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Aerated Poisson distributions and their exact approximants.

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We analyze the properties of combinatorial numbers appearing in the normal ordering of powers of certain differential operators. They are natural generalizations of the conventional Bell numbers. We explicitly construct the solutions of the Stieltjes moment problems with these combinatorial sequences. It turns out that in certain cases one encounters as solutions the discrete probability distributions based on lacunary subsets of positive integers. They generalize the standard Poisson laws and are called aerated Poisson distributions. We furnish explicit approximants of the aerated Poisson distributions through continuous functions via reparametrization of auxiliary solutions for other generalized Bell numbers.

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