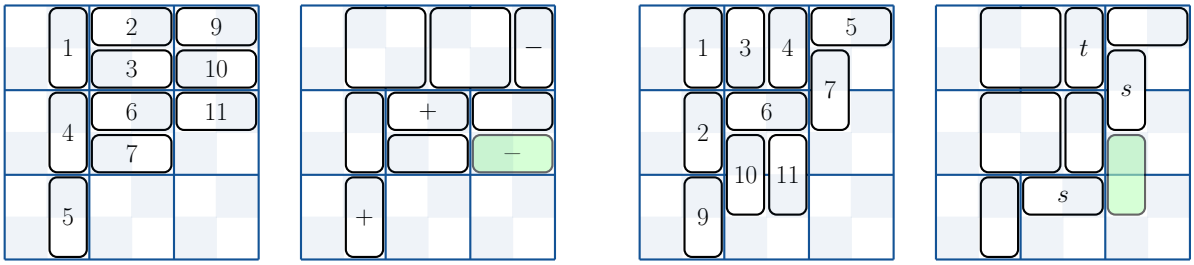


In the above example, there is a shape change, which is then reversed when the + domino is added below.

∗ Here the paired dominoes in the cycle are blank and the top domino is blank (with s in the corresponding domino). As before, we give the new domino a − sign, and then blank the new domino and its pair. After, we need to make the signs in the cycle compatible with the new cycle top. That is, we call `putSignInCycleBottom()` on the s domino.



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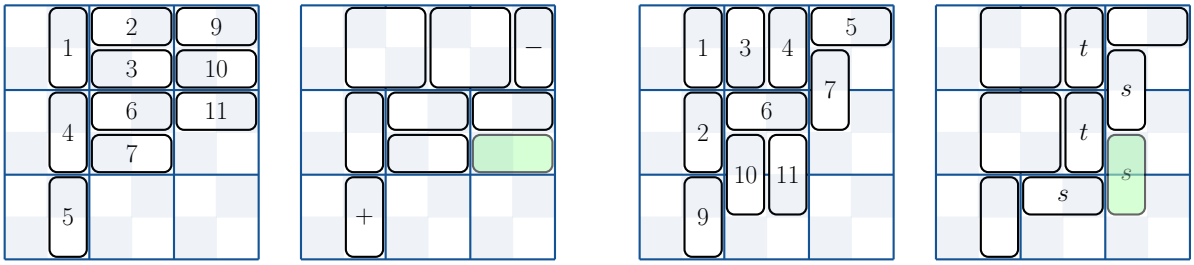

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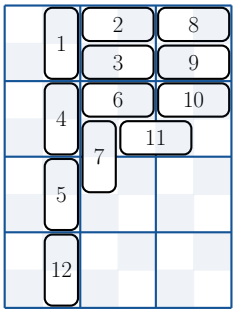
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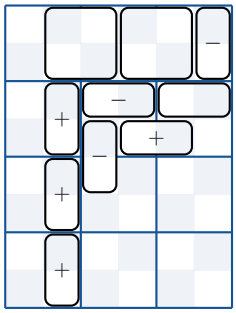
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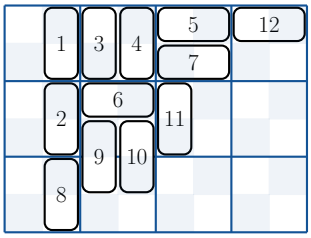
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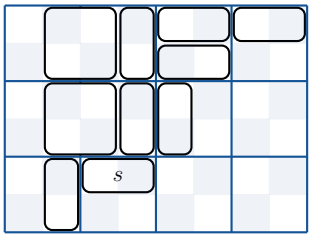
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