

A dice game, a multinomial walk, and the inverted Dirichlet distribution

G. Leobacher^a and A. Steinicke^b

^a University of Graz.

^b Montanuniversitaet Leoben.

We consider a simple dice game on a board, which leads to an intriguing study of multinomial walks, with surprising and seemingly paradoxical properties. The winning and losing probabilities of a general version of the game are investigated via conjugacy relations between Gamma and Poisson distributions, as well as between negative multinomial and inverted Dirichlet distributions. We show a monotonicity property of the regularized incomplete beta function, which implies a monotonicity property of the winning probability. Furthermore, the asymptotic behavior of the game for one or several parameters of the game tending to infinity is analyzed, as well as the probability of being last in the game.