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One-Dimensional Random Walks with One-Step Memory KEVIN PIASKOWSKI, MICHAEL NOLAN, Millersville University — Formalized studies of random walks have been done dating back to the early 20^{th} century. Since then, well-defined conclusions have been drawn, specifically in the case of one and two-dimensional random walks. An important theorem was formulated by George Polya in 1912. He stated that for a one or two-dimensional lattice random walk with infinite number of steps, N, the probability that the walker will return to its point of origin is unity. The work done in this particular research explores Polya's theorem for one-dimensional random walks that are non-isotropic and have the property of one-step memory, i.e. the probability of moving in any direction is non-symmetric and dependent on the previous step. The key mathematical construct used in this research is that of a generating function. This helps compute the return probability for an infinite N. An explicit form of the generating function was devised and used to calculate return probabilities for finite N. Return probabilities for various memory parameters were explored analytically and via simulations. Currently, further analysis is being done to try and find a relationship between memory parameters and number of steps, N.

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