

Math 340
Fall 09
Dr. Sethuraman
HW 3
Due Monday Oct 5th

1. Problem 6, Page 91, §2.1 of the text.
2. A chromosome mutation believed to be linked to color blindness is known to occur, on an average, once every 10,000 births. If 20,000 babies are born this year in a certain city, what is the probability that at least one will develop color blindness? First answer this as a problem on Binomial trials (but don't try to compute your answer, just write down a suitable formula). Next, compute an approximate answer using a Poisson distribution.
3. Given 400 people, estimate the probability that 3 or more will have their birthdays on July 4th. First answer this as a problem on Binomial trials (but don't try to compute your answer, just write down a suitable formula). Next, compute an approximate answer using a Poisson distribution.
4. A man claims to have extra sensory perception (ESP). As a test, a fair coin is flipped 10 times, and the man is asked to predict the outcome in advance. He gets 7 of the 10 correct. What is the probability that he would have done at least this well if he had no ESP?
5. Suppose when in flight, airplane engines will fail in flight with probability $1 - p$, independently from engine to engine. If an airplane needs a majority of its engines to be operational to make a successful flight, for what values of p is a 5-engine plane preferable to a 3-engine plane?
6. In some military courts, 9 judges are appointed. However both the prosecution and the defense attorneys are entitled to a peremptory challenge of any judge, in which case, that judge is removed and not replaced. A defendant is declared guilty if a majority of the judges present cast votes of guilty, and is declared innocent otherwise. Suppose that when the defendant is in fact guilty, each judge will (independently) vote guilty with probability 0.7, whereas when the defendant is in fact innocent, each judge will (independently) vote innocent with probability 0.3.

OVER

- (a) What is the probability that a guilty defendant is declared guilty when there are 9 judges present?
- (b) If the prosecution attorney does not exercise the right to a peremptory challenge of a judge and if the defense is limited to at most two such challenges, how many challenges should a defense attorney make if he or she is 60% sure that the client is guilty?