Assignment #3 — Due Friday, September 24, 2010, by 4:00 P.M.
Turn in homework to your TA's mailbox using this sheet as the cover page.

Fill in your name and also circle the *lecture section in which you are registered* and circle the *discussion section you expect to attend* to pick up this assignment.

Name:

Lecture 1 (Larget).   **311:** Tu 1:00 - 2:15pm   **312:** Th 8:00 - 9:15am   **313:** We 1:00 - 2:15pm

Lecture 2 (Hanlon).   **321:** Tu 1:00 - 2:15pm   **322:** We 2:30 - 3:45pm   **323:** We 1:00 - 2:15pm

Please answer the following questions.

1. Consider a discrete random variable X with $\mathsf{E}(X) = -0.3$. The probability distribution of X is given by the following table.

k	-10	?	3	5	7
$\mathsf{P}(X = k)$	0.2	0.3	0.2	?	0.1

   Fill in the missing values in the table.

2. Consider three random variables X_1, X_2, X_3 where $\mathsf{E}(X_1) = 4$, $\mathsf{E}(X_2) = 3$, and $\mathsf{E}(X_3) = -5$. In addition, $\mathsf{E}(X_1^2) = 20$, $\mathsf{E}(X_2^2) = 12$, $\mathsf{E}(X_3^2) = 31$. Calculate the following.

   (a) $\mathsf{E}(3X_1 + 4X_2 - 2X_3)$
   (b) $\mathsf{E}(X_1 + 2X_1^2 - X_2 + X_2^2 - 3X_3^2)$
   (c) $\mathsf{Var}(X_1)$, $\mathsf{Var}(X_2)$, and $\mathsf{Var}(X_3)$.
   (d) Additionally assume that X_1, X_2, and X_3 are independent. Compute $\mathsf{Var}(3X_1 + 4X_2 - 2X_3)$.

3. Lecture and the textbook present an example of "highly irradiated" male radiologists where a 95% confidence interval for the probability of male births was well below the national average of 0.512. This problem considers the potential complicating factors that each father in the sample may have had multiple children, and each father might have had a different probability of having a male child, perhaps based on different levels of radiation damage.

   The children of highly irradiated male radiologists A, B, C, and D are male with respective probabilities $p_A = 0.3$, $p_B = 0.4$, $p_C = 0.35$, and $p_D = 0.45$. These radiologists are fathers for these respective numbers of children: $n_A = 2$, $n_B = 3$, $n_C = 1$, and $n_D = 2$. Let X be the total number of boys among the eight children. Find $\mathsf{E}(X)$ and $\mathsf{Var}(X)$. Assume that the sexes of all eight children are independently determined. (Thanks to Daniel whose insightful question motivated this problem, but do not blame him for its existence!)

4. p. 170, Problem 14 in the textbook.

5. p. 170, Problem 15 in the textbook.

6. p.588, Problem 10 in the textbook.