# 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?
