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A Farey Fraction Spin Chain

We introduce a new number-theoretic spin chain and explore its thermodynamics and connections with number theory. The energy of each spin configuration is defined in a translation-invariant manner in terms of the Farey fractions, and is also expressed using Pauli matrices. We prove that the free energy exists and a phase transition occurs for some positive inverse temperature. The number of states of energy summed over chain length is shown to be related to a restricted divisor problem. This is joint work with P. Kleban.