

Practice Exam 2: Math 362

1. Suppose that a jury will vote to convict with probability .001 if a defendant is innocent and will vote to convict with probability .99 if the defendant is guilty. If 80% of the defendants who go to trial are guilty find the probability that justice is served in a jury trial (one who is innocent is acquitted, one who is guilty is convicted).
2. Suppose that a four engine airplane has engines that fail independently with probability .01 on a five hour flight. If the plane can fly with 2 or fewer engine failures find the probability that there is a catastrophic failure in a five hour flight (three or more engine failures).
3. Suppose that a rather dull roulette player always places a \$1 bet on red. If red comes up she wins an additional \$1; otherwise she loses the \$1 wager. Suppose the probability of red coming up is $\frac{18}{38} = \frac{9}{19}$ and the player decides to play until she has won exactly 10 times. What is the probability that she comes out ahead? You can use R if you want.
4. In the past 4 years there were 200 motor vehicle accidents at the intersection of Speedway Blvd and Campbell Ave making for an average of 50 per year. Suppose that the number of accidents at that intersection each day is a Poisson random variable with parameter $\lambda = \frac{50}{365}$. What is the probability that a week goes by without an accident at Speedway and Campbell?
5. Suppose that a fair coin is flipped 1000 times. Use Tchebysheff's inequality to estimate the probability that the number of heads is less than 400 or more than 600. Use R to find the probability that the number of heads is between 400 and 600 (the complementary event), and compare the estimate with the calculated value.