

**COT 3100 Recitation #8: Probability**  
**11/6-9/2017**

**Warm-Up Problems**

- 1) One thousand unit cubes are put together into a  $10 \times 10 \times 10$  cube and the surface of this  $10 \times 10 \times 10$  cube is painted. Then, the unit cubes are pulled apart. How many of the 1000 unit cubes have at least one face painted?
- 2) A cowboy is 4 miles south of a stream that flows due east. He is also 8 miles west and 7 miles north of his cabin. He wishes to take his horse to the stream to drink water and then return to his cabin. What's the minimum distance he can travel to accomplish this task?
- 3) Two boys start moving from the same point A on a circular track but in opposite directions. Their speeds are 5 ft/sec and 9 ft/sec, respectively. If they start at the same time and finish when the first meet at point A again, how many times will they meet, excluding the start and finish?
- 4) When one ounce of water is added to a mixture of acid and water, the resulting mixture is 20% acid. When one ounce of acid is added to this new mixture, the resulting mixture is  $\frac{1}{3}$  acid. What is the percentage of acid in the original mixture?
- 5) A plane flew straight against a wind between two towns in 84 minutes and returned with that wind in 9 minutes less than it would have taken in still air. What are the two possible durations of the return trip, in minutes?

**Probability Problems**

- 6) 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?
- 7) 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.
- 8) If A and B are events and  $p(A) = \frac{4}{9}$ ,  $p(A \cap B) = \frac{2}{5}$ ,  $p(A | B) = \frac{1}{2}$  calculate  $p(B)$ ,  $p(B|A)$  and  $p(B | \bar{A})$ , are A and B independent? Mutually exclusive?
- 9) A bag of popping corn contains  $\frac{2}{7}$  white kernels and  $\frac{5}{7}$  yellow kernels. Only  $\frac{2}{5}$  of the white kernels will pop, whereas  $\frac{5}{9}$  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?
- 10) 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 a single shot is 20%. What is the expected value of Bob's prize for this promotion?