Random variable

A **random variable** is a variable whose value is a numerical outcome of a random phenomenon.

- **Discrete random variable**: values can be listed.
- **Continuous random variable**: can take any value in an interval.

Probability distribution

A **probability distribution** for a discrete random variable specifies the probability for each possible value.

Example 5.2.

$0 \leq P(x) \leq 1, \sum_x P(x) = 1.$

Mean of a random variable

$\mu_X = E(X) = \sum[x \cdot P(x)]$
Example 5.6.

Law of large numbers: The sample mean approaches the population mean when large sample size grows.

Variance of a random variable

$\sigma_X^2 = \sum_x [(x - \mu_X)^2 \cdot P(x)] = \sum_x [x^2 \cdot P(x)] - \mu_X^2$

standard deviation: $\sigma_X = \sqrt{\sigma_X^2}$.

Example 5.8. exercise 33, 46. page 205, 206.