Statistics is the science that deals with the collection and obtention of data and of its subsequent treatment in order to express it numerically in order to draw conclusions.

The first statistical studies were demographic so a large part of the vocabulary has been preserved.

1. Population : the group on which the statistical study will be based.
2. Individual

An experiment can be modeled with a binomial distribution whenever :

1. There are only two possible events resulting from the experiment : A, $\bar{A}$ (success and defeat).
2. The probability of every event A, $\bar{A}$ are the same in any happening of the experiment (p and q = 1 – p, respectively). Namely if a coin is flipped several times, the probability of having 'heads' does not change.
3. Any realization of the experiment is independent from the rest.

A binomial random variable will give the number of successes when having happened a certain number of experiments.

It turns out to useful to analyze the number of times that 'heads' is obtained when flipping a coin n times.

The binomial distribution is usually represented by B(n,p), with :

1. n : number of happenings of the random experiment.
2. P : probability of success in doing an experiment.

So if we want to study the binomial distribution that models 10 flips of a coin (in which the 'heads' and 'tails' are equally probable) we have :

B(10, ½)

The probability function of the binomial distribution is :

$$p(X = k) = \binom{n}{k} p^k \cdot q^{n-k}$$

1. n : number of experiments
2. k : number of success
3. p : success probability
4. q : defeat probability

The combinatorial number is defined :

$$\binom{n}{k} = \frac{n!}{k!(n-k)}$$

Calculate the probability of obtaining 8 'heads' when flipping a coin ten times.

Distribution B(10, ½)

Number of experiments : n = 10

Number of successful result: k = 8

Probability of each success and each defeat : p = q = ½

$$p(X = 8) = \binom{10}{8} \left(\frac{1}{2}\right)^8 \left(\frac{1}{2}\right)^2 = 0.044$$

The average of a binomial distribution is :

$$\mu = n \,.\, p$$

The variance is :

$$\sigma^2 = n \,.\, p \,.\, q = n \,.\, p\,(1 - p)$$

The standart deviation is :

$$\sigma = \sqrt{n \,.\, p \,.\, q}$$