1. A satellite system consists of n components, and it functions on any given day if at least k of the n components function on that day. On a rainy day each of the components independently functions with probability p_1, whereas on a dry day they each independently function with probability p_2. If the probability of rain tomorrow is α, what is the probability that the satellite system will function?

2. It is known that diskettes produced by a certain company will be defective with probability 0.01, independently of each other. The company sells the diskettes in packages of size 10 and offers a money-back guarantee that at most 1 of the 10 diskeettes in the package will be defective. The guarantee is that the customer can return the entire package of diskettes if he or she finds more than one defective diskette in it. If someone buys 3 packages, what is the probability that he or she will return exactly 1 of them.

3. Suppose that the average number of cars abandoned weekly on a certain highway is 2.2. Approximate the probability that there will be

   (a) no abandoned cars in the next week;

   (b) at least 2 abandoned cars in the next week.

4. Compare the Poisson approximation with the correct binomial probability for the following cases:

   (a) $P\{X = 2\}$ when $n = 8$, $p = 0.1$;

   (b) $P\{X = 9\}$ when $n = 10$, $p = 0.95$;

   (c) $P\{X = 0\}$ when $n = 10$, $p = 0.1$;

   (d) $P\{X = 4\}$ when $n = 9$, $p = 0.2$.

5. The probability of being dealt a full house in a hand of poker is approximately 0.0014. Find an approximation for the probability that, in 1000 hands of poker, you will be dealt at least 2 full houses.

6. People enter a gambling casino at a rate of 1 every 2 minutes.

   (a) What is the probability that no one enters between 12:00 and 12:05?

   (b) What is the probability that at least 4 peopl enter the casino during that time?

7. Consider a roulette wheel consisting of 38 numbers 1 through 36, 0, and double 0. If Smith always bets that the outcome will be one of the numbers 1 through 12, what is the probability that

   (a) Smith will lose his first 5 bets;

   (b) his first win will occur on his fourth bet?

8. An interviewer is given a list of people she can interview. If the interviewer needs to interview 5 people, and if each person (independently) agrees to be interviewed with probability $\frac{2}{3}$, what is the probability that her list of people wil enable her to obtain her necessary number of interviews if the list consists of (a) 5 people and (b) 8 people? For part (b), what is the probability that the interviewer will speak to exactly (c) 6 people and (d) 7 people on the list?

9. Find Var(X) if
$$P(X = a) = p = 1 - P(X = b)\,.$$

10. Let X be a Poisson random variable with parameter λ. Show that
$$P\{X \text{ is even}\} = \frac{1}{2}\left[1 + e^{-2\lambda}\right]$$
directly, by making use of the expansion of $e^{-\lambda} + e^{\lambda}$.