

Labeled Partitions and the q -Derangement Numbers

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Abstract: Inspired by MacMahon's original proof of his celebrated theorem on the distribution of the major index over permutations, we give a reformulation of his argument in terms of labeled partitions. In this framework, we establish a decomposition theorem for labeled partitions which is analogous to the decomposition of a permutation into derangement points and fixed points. This decomposition implies a reformulation of Wachs' formula concerning the derangement parts and major index on permutations which was derived in order to present a bijective treatment of Gessel's formula on the q -derangement numbers.

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