Due: Thursday, September 10th, 2015
Problem to be turned in:

1. Let X and Y be discrete random variables with Range (X) =$\{0,1,2\}$ and Range $(Y) = \{1,2\}$ with joint distribution given by the chart below.

	$X = 0$	$X = 1$	$X = 2$
$Y = 1$	0.1	0.2	0.1
$Y = 2$	0.3	0.2	0.1

   (a) Find $E[XY]$.
   (b) Compute $\text{Cov}(X,Y) := E[XY] - E[X]E[Y]$

2. Let X, Y be discrete random variables. Suppose $X \leq Y$ then show that $E[X] \leq E[Y]$.

3. A lottery is held every day, and on any given day there is a 30% chance that someone will win, with each day independent of every other. Let X denote the random variable describing the number of times in the next five days that the lottery will be won.
   (a) What type of random variable (with what parameter) is X?
   (b) On average (expected value), how many times in the next five days will the lottery be won?
   (c) When the lottery occurs for each of the next five days, what is the most likely number (mode) of days there will be a winner?
   (d) How likely is it the lottery will be won in either one or two of the next five days?
   (e) What is the variance of X ?

4. A game show contestant is asked a series of questions. She has a probability of 0.88 of knowing the answer to any given question, independently of every other. Let Y denote the random variable describing the number of questions asked until the contestant does not know the correct answer.
   (a) What type of random variable (with what parameter) is Y?
   (b) On average (expected value), how many questions will be asked until the first question for which the contestant does not know the answer?
   (c) What is the most likely number of questions (mode) that will be asked until the contestant does not know a correct answer?
   (d) If the contestant is able to answer twelve questions in a row, she will win the grand prize. How likely is it that she will know the answers to all twelve questions?