Ch 4.5 Poisson Distribution

1. The National Fire Protection Association reports that the number of forest fires reported per week in one national park follows a Poisson distribution with $\mu = 4$. What is the probability that the number of forest fires reported in this national park in a given week will be less than or equal to 2?

2. According to the *Statistical Abstract of the U.S. 1989*, p. 493, there were an average of 67.6 bank failures per year among FDIC banks during the period 1978–1987. Assume that for one particular region, the number of bank failures can be approximated by a Poisson distribution whose mean μ is 8. What is the probability that the number of bank failures will be less than or equal to 4 for this region?
3. A helicopter pilot on traffic patrol in Los Angeles claims that the number of car breakdowns occurring per morning drive-to-work period follows a Poisson distribution with an average of five per period. What is the probability that in a particular morning drive-to-work period
   a. there will be at most two car breakdowns?
   b. there will be at least two car breakdowns?
   c. there will be exactly two car breakdowns?

4. One software developer has established a toll-free support hotline for customers to call when they have problems with the software. After several years of operation, the software developer finds that the number of customers using the hotline follows a Poisson process with an average of seven calls per hour. What is the probability that on a particular workday, the hotline will receive
   a. at least three calls per hour?
   b. at most three calls per hour?
   c. exactly three calls per hour?
5. One study finds that the average annual rate of suicides on U.S. college campuses is 1 in 10,000 students, or about 0.0001. If a typical U.S. college with 15,000 students is randomly selected, what is the probability that there will be at least two suicides on this campus? (Assume that the Poisson distribution is applicable with $\mu = 1500\ (0.0001) = 15$.)
6. The Marvo Insurance Company finds that the average number of auto accident claims involving uninsured motorists filed against the company is two per day. Assuming a Poisson process, what is the probability that on any given day
   a. no claim involving an uninsured motorist will be filed against the company?
   b. at most two claims involving an uninsured motorist will be filed against the company?
   c. at least two claims involving an uninsured motorist will be filed against the company?
7. Police department officials indicate that the average number of homicides per day in New York City is 5.4. Assuming a Poisson process, what is the probability that on any given day there will be
   a. at most four homicides?
   b. exactly four homicides?
8. One large fast-food chain receives an average of four complaints per day at its corporate headquarters. Assuming that the number of complaints received may be represented by a Poisson process, what is the probability that no complaints will be received on the next two business days?

9. The probability that a nurse at Brooks Hospital will call in sick on any day is 0.002. What is the probability that at most three of the hospital's 2400 nurses will call in sick on any particular day? (*Hint:* Assume a Poisson process with $\mu = 2400 \times 0.002 = 4.8$)
10. The average number of coliform bacteria found in one polluted lake follows a Poisson distribution with an average of four bacteria per square centimeter. What is the probability that at most two bacteria per square centimeter will be found?
11. Marcy Ovington is the director of the Social Services agency for one city. She receives an average of five complaints a day about lack of child support by the other parent. Assuming that the number of lack of child support claims received follows a Poisson distribution, what is the probability that on any day, Marcy's agency will receive
    a. at least three lack of child support claims?
    b. at most three lack of child support claims?
    c. exactly three lack of child support claims?
    d. between two and four lack of child support claims?
12. A video store owner finds that the demand for one particular video has been following a Poisson distribution with $\mu = 5$. How large a stock of videos should the owner have on hand so as to be able to supply the customer demand with a probability of at least 0.90?