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Combinatorics of Euclidean spaces over finite fields

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q-analogues of quantities in mathematics involve perturbations of classical quantities using the parameter q, and revert to the original quantities when q goes 1. An important example is the q-analogues of binomial coefficients, which give the number of k-dimensional subspaces in $\mathbb{F}_q^n$. When q goes to 1, this reverts to the binomial coefficients which measure the number of k-sets in $[n]$.

In this talk, we describe a formula of the number of quadratic subspaces of Euclidean type in $(\mathbb{F}_q^n, x_1^2 + \cdots + x_n^2)$, which can be described as the form of the analogue of binomial coefficients. The main goal of this talk is to explain this new analogue of binomial coefficients and to study their related combinatorics.

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