Math 2210
Examples involving the Binomial Distribution

0. You throw a fair coin 50 times.
   a. What is the probability the coin lands heads exactly 25 times?
   b. What is the probability the coin lands heads 20 times or less?

1. NASA has stated that there is about a 1% probability of a catastrophic accident occurring during any given space shuttle mission. To date, there have been 116 shuttle missions. Using NASA's estimate, compute the probability of having 2 or more catastrophic accidents during these 116 missions. Assume each mission is independent.

2. A company believes that approximately 5% of the items made on its assembly line contain some sort of defect. The company samples 200 items made on its assembly line at random.
   a. What is the probability that 20 or more of the items are defective? Assume independence.
   b. Suppose the company pulled 200 products at random from the assembly line and found 20 of them to be defective. Would you question whether the 'true' defect rate was actually 5%? Explain.

3. In 1941, at the age of 22, Ted Williams managed to reach base successfully during 55.3% of his times at bat. Suppose that in a given week, old Ted batted 30 times. If X = the number of times he successfully reached base during these 30 'trials', find the mean and standard deviation of X. Suppose each at bat is independent.

4. It has been estimated that about 25% of potential jurors will find some excuse to shirk jury duty when called upon. Suppose that a court needs to assemble 12 (independent) jurors.
   a. When sending out summonses, the court wants to be 99% certain that 12 or more people will show up. How many people would thus have to be summoned for jury duty?
   b. Same question, with "99.9%" in lieu of "99%".