

COT 3100 Recitation: Probability 1 Problems

Set #1

- 1) Disease A occurs in 0.1% of the population. If a person does NOT have the disease and takes a test for the disease, the test correctly indicates that they don't have the disease 96% of the time. If a person has the disease and takes the same test, the test correctly indicates that they do have the disease 98% of the time. Given that you've taken the test and have tested positive for disease A, what is the probability you actually have disease A? Given that you've taken the test and have tested negative for disease A, what is the chance that you have the disease anyway?
- 2) Anderson gets 80% of the multiple choice questions in COT 3100 he answers. Given a set of 15 questions, what is the chance that he gets at least 13 of them? Write your answer using combinations and then use a calculator to get a decimal approximation for it.
- 3) If A and B are events and $p(A) = 4/9$, $p(A \cap B) = 2/5$, $p(A | B) = 1/2$ calculate $p(B)$, $p(B|A)$ and $p(B | \bar{A})$, are A and B independent? Mutually exclusive?
- 4) Bob has been chosen for a half-time promotion at a local basketball game. He will take as many three point shots as he can in 60 seconds. If he makes at least two of the shots, he wins \$1000. After some practice, Bob knows that he'll get off 9 shots in the given time and that he chance of making an single shot is 20%. What is the expected value of Bob's prize for this promotion?

Set #2

- 1) Consider a variant of the Monty Hall Problem with n doors and 1 car behind a single door and goats behind the rest, where k ($k < n-1$) doors are revealed before you choose whether or not to switch. What is the probability of winning if you stay? What is the probability of winning if you switch?
- 2) A factory manufactured 1,000,000 cell phones in 2012, of which 20,000 were defective. In the factory there are two assembly lines, A and B, responsible for manufacturing all of the phones. Assembly line A manufactured 200,000 phones total and assembly line B manufactured 12,000 defective cell phones. Determine the following probabilities:
 - a) Given that a cell phone was manufactured in assembly line A, what is the probability that it is defective? Give your answer as a percentage.
 - b) Given that a cell phone was manufactured in assembly line B, what is the probability that it is defective? Give your answer as a percentage.
- 3) A bag of popping corn contains $2/7$ white kernels and $5/7$ yellow kernels. Only $2/5$ of the white kernels will pop, whereas $5/9$ of the yellow ones will pop. A kernel is selected at random from the bag, and pops when placed in the popper. What is the probability that the kernel selected was white?
- 4) Mikey is taking a matching quiz with 4 items on it. Unfortunately, Mikey didn't study and he completely guesses the answers, knowing that each of the four words will match to a different definition of the four given. What is the chance that Mikey gets all four definitions incorrect? What is the chance that he gets precisely 3 of the definitions correct? (We assume he matches each word to a unique definition listed.)