Mathematics 305
Probability and Statistics
Exam 1

Instructor: Mark Goadrich

March 11-15, 2010

Read all questions before beginning. You will have until 24 hours from when you begin this exam to complete it, at the latest this exam is due at 8am Monday March 15th, 2009 to complete this exam. You are allowed to use your notes or textbook, but not the Internet nor Google. You are bound by the Honor Code for this exam, which you need to sign below. **Show your work on all problems for full credit.**

Score ________________________

Print Your Name ____________________________________

Honor Code

Signature ____

1) Each bag in a large box contains 25 tulip bulbs. Three-fourths of the bags contain bulbs for 10 red and 15 yellow tulips; one-fourth of the bag contains bulbs for 5 red and 20 yellow tulips. A bag is selected at random and one bulb is selected randomly and planted. Give the probability that it will produce a

Red tulip

Yellow tulip

If the tulip is red, find the conditional probability that a bag having 10 red and 15 yellow tulips was selected.

2) A biology researcher wants to know if the traits of "detached earlobes" and "color-blindness" are related. They collect data from 43 people, and obtain the following chart:

	YES	NO	Colorblind
YES	18	5	
NO	11	9	
Earlobes			43

What is the most likely distribution of the trait pairings given the marginal counts?

What is probability of finding a distribution more extreme than the one found experimentally?

3) We know that the probability of manufacturing a defective rear-view mirror for a car is 0.07. We also know further that the quality of any one mirror is independent of the quality of any other mirror. If an inspector selects mirrors at random from the production line, give the probability that the first defective mirror is the sixth mirror selected.

4) Given that the probability of experiencing a side effect from a certain flu vaccine is 0.006. If 1000 persons are inoculated, compare the results of using the Poisson distribution to estimate the probability that

At most 1 person suffers.

3, 4, or 5 persons suffer.

5) Let X be the number of students who use a computer in Wright 105 every day. Assume that X has a Poisson distribution with lambda = 5. If we let W equal the time in minutes between two student arrivals,

What is the exponential distribution for W?

Find $P(W > 6)$

6) John bets Mary \$50 that he can distinguish between Coke and Pepsi 70% of the time. To win the bet, John must correctly distinguish 14 out of 17 drinks. What is the probability of a Type I error? What is the probability of a Type II error? Is there a better bet that could be made out of 17 drinks that will minimize the sum of both errors and be fairer for both John and Mary?