Models for Counts
COR1-GB.1305 – Statistics and Data Analysis

Binomial Random Variables

1. A certain coin has a 25% of landing heads, and a 75% chance of landing tails.
   (a) If you flip the coin 4 times, what is the chance of getting exactly 2 heads?

   (b) If you flip the coin 10 times, what is the chance of getting exactly 2 heads?

2. Suppose that you are rolling a die eight times. Find the probability that the face with two spots comes up exactly twice.

3. The probability is 0.04 that a person reached on a "cold call" by a telemarketer will make a purchase. If the telemarketer calls 40 people, what is the probability that at least one sale with result?

4. A new restaurant opening in Greenwich village has a 30% chance of survival during their first year. If 16 restaurants open this year, find the probability that exactly 3 restaurants survive.

5. The probability of winning at a certain game is 0.10. If you play the game 10 times, what is the probability that you win at most once?

6. The probability is 0.3 that an audit of a retail business will turn up irregularities in the collection of state sales tax. If 16 retail businesses are audited, find the probability that

   (a) fewer than 3 will have irregularities in the collection of state sales tax.

   (b) more than 3 will have irregularities in the collection of state sales tax.

Poisson Random Variables

7. The number of calls arriving at the Swampside Police Station follows a Poisson distribution with rate 4.6/hour.
   (a) What is the probability that exactly six calls will come between 8:00 p.m. and 9:00 p.m.?

   (b) Find the probability that exactly 7 calls will come between 9:00 p.m. and 10:30 p.m.

8. Car accidents occur at a particular intersection in the city at a rate of about 2/year.
   (a) Estimate the probability of no accidents occurring in a 6-month period.

   (b) Estimate the probability of two or more accidents occurring in a year.

Empirical Rule with Binomial and Poisson Random Variables

9. If you flip a fair coin 100 times, would it be unusual to get 42 heads and 58 tails?

10. If X is a Poisson random variable with $\lambda = 225$, would it be unusual to get a value of X which is less than 190?

11. The probability is 0.10 that a person reached on a "cold call" by a telemarketer will make a purchase. If the telemarketer calls 200 people, would it be unusual for them to get 30 purchases?