An experiment can be modeled with a binomial distribution whenever :

1. There are only two possible events resulting from the experiment : A, Ā (success and defeat).
2. The probability of every event A, Ā 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 :

μ = n . p

The variance is :

σ^2 = n . p . q = n . p (1 – p)

The standart deviation is :

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