

Nxnxn Rubik's Cubes and God's Number

Salkinder, Daniel (School: Half Hollow Hills High School East)

The Rubik's Cube is the most popular puzzle in the world. Two of its studied aspects are God's Number, the minimum number of turns necessary to solve any state, and the First Law of Cubology, a solvability criterion. We modify previous insufficient statements of the First Law of Cubology Rubik's Cubes made by Bonzio, Loi, and Peruzzi, and prove necessary and sufficient solvability conditions. We compute the order of the Rubik's Cube group and the number of distinct configurations of the nxn Rubik's Cube. Finally, we derive an improved lower bound for God's Number using the group theoretical results and a counting argument.

Awards Won:

American Mathematical Society: Second Award of \$1,000

Third Award of \$1,000