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Some problems related to the enumeration of lambda-terms

Lambda-terms are basic objects of lambda calculus. Syntactically, they can be seen as Motzkin trees on which we add arcs from some unary nodes to some leaves; equivalently they can be modeled by colored trees. Understanding their statistical behaviour, beginning with the number of terms of specific size, and graduating to shape parameters and to such lambda calculus-related properties as being normalizable, turns out to be no simple task. We consider here terms with bounded number of unary nodes or bounded unary height: we obtain enumeration results and the probability that a random term is normalisable.