Numerical Analysis, Statistical Probability →

Two types of distribution, Discrete and Continuous. Think of discrete as 'number of children in household' and continuous as 'time taken to respond to question'. Discrete is finite, whereas continuous is infinite. This is the main distinction to think of.

There are 3 types of discrete probability distributions:

1. Binomial
2. Poisson
3. Hypergeometric

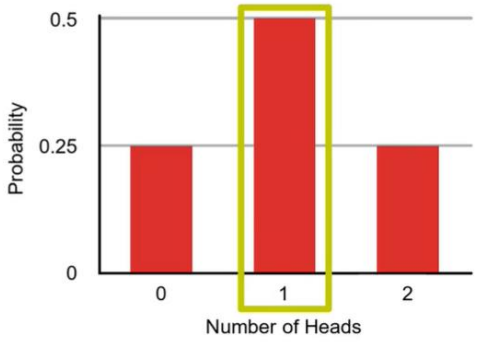
Binomial –

1. Fixed number of events, e.g. yes or no, 'success' and 'failure';
2. Events are independent;
3. Events can be repeated using identical conditions.

For Example

Number of Heads	Probability
0	1/4
1	1/2
2	1/4

Outcome	First Flip	Second Flip
1	Heads	Heads
2	Heads	Tails
3	Tails	Heads
4	Tails	Tails



Poisson – The poisson distribution can be used to calculate the probabilities of various number of "successes" based on the mean number of successes. (e.g. Police called out an average of 8 times on a Friday, probability of police receiving only 4 calls).

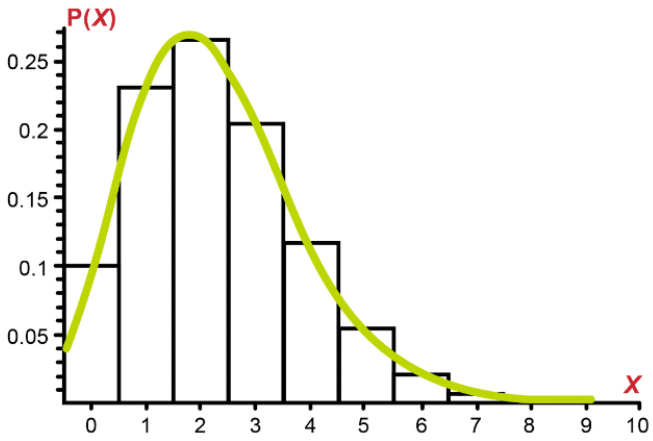
Formula for Poisson Probability Distributions

Here is the formula for the probability distribution. *p* is probability of a "success" where:

$$p = \frac{e^{-\mu}\ \mu^{x}}{x!}$$

We have μ referring to the mean of “successes”. Then, e is the natural logarithm, followed by X for the number of “successes”.

Graph of the Poisson Distribution



Hypergeometric-

The hypergeometric distribution is used to calculate probabilities when sampling without replacement. It’s used frequently in Poker, when calculating the probability with a deck of cards.

$$p = \frac{({}_{k}C_{x})(({}_{N-k}C_{(n-x)})}{{}_{N}C_{n}}$$

X is the number of successes in the Sample

K is number of successes in the population

N is for Population, n is for sample.

Combination of K things, taken X at a time

What is the probability that exactly two of the sampled cards will be aces?

$$n = 3$$

$$p = \frac{({}_4C_2)(({}_{52-4})C_{(3-2)})}{{}_{52}C_3}$$

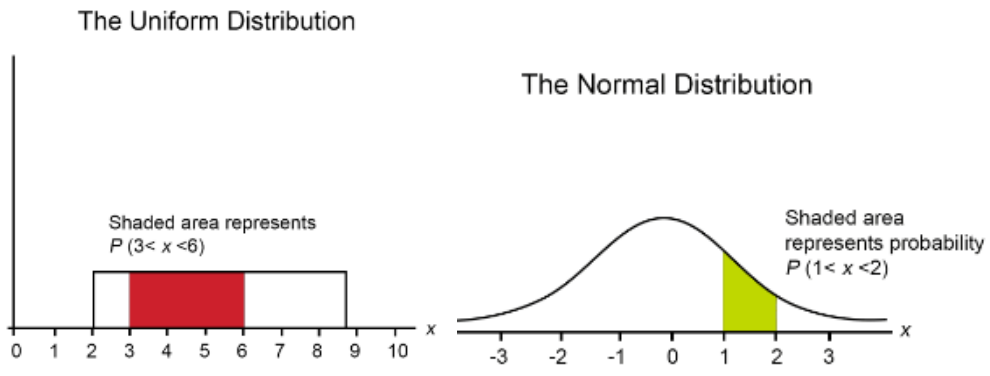
So in a 52 card deck , there a 4 aces, and in our case, we'll be finding the probability of drawing 2 aces from 3 draws (e.g. n=3).

$$p = \frac{\frac{4!}{2!2!}\frac{48!}{47!1!}}{\frac{52!}{49!3!}} = 0.013$$

You get a probability of 1.3% for drawing two aces from a sample of 3 turns.

Continuous Probability-

As discussed at the start, Continuous Probability is infinite. The two examples of continuous probability are; Uniform Distribution and the Normal Distribution.



Uniform Distribution – The distribution that has constant probability.

Normal Distribution - The most common probability distribution for describing a continuous random variable is the normal probability distribution, with a bell-shaped curve.

You also have **Exponential Distribution**, which can show positive/negative distribution for events such as; Battery life, population rises.