1. A conference organizer is planning a meal. There are 5200 attendees at the conference, but each person has a 20% chance of skipping the meal. (Assume that the people’s behaviors are independent.)

1a. The number of attendees is a Binomial random variable. Write down an expression for the probability that at least 4200 people attend the meal. You do not need to calculate the probability itself.

1b. Use a Normal approximation to calculate the (approximate) probability that at least 4200 people attend the meal.

2. Consider a Gamma random variable with parameters $r = 1200$ and $\lambda = 1/3$. Approximate the probability that this Gamma random variable exceeds 3500. (Hint: This Gamma random variable has the same distribution as the sum of 1200 Exponential random variables, each with $\lambda = 1/3$.)

3. Suppose that the number of Roseate Spoonbills (a very rare bird in Indiana) that fly overhead in 1 hour has a Poisson distribution with mean 2. Also suppose that the number of Roseate Spoonbills is independent from hour to hour (e.g., the number of birds between noon and 1 PM does not affect the number of birds between 1 PM and 2 PM, etc.). Assume that a digital video camera tracks the sky overhead for 24 hours.

3a. Let $X$ denote the number of Roseate Spoonbills that fly overhead during that 24 hour period. What kind of distribution does $X$ actually have? What is/are the parameter(s)?

3b. Use a Normal random variable to approximate the probability that at least 45 Roseate Spoonbills fly overhead during that 24 hour period.

4. The Jelly Belly factory claims that it produces 1,250,000 beans per hour, on this website: http://news.jellybelly.com/brand-fact-sheet-jelly-belly-jelly-beans

Suppose that the number of beans produced per hour is a Poisson random variable with mean 1,250,000. Therefore it is reasonable to assume that the number of beans produced in one minute is a Poisson random variable with mean 20833.33.

4a. Write down an exact formula for the probability that the number of jelly beans produced during the next 1 minute is between 20800 and 20900 (inclusive). You do not need to simplify or approximate this probability.

4b. Use a Normal approximation to estimate the probability that the number of jelly beans produced during the next 1 minute is between 20800 and 20900 (inclusive).