Assignment #2 — Due Wednesday, September 17, 2008, by 5:00 P.M.

Turn in homework in lecture, discussion, or your TA’s mailbox. Please circle the discussion section you expect to attend to pick up this assignment.

311: Monday 1:20–2:10        312: Monday 12:05–12:55

• Please see the syllabus for the course policy homework assignments:
  – There are severe penalties for late work.
  – Your work must be clear and well-organized with all problems in order.
  – Grading is on a 0 to 4 point scale. (Think of each assignment as getting an A, B, C, D, or F and a corresponding number of points from 4 down to 0.)

1. Exercise 1.3.6.

2. Suppose we roll 12 fair six-sided dice.
   (a) What is the probability of rolling exactly two 6’s?
   (b) What is the probability of rolling at least one 6?
   (c) What is the probability that the sum of the dice is 15?
   (d) What is the probability that the maximum of the dice is 5?

3. In a well-shuffled ordinary 52-card deck, what is the probability that in a hand of five cards:
   (a) we get four jacks (and another card)?
   (b) we get four cards of the same rank (and another card)?
   (c) we get a full house (three cards of one rank and two cards of another rank)?
   (d) we get two pairs (two cards of one rank, two cards of another rank, and another card of a different rank)?
   (e) we get a flush (all cards the same suit)?
   (f) we get no pairs?

4. Suppose we draw two cards from an ordinary 52-card deck. Cards have these point values: aces are worth one, twos through ten are worth their pip value (2–10), and face cards (jacks, queens, and kings) are worth ten.
   (a) What is the probability that the sum of the values of the two cards is exactly 17?
   (b) What is the probability that the minimum value of the two cards is five?

5. A fair coin is tossed 12 times. What is the probability that the longest run of heads is 4? *Hint: follow the example from lecture using a recursion relation.*

6. Consider the set of $1 \times 5$ tables of non-negative integers that sum to ten. Select one uniformly at random.
   (a) What is the chance of picking the table where each entry is a two?
   (b) What is the probability that the first two entries are one and that there are no zeros in the table?
7. An urn has five balls, each of a different color. Ten balls are drawn from the urn, replacing the ball and mixing well after each draw. What is the probability that each color appears exactly twice?

8. Assume that each child in a family with three children is equally likely to be a boy or a girl, independent of the sexes of other children.
   
   (a) What is the probability that at least two of the children are boys?
   (b) What is the probability that at least two children are boys given that the oldest child is a boy?
   (c) What is the probability that at least two of the children are boys given that at least one is a boy?

9. In a genetics experiment involving crossing fruit flies, a male fly is equally likely to be genetic type A or B. If the fly is type A, then all offspring in a cross with a particular female will have red eyes. If the fly is type B, then each offspring in a cross with the same female is equally likely to have red eyes or not. Suppose that in the cross, there are six offspring, and all have red eyes. Given this additional information, what is the probability that the male fly is genetic type A?

10. Three fair six-sided dice are rolled. Compute the conditional probability that the first die rolls a 1, given that the sum of the dice is six.

Work to do, but not turn in.

- Read Chapter 1, sections 3–7, and Chapter 2, sections 1–2.