Open Problems on TRIROAD

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The number of possible states on the board is $7^{24}(\approx 1.9158123 \times 10^{20})$, considering six possible placements and empty in each location. (The number of essentially different states are reduced by considering symmetry.) We are interested in states in which the first-player absolutely wins.

First, see Variant 1 in the brochure of TRIROAD×T3PUZZLE. There is the tutorial of composition with 3 pieces. For this tutorial, the first-player wins by placing 2 pieces, that is, a total of 3 pieces are placed to build a blue road since the second-player places 1 piece. You can play the composition with 11 pieces at Stage 15 in app of TRIROAD. (Let's challenge!) Here we are interested in the composition with $(2N-1)$ pieces for large N.

Problem 1: *For an integer $N \geq 9$, find a state where the first-player needs at least $(2N-1)$ pieces to win by building a road against any possible defence, and show the solution (piece placement) to win.*

- Note that the first (resp. second)-player places N (resp. $N-1$) pieces.
- Some answers for Problem 1 are known when $N \leq 8$.
- The case $N = 12$ is the biggest open problem because finding a solution implies that this game is absolutely a first-player win.
- In the case of Stage 15 in app, we found a solution to win for which the second-player must avoid losing the game on every turn. For the Problem 1, however, we don't concern about whether there is a solution with such situation.

Next, see Variant 2 in the brochure. We are also interested in states for which the first-player wins by occupying the largest territory. You can play such type of composition with 4 pieces at Stage 13 in app.

Problem 2: *For an integer $N \geq 3$, find a state with $2N$ vacancies where the first-player can win by occupying the largest territory against any possible defence, and show the solution to win.*

- Note that it is easy to find a state where the first-player can win no matter how you place the pieces, by making a larger territory of the first-player from the beginning. Then, please find a state with as few solutions as possible. For example, the Stage 13 in app has only one solution to win.

If you find answer for the above problems or make interesting composition, please contact to

`triroad.t3puzzle@gmail.com`

The interesting composition problems may be added to the puzzle mode in the app.

Feel free to ask any question!!

Install TRIROAD App

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