In the absence of partitions

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Abstract

Partitions arise in linear algebra as Smith normal forms of finite DVR-modules. This viewpoint has given rise to several important objects in symmetric function theory; they are indexed by partitions. What if we replace the DVR by other rings? The analogous objects can no longer be indexed by partitions, but certain general properties can still be proved. They show up in discrete random matrix theory (joint with Gilyoung Cheong) and algebraic geometry (joint with Ruofan Jiang). In some special cases, these objects can still be expressed in partitions (though more convoluted), and the proven general properties give rise to new identities involving Hall polynomials that do not seem to have a direct combinatorial proof.