Poisson / Empirical Rule Approximations / Hypergeometric STAT-UB.0103 – Statistics for Business Control and Regression Models

Binomial random variables (Review)

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

2. 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.

3. 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?

- 4. 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 5 will have irregularities in the collection of state sales tax.

(b) more than 5 will have irregularities in the collection of state sales tax.

Poisson random variables

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

6. In the station from Problem 5, find the probability that exactly 7 calls will come between 9:00 p.m. and 10:30 p.m.

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

8. In the intersection from Problem 7, 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?

Hypergeometric random variables

12. If we draw 5 cards from a 52-card deck, what is the probability of getting exactly 2 aces?

13. Suppose that a shipment of 100 fruit crates has 11 crates in which the fruit shows signs of spoilage. A quality control inspection selects 8 crates at random, opens these selected crates, and then counts the number (out of 8) in which the fruit shows signs of spoilage. What is the probability that exactly two crates in the sample show signs of spoilage?

14. There are 70 students in enrolled in a course: 40 freshman, 20 sophomores, and 10 juniors. If you randomly select a group of 4 students, what is the probability of getting all freshman?