

Cops & Robbers on Graphs

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The mathematical game of Cops & Robbers on a graph was introduced independently by Nowakowski & Winkler and Quilliot in early 1980's. There are n cops, thought of as pawns, which occupy the vertices of a given graph. There is a single robber, a pawn, which is placed on a vertex after the cops have been placed. The cop and robber players alternate turns, moving any and all of their pawns to adjacent vertices. The minimal n for the given graph such that the cop player can always capture the robber pawn is called the cop number of the graph, and it is denoted $c(G)$.

The outstanding research problem is to bound the cop number as a function of the number of vertices of a finite graph. Meyniel's conjecture is that $c(G)$ is $\mathcal{O}(\sqrt{m})$ where m is the number of vertices in G . There are numerous research problems which can be appreciated after a rapid, but elementary, introduction to graph theory. Attacking this problems will require ingenuity and new ideas. Avenues for research include studying restricted classes of graphs, variations on the rules of the game, and connections with search problems in computer science.

Recently, Bonato & Nowakowski published a research monograph on the problem: "The Game of Cops and Robbers on Graphs" (American Mathematical Society, 2011). The text provides an excellent guide to the literature as well as a self-contained introduction to the problem and techniques that have been successfully applied thus far.