

PROBABILITY—Ph.D. Qualifying Exam Fall 2008**Part A (6 pts.)**

Eight pawns are placed randomly on a 8×8 chessboard, no more than one to a square. “Randomly” means that all outcomes (configurations) are equally likely. What is the probability that

(A1) (3 pts.) all eight pawns are in a straight line? (*do not forget the diagonals*)

(A2) (3 pts.) no two pawns are in the same row or column?

Part B (6 pts.)

The annual rainfall figures in College Park are independent and identically distributed continuous random variables. If X_r is the rainfall during the r^{th} year, determine the probability of the event $\{X_1 \leq X_2 \leq X_3 \leq X_4\}$.

Part C (8 pts.)

A total of n bar magnets are placed end-to-end in a line with random independent orientations (the two orientations being equally likely for each magnet). Adjacent like poles repel, while ends with opposite polarities join to form blocks. Let X be the resulting number of blocks of joined magnets. What is the distribution of X ? What is its mean and variance?

