Recent Partition Theory Results on the Coefficients of Gaussian Polynomials

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Abstract

In this talk we review several results obtained over the past 18 months on the coefficients of Gaussian polynomials with a look towards future research. Gaussian polynomials are also known as the q-binomial coefficients and are often denoted by $\left[\begin{smallmatrix} N+m \\ m \end{smallmatrix}\right]$. They are the generating functions for partitions of n into at most m parts, no part larger than N, denoted by $p(n, m, N)$.

We prove a general theorem on an infinite family of prime divisibilities for $p(n, m, N)$ and a general result on the largest coefficient of any given Gaussian polynomial. A result on combinatorial statistics related to certain divisibility properties of $p(n, m, N)$ is proved using some polyhedral geometry and integer lattices.