Discrete Probability spaces

Ω : countable (finite or countably infinite)

* These are the easiest and nicest kind of probabilities to work with.

* we can afford to take set of all possible subsets of sample space.

* so, in fact we will be assiging probabilites to all subsets of sample space.

* All subsets of Ω are event's

* $\mathcal{F} = 2^{\Omega}$

Ω = countable

$$\Rightarrow \quad \Omega = \{\omega_1, \omega_2, \ldots \omega_n\}$$

or

$$\Omega = \{\omega_1, \omega_2, \ldots, \omega_n, \ldots \omega_\infty\}$$

The Probability of each $A \subseteq \Omega$, is defined in term's of the Probability of $\mathbb{P}(\{\omega\})$ of the singleton subsets

$$\mathbb{P}(A) = \sum_{\omega \in A} \mathbb{P}(\{\omega\})$$

and

$$\sum_{\omega \in \Omega} \mathbb{P}(\{\omega\}) = 1$$

* Probabilities are always assigned to elements of $\mathcal{F}$, not elements of Ω.

* But in discrete space it looks like we are assigning to each one of the elementary outcomes. But that's not correct view,