

Some partitions identities related to associated Al-Salam-Chihara polynomials

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For a partition λ , R. Stanley introduced the weight $\omega(\lambda)$, which may be computed from the Ferrers diagram of λ by filling the squares in the $(2i + 1)$ -st (resp., $2i$ -th) row alternately with a and b (resp., c and d) and then multiplying over all squares. Let $\ell(\lambda)$ denote the number of parts of λ . In a previous work with M. Ishikawa we have shown that the generating function $S := \sum_{\lambda} \omega(\lambda) z^{\ell(\lambda)}$, where the sum is over all partitions (resp. strict partitions) whose parts are at most N , are related to the *associated Al-Salam-Chihara polynomials*, leading to exact expressions for S as a sum of products of q -factorials and ${}_2\phi_1$ basic hypergeometric series.

Savage-Sills and Berkovich-Uncu have recently proved some refinements of the well-known little Göllnitz identities and Capparelli's identities respectively. Noticing the connection between their results and Stanley's earlier four-parameter partition generating functions, we define and study a new class of partitions, called k -strict partitions. This leads to a unified combinatorial treatment of their results and shed more lights on the intriguing conditions of their companion to Capparelli's identities as well as to combinatorial proofs of some results originally derived using the theory of Al-Salam-Chihara polynomials. The second part of this talk is based on joint work with Shishuo Fu.