Exam 1 (Part I)

Friday, October 3, 2014

Name: _____

This is the in–class portion of Exam 1. This is a closed–book and closed–notes exam. Show all significant work and give reasons for all your answers. Use your own paper and/or the paper provided by the instructor. You have up to 40 minutes to work on the following 2 questions. Relax.

1. Let $(\mathcal{C}, \mathcal{B}, \Pr)$ denote a probability space, and let A and B denote events in $\mathcal{B}$.

   (a) State what it means for A and B to be independent.

   (b) State what it means for A and B to be mutually exclusive.

   (c) Assume that $\Pr(B) > 0$. Define the conditional probability of A given B.

   (d) Given that $\Pr(B) > 0$, state the multiplication rule for computing the probability of the joint occurrence of A and B.

   (e) State the inclusion–exclusion principle for computing $\Pr(A \cup B)$.

2. An experiment consists of flipping a fair coin three consecutive times.

   (a) List all the elements of the sample space, $\mathcal{C}$, for this experiment.

   (b) For each element, c, of the sample space, $\mathcal{C}$, let $N_H(c)$ denote the number of heads in c, and $N_T(c)$ the number of tails in c. Put

   $$X(c) = N_H(c) - N_T(c), \quad \text{for all } c \in \mathcal{C}.$$

   List all possible values for the random variable X.

   (c) Compute the probability mass function (pmf) for X. Explain the reasoning behind your calculations.

   (d) Compute $\Pr(X \leqslant 0)$. Explain the reasoning behind your calculations.