Asymptotics of Mahonian statistics

Abstract:

Percy MacMahon introduced the “major index” of a permutation a century ago and proved that it has the same distribution as the “inversion number”. Such statistics are now called “Mahonian”. Baxter and Zeilberger considered the joint distribution of inversions and the major index on permutations and showed they are jointly independently asymptotically normally distributed. However, Baxter-Zeilberger’s argument has no hope of giving a more precise “local limit theorem” and Zeilberger subsequently offered a $300 reward for a different proof. This is the story of that reward.