Counting Random Walk Labelings of Various Graph Families

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We examine the total number of random walk labelings of various graphs, with emphasis on caterpillar graphs and modifications on caterpillar graphs. Our motivation is discovering new integer sequences not in the OEIS, and establishing combinatorial identities for sequences already existing in the OEIS. A random walk labeling of a graph is defined to be any labeling obtainable by performing a random walk, wherein a walker walks randomly along the edges of a graph. Each previously unvisited vertex is subsequently labeled in increasing order. We derive closed form expressions for the total number of random walk labelings for the standard caterpillar and its variants.

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