Figure 2 Explanation

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Since the game board is a perfect square, a good way to think about it taking all the rows and lining them up into one really, long row. For example, a 3x3 game board could change one row that’s 9 squares long.

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we represent the length of one side of the board with n. The total number of squares of any size board is n2 (game boards are perfect squares).

Per the rules, all the “good guys” start on the bottom row, meaning there can be anywhere from 1 to n good guys, otherwise they wouldn’t fit in the bottom row. Calculating how many ways there are to fit p players into n squares is a simple combinations formula.

The “bad guy” must be in the top row and occupies a single square in n (the length of a row) possible squares. We apply the combinations formula (if there are n squares, how many ways are there for that guy to occupy a square), and essentially there will always be n ways to arrange the “bad guy”.

simplifies

All the possible ways to arrange the monsters and treasures on the gameboard is a permutations calculation that can be solved with a certain formula.

Suppose a set contains k types of objects, with ni indistinguishable objects of type 1 for each i=1,2, … *k*. Then the number of distinguishable permutations of the objects is

We know that there are n2 squares to place all the pieces, but since only “good guys” can be placed in the bottom row, there are only n2 – n places to put monsters and treasure. Also, since the “bad guy’s” piece is the only piece that can be in the top row at the start of the game, that further diminishes the possibilities to n2 – n for where monsters or treasures can be placed. Permuting n2 – n objects would be over counting because these permutations do not account for rearranged monsters and treasures that yield the same setup; therefore, we divide by the number of indistinguishable object permutations. One thing to note is that these object permutations include the monsters ( m! ), treasures ( t! ), and blank spaces on the board ( ((n2 – n)-m-t)! ).