Homework 15: The Poisson Distribution

1. If $P(H) = 0.03$, then the probability of 2 Heads in 1000 tosses is $\binom{1000}{2}(.03)^2(.97)^{998}$. What is the Poisson approximation to this answer? Compare with the exact probability.

2. Astronomers estimate that as many as one hundred billion stars in the Milky Way galaxy are encircled by planets. Let p denote the probability that any such solar system contains intelligent life. Use the Poisson distribution to estimate how small p can be and still give a fifty-fifty chance that we are not alone.

3. A town in Alaska has one earthquake every 8 months, on average.

   (a) What is the probability that the town has fewer than 3 earthquakes next year?

   (b) What is the probability that the town has exactly 4 earthquakes in the next six years?

4. Records show that on average there are four deaths every 50 days among residents of a large nursing home. What is the probability that there will be exactly five deaths in the next 80 days?

5. Five hundred people are attending the first annual "I Was Hit by Lightning" club. Approximate the probability that at most two of the five hundred were born on Poisson's birthday.