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On the waiting time for the first success run

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Abstract Let k and m be positive integers with $k \geq m$. The probability generating function of the waiting time for the first occurrence of consecutive k successes in a sequence of m -th order Markov dependent trials is given as a function of the conditional probability generating functions of the waiting time for the first occurrence of consecutive m successes. This provides an efficient algorithm for obtaining the probability generating function when k is large. In particular, in the case of independent trials a simple relationship between the geometric distribution of order k and the geometric distribution of order $k - 1$ is obtained.

Keywords Geometric distribution of order k · Probability generating function · Conditional expectation · Markov chain · Run · Discrete distribution