Distribution independence of statistics of symmetric random walks: an intuitive proof ROBERT CORDERY, Fairfield Univ, CLAUDE ZELLER, C. Zeller Consulting LLC — Random walks on the real line are used to approximate diffuse light reflection, logarithm of stock prices, Brownian motion, and other stochastic processes. First passage statistics and time distribution of the order statistics of one-dimensional symmetric continuous random walks have important applications such as diffuse reflectance. These statistics are surprisingly independent of the step size distribution. Further, the statistics of finite walks constructed from permutations of a finite set of real step lengths are also independent of the set of lengths. Many of these independence results were known from the fluctuation theory of partial sums developed by Andersen, Baxter, Darling and others between 1940 and 1960. We present simple proofs of several fluctuation theory results by examining certain pairs of walks. Our approach reveals the mechanism behind these remarkable results and the ubiquity of combinatoric formulas and Catalan numbers even in the continuous case.

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