

Conditional Expectation

Let X be a random variable, A be any event. We define the **conditional expectation of X given A** :

$$\mathbb{E}[X|A] = \sum_k k \cdot \mathbb{P}(X = k|A).$$

Law of Total Expectation

Let A_1, A_2, \dots, A_n be a partition of Ω . Then

$$\mathbb{E}[X] = \sum_{i=1}^n \mathbb{E}[X|A_i] \mathbb{P}(A_i).$$