Distribution Exercises

Discrete Distribution (demonstration)

A game of chance is played by spinning a wheel and paying the amount that comes up. There are four possible outcomes:

x	p(x)
$1	0.50
$2	0.30
$5	0.15
$10	??

a) What is the probability that $10 comes up?

b) What is the expected value of this game?

Taking a shot

A basketball player is practicing 3-pointers. The probability that she successfully scores each shot is 4/5.

a) What is the expected value of the points will she have scored after 100 shots? (Don't forget that each successful shot is 3 points.)

b) What is the probability that she misses exactly 20 of the 100 shots ?

c) What is the probability that the number of successful shots out of the 100 attempts is greater than 90? Between 50 and 60, inclusive?

d) Plot the probability mass function and the CDF for the distribution

Holo Holo Clothing

On average, the Holo Holo clothing store sells five hand painted Hawaiian shirts a day.

- What is the probability of selling exactly three shirts today?
- What is the probability of selling more then 8 shirts in a day?
- What is the probability of selling less than 3 shirts ina day?
- What is the median number of shirts sold per day?

Note to self: 97% yields are losers

Parts are produced by a machine that has a 3% defect rate. To find defects, finished parts are drawn at random one at a time and inspected.

a) What is the probability that the first defective part is the fifth item inspected?

b) What is the probability that the first defect is found in the first 10 parts inspected?

c) What is the probability that the first defect is found after 20 parts have been inspected?

d) What is the median of the distribution of defective parts? What is the IQR?

e) Draw a box plot for the distribution of defective parts.

Hypergeometric Distribution

A deck of cards contains 20 cards: 6 red cards and 14 black cards. 5 cards are drawn randomly *without replacement*.

a) What is the probability that exactly 4 red cards are drawn?

b) What is the probability that at least 2 black cards are drawn?

c) What is the probability that less than 3 red cards are drawn?

Highway 61 Revisited

You are revisting Highway 61 where the speed of cars is normally distributed with a mean speed of 65 mph and standard deviation of 4 mph. The speed of cars on the highway is measured at random with a radar gun operated by Officer Dylan.

a) Find the probability that the measured speed of a car is less than 60 mph.

b) What is the probability that the measured speed of a car is between 60 mph and 70 mph?

c) If car speeds are mutually independent, what is the probability that three cars in a row are driving at speeds in excess of 70 mph? Is independence a reasonable assumption?

Acme

Acme Custom Circuits sells three FPGAs that have been programmed to support three different bands on a Software Defined Radio device that Acme supplies to hobbiests. Acme's code works well, but the FPGAs have an average life of only 300 hours with a standard deviation of 10 hours. FPGA lifetimes are normally distributed and are independent of each other.

- If a customer buys three FPGAs from Acme, what is the probability that at least one of the parts last at least 290 hours?
- What is the 95% confidence interval for the lifetime of a single FPGA drawn at random?

Fatal Attraction, Inc

- Fatal Attraction, Inc. makes bargain-priced slack lines. The defect rate for the slack lines is 3 defects per 1000 feet, which adds to the thrill of the sport. You are planning to slackline across a famous ravine -- a demonstration of your slacklining skill and lack of forethought. You need a 1200-foot slackline which you have bought at a very competitive price from Fatal Attraction.
- What is the probability that your slackline will be defect-free?
- Plot the distribution of defects in a 1200-foot slackline
- What is the probability that your slackline will have more than 5 defects?