Tac Tix

Previously there were possible positions for the board state. But most of these boards have order 4, meaning if we rotate the board 3 times, each 3 times we will get a different board state. Some of the boards have order 1, which means if we rotate it any times, we will get the same thing, and we have boards that have order 2, which means we only get the same thing when we rotate it twice. We can divide by 4 all the boards that have order 4 by using symmetry, and we can divide all boards that have order 2 by 2, and leave the ones that have order 1. Let us call the positions that have order 1 or 2 “special cases”.

When we look at special case with order 1, we realize that whatever happens to the first quarter, has to happen to all the other quarters, because if the position has order 1, then the 2nd quarter has to be the rotated version of 1st quarter, 3rd quarter has to be the rotated version of the 2nd quarter, etc. This means we can have variations within only one quarter of our board, which for n = even case becomes and for odd case becomes where n = 2k-1.

When we look at order 2 positions, we find out that variations can only occur in only one half of the board, so it becomes for n = even and for odd cases. Notice that all the order 2 cases are within order 1 case. So, using the inclusion exclusion formula, we conclude the

* Case 1 (N = even). Upper Bound = [ ] + [- ]/2 + [- ]/4
* Case 2 (N = odd ). Upper Bound = [] + [-]/2 + [-]/4