The average can be interpreted as the center of gravity of the probability function. The average tends to be closer to the most probable result of the random experiment.

The general expression of the average is :

$\mu = x1 - p1 + x2 \,.\, p2 + x3 \,.\, p3 + \ldots + xn \,.\, pn = \sum_{i=1}^{n} xi.pi$

The average result of a dice is xi = I that is,

xi = 1 , x2 = 2 , …., x6 = 6

And $p = \frac{1}{6}$, so :

$\mu = \frac{1}{6}.1 + \frac{1}{6}.2 + \frac{1}{6}.3 + \frac{1}{6}.4 + \frac{1}{6}.5 + \frac{1}{6}.6 = \frac{1}{6}.21$
= 3.5

The variance

The variance gives an idea of the variation of results with respect to the average value. The general expression of the variance is :

$$\sigma^2 = \sum_{i=1}^{n} x_i^2 \cdot p_i - \mu^2$$

Computer the variance of the result from throwing a dice .

First, we compute the average :

$\mu = \frac{1}{6}.1 + \frac{1}{6}.2 + \frac{1}{6}.3 + \frac{1}{6}.4 + \frac{1}{6}.5 + \frac{1}{6}.6 = \frac{1}{6}.21$
= 3.5

And then, with xi = i that is

x1 = 1, x2 = 1, ……., x6 = 6

and $p = \frac{1}{6}$. We compute

$\sigma^2 = \frac{1}{6}.1^2 + \frac{1}{6}.2^2 + \frac{1}{6}.3^2 + \frac{1}{6}.4^2 + \frac{1}{6}.5^2 + \frac{1}{6}.6^2 - 3.5^2 = \frac{1}{6}.91 - 12.25 = 2.91$

The standart deviation

The standard deviation is the square root of the variance, and it is expressed as follows :

$$\sigma = \sqrt{\sum_{i=1}^{n} x_i^2 \cdot p_i - \mu^2}$$

In the previous example, $\sigma = \sqrt{2.91} = 1.7$