Longest Path in Acyclic Orientation of Complete Bipartite Graph

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An acyclic orientation on a graph is an assignment of a direction to each edge in a way that does not form any directed cycles. Acyclic orientations on a complete bipartite graph are in bijection with a class of matrices called lonesum matrices, which can be uniquely reconstructed from their row and column sums. We utilize this connection and other properties of lonesum matrices to determine an analytic form of the generating function for the average length of the longest path in an acyclic orientation on a complete bipartite graph.

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