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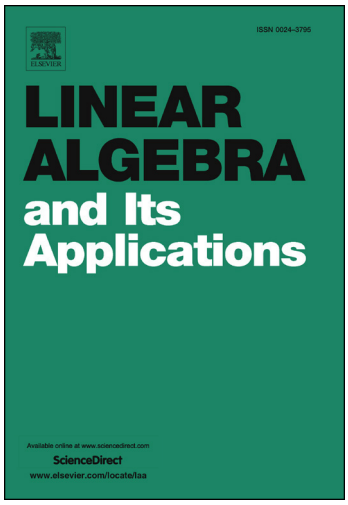

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Half of a Riordan array and restricted lattice paths

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Abstract

For an infinite lower triangular matrix $G = (g_{n,k})_{n,k\geq 0}$, we define the half of G to be the infinite lower triangular matrix $H = (h_{n,k})_{n,k\geq 0}$ such that $h_{n,k} = g_{2n-k,n}$ for all $n \geq k \geq 0$. In this paper, we will show that if $G = (g_{n,k})_{n,k\geq 0}$ is a Riordan array, then its half $H = (h_{n,k})_{n,k\geq 0}$ is also a Riordan array, and we obtain new combinatorial interpretations for some Riordan arrays in terms of weighted lattice paths.

Keywords: Riordan array; Lukasiewicz path; central coefficients; Catalan numbers; generating function

AMS Classification: 05A05, 05A15, 05A10, 15A09,15A36

1 Introduction

In the recent literature, one may find that Riordan arrays have attracted attention of various authors from many points of view and many examples and applications can be found (see, e.g., [4, 10, 11, 13, 15, 16]). An infinite lower triangular matrix $D = (d_{n,k})_{n,k\geq 0}$ is a Riordan array if there exist generating functions $g(t)$ and $f(t)$ with $g(0) = 1$, $f(0) = 0$ and $f'(0) \neq 0$, such that

$$d_{n,k} = [t^n]g(t)f(t)^k,\ n, k \in \mathbb{N}, \tag{1}$$

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