CHARACTERISATIONS OF THE GEOMETRIC DISTRIBUTION USING DISTRIBUTIONAL PROPERTIES OF THE ORDER STATISTICS

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Abstract: Let $X_1, X_2, \ldots, X_N$ be independent, identically distributed, non-negative integer valued random variables and let

\[ X_{1:N} \leq X_{2:N} \leq \ldots \leq X_{N:N} \]

denote the corresponding order statistics. If $P(X_{1:N} \geq k) = P(X_1 \geq Nk)$ for all $N \geq 1$ and $k = 1$, then the distribution of $X_1$ is geometric. We modify this distributional property of the order statistics in several directions to obtain characterisations of the geometric distribution. We provide examples to show that the assumptions, in some respect, cannot be weakened any further.

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