Math 408, Spring 2008
HW Assignment 8, due Friday, 3/28/2008

Name (print please):

Instructions

- **Use this sheet as cover sheet and staple it to the assignment.** Write your name **legibly** in the space above; if necessary, underline your last name. If your name is not clearly and unambiguously identifiable on the class roster, we cannot credit you for the homework.
- Do the problems in order, and make sure that each problem is clearly labelled.
- Show all work; an answer alone will not earn credit.
- **Due date:** The assignment is due **in class** on Friday after the break. Late homework, or homework dropped off in mailboxes, will not be accepted. You can, however, turn in the homework early, in my office, 241 Illini Hall, any time before the due date.
- **Open House Hours:** Wednesdays, 5 pm, 141 Altgeld. Backup slot: Thursdays, 5 pm, 141 Altgeld. I will stay as long as needed. Math 408 students should try to come to the Wednesday hour; on Thursday my Math 453 students will have priority, so use that slot only if you absolutely can't make it on Wednesday.

Problems (from Hogg/Tanis, 7th edition)

1. 4.1-1 (all parts)
2. 4.1-3 (omit (a)) For part (b), represent the joint distribution (p.m.f.) in matrix (instead of graphical) form, and, most importantly, show clearly the calculation of the individual entries.
3. 4.2-1 (all parts)
4. 4.2-2 (omit (d))
5. 4.2-7 (Both parts. Start out by representing the given joint distribution in matrix form, then compute the marginal distributions, μ_X, μ_Y, etc., as in the earlier problems.)
6. 4.2-9 (omit (d))
7. 4.3-1
8. 4.3-6

***** Turn page for instructions and comments *****

Instructions/comments

1. **Representing joint distributions.** The book requests for some problems representations of joint p.m.f.'s as "graphs", or "using graph paper". You can ignore such requests and instead represent joint distributions in matrix form, as was done in class. This is simpler, more natural, and it is more convenient for computations of marginal distributions, etc.

2. **Calculating joint distributions (4.1-3).** While in most of the problems a joint p.m.f. is given, in Problem 4.1-3 you are given a description of the random variables X and Y and you need, as a first step, compute the joint p.m.f. $f(x, y)$ of these random variables. Simply writing down a formula, or matrix, for $f(x, y)$ is not enough (in fact, you can find a formula in the back of the book). You need to show how you calculated the entries in the matrix. (See the first paragraph in Example 4.1-3 for a similar situation. As in this example, it suffices to give the details for one or two typical entries.)

3. **Independence.** For questions about independence, a yes/no answer will not earn credit. You need to justify the answer using the formal definition of independence.

4. **Show work.** As always, you need to show how you arrived at your answers. For example, calculating things like $P(X = Y)$, $E(X)$, $E(XY)$, $\mathrm{Cov}(X, Y)$, usually requires adding up a bunch of terms, and you need to show clearly that you have done that.

5. **Representing marginal distributions.** The easiest and most natural way to obtain and represent marginal distributions is via the joint distribution matrix. If you have already represented the joint p.m.f. in matrix form, simply use an extra column and row to enter the probabilities in the marginal distributions; there no need to work out a formula in this case.

   The book tends to give answers in the form of such formulas, even in situations where the formula does not come out naturally from the reasoning, but appears to be pulled out of the air. For example, in the answer to 4.1-3(d) the p.m.f. of Y is given as $f_Y(y) = (4-|y-5|)/16$ for $y = 2, 3, \ldots, 8$. While this happens to be correct, this is highly misleading since it suggests that somehow one can obtain this formula in one fell swoop from the problem. Instead, one gets the values of $f_Y(y)$ one at a time by computing column sums in the joint distribution matrix. It is only after having computed each individual value that one may observe that these values happen to match those of the above formula. However, this extra step of trying to fit a formula to a list of values already computed is redundant (as far as specifying the marginal distribution is concerned), and rather than adding insight to the problem, it obscures what is really going on.