



## Why

If we have some outcomes and a distribution, we can construct a function which assigns probabilities to events.

## Definition

The *probability of an event* is the sum of the probabilities of the outcomes in the event. The *event probability function* is the correspondence assigning events to their probabilities.

## Notation

Let  $A$  be a set of outcomes and  $p$  a distribution on  $A$ . Let  $B \subset A$  be an event. Let  $\mathbf{P} : 2^A \rightarrow \mathbf{R}$  be the event probability function, which is defined by

$$\mathbf{P}(B) = \sum_{b \in B} p(b).$$

The event probability function  $\mathbf{P}$  depends on the set of outcomes  $A$  and the distribution  $p$ . Sometimes we use notation indicating this dependence and will denote the event probability function by  $\mathbf{P}_{A,p}$ .

## Properties

**Prop. 1.** *Let  $\mathbf{P}$  be the event probability function of the distribution  $p : A \rightarrow [0, 1]$ .*

1.  $\mathbf{P}(B) \geq 0$  for all  $B \subset A$

2.  $\mathbf{P}(A) = 1$

3.  $\mathbf{P}(B \cup C) = \mathbf{P}(B) + \mathbf{P}(C)$  for  $B, C \subset A$  and  $B \cap C = \emptyset$

