Name:

Collaborator(s)[1]:

Math 213, Section F1, Prof. Hildebrand, Fall 2010
Graded HW Assignment 5, due Friday, 10/8/2010

Instructions

- **Rules:** Use this sheet as cover sheet and staple it to the assignment. Do the problems in order, and make sure that each problem is clearly labelled. Leave plenty of space for the problems. The assignment is due in class on the above date; late homework, or homework dropped off in mailboxes, will not be accepted. See the Course Information Sheet for the policy on "excused" homework.
- **Write-up:** Solutions, rather than answers, are required. An answer alone will not earn credit. The solutions must be written up in a clear, logical manner, using correct mathematical terminology and notation, and any key steps explained. **See below for any specific instructions on the write-up.**
- **Getting help:** Open House hours are 5 pm Tuesdays (NEW!), Wednesdays, and Thursdays in 159 Altgeld (or an adjacent room in case 159 is taken). I'll stay as long as someone is there. The Open House is intended as informal get-together and office hour for students in my classes. Take advantage of this opportunity!
- **Group work policy:** Work on the problems with another student or in a small group is fine and, indeed, encouraged, **provided** (i) you write up solutions yourself, using your own words, and (ii) you indicate the names of the student(s) you worked with on the cover sheet.
- **Write-up for combinatorial problems:** Most problems have a numerical answer (such as $15,600$ or $63,273,600$). These numerical answers are the result of multiplying out "raw" counts like $26 \cdot 25 \cdot 24$ or $26^6 + 26^6 - 26^4$. Leave your answers in the latter, "raw", form, rather than getting a numerical answer. **For grading purposes, a numerical answer is irrelevant, and a numerical answer alone will not earn credit. You must show how you arrived at your answer, for example, using a notation such as $\underbrace{26 \cdot 26}_{\text{2 letters}} \cdot \underbrace{10 \cdot 10 \cdot 10}_{\text{3 digits}}$. or a brief explanation such as "5 types of donuts" or "pick 2 suits out of 4".**

Problems (from Rosen, 6th Edition)

1. 5.5: 8
2. 5.5: 10(a)(c)
3. 5.5: 12 (Compare to 11)
4. 5.5: 14
5. 5.5: 16(a)(b)
6. 5.5: 20
7. 5.5: 26 (Compare to 25)
8. 5.5: 30 (Compare to 31)
9. 5.5: 32
10. 5.5: 46 (see hint given)
11. 6.1: 10–20 (all **except** 19)
12. 6.1: 26(a)
13. 6.1: 27(a)
14. 6.1: 30
15. 6.1: 36, 37

See back of page for instructions

[1] If you worked with another student or in a small group on this assignment, list the names of all students involved.

Instructions and tips

1. **Problems from 5.5:** Most of these are problems of the same type as the various donut counting problems covered in class last week. Two of the problems (30 and 32) are word counting problems involving repeated letters; these can be done either by picking slots for the various letters (as in the ILLINI example worked out in class about a week ago), or by using the method of Example 7 in the book.

2. **Problems from 6.1:** These problems are phrased as probability questions, but they all boil down to combinatorial questions that require the techniques from Chapter 5 in order to get the appropriate counts, $\#S$, the total number of outcomes, and $\#E$, the number of outcomes in the event we are interested in. Getting $\#S$ is usually very easy, so the main focus should be on correctly working out $\#E$. **The latter is a purely combinatorial problem and should done in the same manner as the combinatorial questions from the last two hw assignments.** In particular:

   - Leave answers in "raw" form, such as $\binom{13}{3} \cdot 4^6/13!$. Use binomial coefficient and factorial notation (e.g., $\binom{13}{3}$ or $13!/10!$) for your answers rather than the $C(n,k)$ and $P(n,k)$ notations.
   - Numerical answers will not be taken into account when grading, so you need **not** work out numerical values, except to satisfy your own curiosity or check answers against those in the back of the book.
   - Provide brief explanations for each of the various components of your answer come from, as in the class examples or the hw solutions . For example, you can use an annotation such as $\underbrace{26 \cdot 26}_{\text{2 letters}} \cdot \underbrace{10 \cdot 10 \cdot 10}_{\text{3 digits}}$. or "bubble" in an explanation (e.g., "pick 2 suits out of 4") pointing to the appropriate quantity.

3. **Problem 36, 37 from 6.1:** These problems ask which of two probabilities is larger. The only way to decide these questions, is to work out the probabilities in question explicitly, in the same way as the other problems from this section, namely as a ratio $\#E/\#S$, of counts of outcomes. The two problems differ only in the numbers involved (8 versus 9), so it's enough to give full explanations in only one case, but work out numerical values for both cases.

4. **Poker problems:** The first group of problems from 6.1 (Problems 10–18, 20) deal with poker probabilities. In all of these problems, the denominator in the probability asked is the same, namely, $\binom{52}{5}$, the total number of poker hands, so it remains to find the numerator, the count of the number of poker hands that satisfy the given conditions. In most cases, these counts are easy quickies, but you should still be careful in order not to overlook something. If you want, compare your answers against the numerical values of these probabilities; for grading purposes, however, only the "raw" answers count.

5. **"Twin" problems:** Some of the problems from 5.5 have odd-numbered "twins", which are problems of exactly the same type, except for different numbers. These twin problems, indicated in parentheses on the problem sheet, have answers/solutions in the back of the book. If you get stuck on an assigned problem, look up the corresponding twin. (The twin problems are not to be turned in.)