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Periods of iterations of mappings over finite fields with restricted preimage sizes

Let $[n] = \{1, \dots, n\}$ and let Ω_n be the set of all mappings from $[n]$ to itself. Let f be a random uniform element of Ω_n and let $T(f)$ and $B(f)$ denote, respectively, the least common multiple and the product of the length of the cycles of f . Harris proved in 1973 that $\log(T)$ converges in distribution to a standard normal distribution and, in 2011, E. Schmutz obtained an asymptotic estimate on the logarithm of the expectation of T and B over all mappings on n nodes. We obtain analogous results for random uniform mappings on $n = kr$ nodes with preimage sizes restricted to a set of the form $\{0, k\}$, where $k = k(r) \geq 2$. This is motivated by the use of these classes of mappings as heuristic models for the statistics of polynomials of the form $x^k + a$ over the integers modulo p , with $p \equiv 1 \pmod{k}$. We also exhibit and discuss our numerical results on this heuristic. Joint work with R. Martins, D. Panario and E. Schmutz.