Due: Thursday, October 22nd, 2009
Problem to be turned in: 2,4

1. Let T_m count the number of heads of a biased (p) coin in m independent tosses. Let S_n count the number of head of a biased (p) coin in n independent tosses. Find the distribution, mean and variance of $S_m + T_n$.
2. Let $\{X_n\}_{n=1}^3$ be independent discrete random variables having variances $\{\sigma_1^2\}_{i=1}^3$. Find the correlation coefficient between $X_1 - X_2$ and $X_2 + X_3$.
3. Let X be a random variable with mean μ and variance σ^2. Find the mean and variance of the random variable $Z = \frac{X-\mu}{\sigma}$.
4. A random variable X has mean $\mu = 1$ and standard deviation $\sigma = 2$.
   (a) Find $E(3X + 4)$ and Variance$(3X + 4)$.
   (b) Estimate $P(-3 < X < 5)$ using Tchebysheff's theorem.
5. Let X be a discrete random variable with $E(X) = 10$. What is the largest possible value of $P(X \geq 1000)$?
6. Let X be discrete random variable such that Range$(X) = \{0, 1, \ldots, n\}$ for some $n \geq 1$. Show that
$$E(X) = \sum_{j=1}^{n} P(X \geq j).$$
7. Suppose that seven dice are rolled. Let M be the minimum of the seven numbers. Find $E(M)$
8. Let X and Y be two discrete random variables. When are $X + Y$ and $X - Y$ are uncorrelated ?