On intersection probabilities of four lines inside a planar convex domain

Abstract

Let n≥2 random lines intersect a planar convex domain D. Consider the probabilities pnk , k=0,1,…,n(n−1)/2 that the lines produce exactly k intersection points inside D. The objective is finding pnk through geometric invariants of D. Using Ambartzumian's combinatorial algorithm, the known results are instantly reestablished for n=2,3. When n=4, these probabilities are expressed by new invariants of D. When D is a disc of radius r, the simplest forms of all invariants are found. The exact values of p3k and p4k are established.