6.3 Binomial Distribution

A Binomial distribution is derived from a random experiment in which we either obtain event A with constant probability p, or the complementary event $\bar{A}$ with probability 1-p.

Suppose this experiment is repeated n times.

A discrete random variable that contains the number of successes A after n repetitions of this experiment, has a Binomial distribution with parameters n and p. Its probability density function is:

$$f(x;n,p) = \begin{cases} \binom{n}{x} \cdot p_x \cdot (1-p)^{n-x} & \text{for } x = 0, 1, \ldots, n \\ 0 & \text{otherwise} \end{cases}$$

Denoted $X \sim B(n;p)$

The distribution function is given as:

$$f(x;n,p) = \begin{cases} \sum_{k=0}^{x} \binom{n}{k} \cdot p^k \cdot (1-p)^{n-k} & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases}$$

The expected value and the variance of a Binomial distribution B(n;p) are: