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Catalan Identities for Generalized Fibonacci Polynomials,
Fibonacci Quart. **62** (2024), no. 2, 100–111.

Abstract

This paper extends two Catalan identities, originally formulated for the Fibonacci and Lucas numbers, to polynomial sequences of the second order, which have a Binet formula similar to that of the Fibonacci and Lucas numbers. These polynomial sequences are classified as of Fibonacci type and Lucas type. As a result of this generalization, Catalan identities are obtained for a range of polynomial sequences, such as Pell, Pell-Lucas, Fermat, Fermat-Lucas, both types of Chebyshev polynomials, Jacobsthal, Jacobsthal-Lucas, and both types of Morgan-Voyce polynomials.

Furthermore, we use generating functions and the Wilf-Zeilberger algorithm to derive a general expression for Catalan identities and other combinatorial identities.