Random constructions of countable abelian p-groups

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By Ulm's theorem, countable reduced abelian p-groups are characterized, uniquely up to isomorphism, by their Ulm invariants. Given a sequence f of Ulm invariants, we provide a probabilistic construction of a countable abelian p-group G_f, having the set of natural numbers as its domain, with Ulm invariants $\leq f$. We then show that with probability 1, G_f has precisely f s its sequence of Ulm invariants. This establishes the existence part of Ulm's theorem in a probabilistic way. We also develop new results for valuated abelian p-groups which are essential for our construction.

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