Mathematics 210, Lecture 3 (Wilson) Exam I 9/20/96

Your Name: _____

- 1. There are EIGHT problems. One of them is on the back of this sheet.
- 2. Write your answers to the eight problems in the spaces provided. If you must continue an answer somewhere other than immediately after the problem statement, be sure (a) to tell where to look for the answer, and (b) to label the answer wherever it winds up. In any case, be sure to circle your final answer to each problem.
- 3. There is scratch paper at the end of the exam. We will not look there for answers unless you have said to as described in instruction 2.
- 4. You may refer to notes you have brought in on one sheet of paper, as announced in class.

BE SURE TO SHOW YOUR WORK: YOU MAY RECEIVE REDUCED OR ZERO CREDIT FOR UNSUBSTANTIATED ANSWERS.

Problem	Points	Score
1	12	
2	12	
3	12	
4	12	
5	12	
6	12	
7	12	
8	16	
TOTAL	100	

Problem 1 (12 points)

200 students are polled. Some have a TV set for watching programs, some have either a radio or a CD player for listening to music: some have both a TV set and a device for listening to music, some have one or the other only, and some have neither. The data show that:

- 69 own none of these things.
- 98 own a TV set.
- 32 own a radio.
- 39 own a CD player.
- Nobody has both a CD player and a radio.
- (a) How many students own just a TV set?

(b) If we find out that 21 students in this group have a CD player but no TV set, how many students own a radio and a TV set?

Problem 2 (12 points)

A box contains 2 red balls, 1 white ball, and 3 green ball. As an experiment we draw balls out of the box one after another and note the color: We do NOT put the balls back in the box after drawing them out. We continue until either we have drawn 2 red balls or 1 green ball. We write a sequence like "RWG" to denote drawing a red ball the first time, a white one the second time, and a green ball the last time.

(a) Draw a tree diagram for this experiment.

(b) List the elements in the sample space for this experiment.

Problem 3 (12 points)

As an experiment we flip a coin, repeating until either the coin has been flipped four times or we get the same side of the coin two times in a row. We write down a sequence like "HTT" as the outcome to represent heads followed by tails twice.

(a) List the elements in the sample space for this experiment.

(b) How many outcomes are there for this experiment?

(c) How many outcomes have 3 H's?

(d) How many outcomes have 4 T's?

Problem 4 (12 points)

We roll a die and observe which side turns up. The six-sided die is weighted so that the sides are not equally likely to turn up:

- Side 1 is just as likely as side 2.
- Sides 3, 4, 5, and 6 are all equally likely (as each other, not as 1 and 2).
- Side 1 is four times as likely to turn up as side 3.

(a) What probabilities (weights) should be assigned to the six possible outcomes?

(b) What is the probability that the outcome is 4 or more?

Problem 5 (12 points)

Four people lose their car keys at a concert. (All the keys are different.) The people come to the lost-and-found office to get their keys back. Unfortunately the keys are returned randomly to the people.

(a) In how many different ways can the keys be returned to the people?

(b) If you are one of the four people, in how many of the different ways of returning the keys do you get your own keys back?

(c) In how many different ways can the keys be returned so that 2 people get their own keys but the other 2 do not?

Problem 6 (12 points)

A box contains 9 red balls and 6 green balls. We draw out three balls chosen randomly.

(a) What is the probability that all three balls we draw are green?

(b) What is the probability that at least one of the balls we draw is red?

Problem 7 (12 points)

We roll two dice, one of them red and the other green. We note the numbers on the dice, remembering which number came from which die. Each die is a regular six-sided die and is fair, *i.e.* each of its six sides is equally likely to come up.

(a) What is the probability that the two numbers are the same?

(b) What is the probability that the product of the two numbers is 19 or more?

Problem 8 (16 points)

You win as a prize the right to pick three tickets out of a box. There are 24 tickets in the box. When you pick your tickets you have to reach into the box and draw randomly. 6 of the tickets are to a rock concert, and the remaining 18 are tickets to a folk concert. The result is your triple of tickets, for example one folk ticket and two rock tickets. The order in which they were picked does not matter.

- (a) How many different results as described are there?
- (b) Those results are not equally likely: Why?

(c) Describe a set of outcomes for the drawing which <u>are</u> equally likely.

- (d) What is the probability that all three of your tickets will be for the same concert, either all three for the folk concert or all three for the rock concert?
- (e) What is the probability that all three of your tickets will be for the rock concert?

Scratch Paper