The Worpitzky identity for the groups of even-signed permutations

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Abstract: The well-known Worpitzky identity $(x+1)^n = \sum_{k=0}^{n-1} A_{n,k}\binom{x+n-k}{n}$ provides a connection between two bases of $\mathbb{Q}[x]$: the standard basis $(x+1)^n$ and the binomial basis $\binom{x+n-k}{n}$, where the Eulerian numbers $A_{n,k}$ for the symmetric group serve as the entries of the transformation matrix. Brenti has generalized this identity to the Coxeter groups of types B_n and D_n (signed and even-signed permutations groups, respectively) using generatingfunctionology. Motivated by Foata-Schützenberger's and Rawlings' proof for the Worpitzky identity in the symmetric group, we provide combinatorial proofs for the generalization of this identity and for its q-analogue to the Coxeter groups of type D_n. Our proofs utilize the language of P-partitions for the D_n-posets, introduced by Stembridge. This is joint work with David Garber and Moti Novick.