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On some identities involving k-Jacobsthal numbers

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Resumo

In recent article, Jhala, Sisodiya and Rathore [2] proved a number of sum identities involving a k-Jacobsthal Numbers $J(k,n)$ defined by $J(k,n+1) = kJ(k,n) + 2J(k,n-1)$; for $n \geq 1$, with initial condition $J(k,0) = 0$, $J(k,1) = 1$. For $n \geq 1$, we have that $J(1,n) = J_n$, the *nth* Jacobsthal number. For example, Jhala, Sisodiya and Rathore proved the following identities using Binet's formula for the general term of the k-Jacobsthal sequence, for all integers $n \geq 0$:

Theorem 1. *(Catalan's identity)*

$$J(k,n-r)J(k,n+r) - J^2(k,n) = (-1)^{n+1-r}J^2(k,r)2^{n-r}.$$

Theorem 2. *(D'ocagne's identity)* If $m > n$ then $J(k,m)J(k,n+1) - J(k,m+1)J(k,n) = (-2)^n J(k,m-n)$.

Many authors have employed the technique of counting via tilings in differents contexts, like in [1]. Our goal in this work is to view above identities combinatorially with point view generalized, provinding bijective arguments from the context of tilings as discussed in [1].

Referências

[1] Benjamim, A. T. and Quinn, J. J. Proofs that Really Count: *The Art of Combinatorial Proof*. The Dolciani Mathematical Expositions, 27, Mathematical Association of America, Washington, DC, 2003.

[2] Jhala D., Sisodiya,K., Rathore, G.P.S, *On Some Identities for k-Jacobsthal Numbers*, Int. Journal of Math Analysis, Vol. 7, 2013, no. 12, 551-556.