Name: \_\_\_\_\_

Group \_\_\_\_\_

1) In a certain city, 30% of the people are Conservatives, 50% are Liberals, and 20% are Independents. Records show that in a particular election, 65% of the Conservatives voted, 82% of the Liberals voted, and 50% of the Independents voted. If a person in the city is selected at random and it is learned that she did not vote in the last election, what is the probability that she is Liberal?

2) A diagnostic test for a certain disease has a 99% sensitivity and a 95% specificity. Only 1% of the population has the disease in question. If the diagnostic test reports that a person chosen at random from the population tests positive, what is the probability that the person does, in fact, have the disease? Using this information, if you tested positive for a rare disease, what should you do?

Specificity = P(negative test | person does not have the disease).

Sensitivity = P(positive test | person has the disease).

3) Using Pólya's Urn, with r red balls, b black balls and c = 2, what is the probability that you have 2 black balls when you have drawn 3 balls total?

4) a) For the following problem, assume that each switch is independently closed or open with probability p and 1 - p, respectively. Note: The answer should include 'p'. In the figure below, there are 4 switches labeled 1, 2, 3 and 4. If a signal is fed to the input, what is the probability that it is transmitted to the output?



b) If a circuit is composed only of n independent parallel components each with a probability of p of being closed, then what is the probability that, at a specified time, the system is working?

5. It is estimated that 82% of homes have working smoke detectors. On average, 22% of fires result in fatalities, but the presence of a working smoke detector cuts the risk to just 7%.

a) If a random fire resulted in a fatality, what is the probability that the house had a working smoke detector?

b) In homes without a working smoke detector, what is the risk of fatalities?

6. In the Department of Mathematical and Computational Science, 83% of lecture halls have chalkboards, and the other 17% have dry-erase boards. Of the classes taught in rooms with chalkboards, 75% are mathematics courses, 15% are computer science courses, and 10% are statistics courses. Of the classes taught in rooms with dry-erase boards, 65% are computer science courses, 8% are mathematics courses, and 27% are statistics courses. What percent of courses at the college are mathematics or statistics? List three numbers which could have been calculated from the rest of the information in the problem.

7. Twenty percent of students will participate in an Honors course this semester. Students who have an Honors course on their schedule are known to have 99% chance of fully enjoying their semester. Students who are not in an Honors course during the semester have only a 30% chance of fully enjoying their semester. With these assumptions, if a randomly chosen student is fully enjoying his semester, what is the probability that he has an Honors course on this schedule?

8. Students are given three chances to pass a basic skills exam for permission to enroll in Calculus I. Sixty percent of the students pass on the first try; of those that fail on the first try, 54% pass on the second try; and of those remaining, 48% pass on the third try.

a) What is the probability that a student passes on the second try?

b) What is the probability that a student passes on the third try?

c) What percentage of students pass?

9. You have Pôlya's Urn with r red balls, b black balls and c to be returned with each draw. When you draw 2 balls, determine the probability that

a) the second ball drawn is red. Work this out mathematically. Hint: What do you think the answer should be?

b) the first ball drawn is red, given that the second ball drawn is red.

10. Each component in the system shown below will work with probability 0.9 independently of the other components. What is the probability that system will work?"

