SEMANTICS of the Propositional Language

Evaluating Formulas

How do we know if a given formula φ is **true** or **false**?

- We need the **truth-values** of the basic propositions p, q, r, ... that appear in φ.
- We need to know the **meaning** of $\neg$, $\wedge$, $\vee$, $\rightarrow$ and $\leftrightarrow$.

Valuation Functions

This encodes the **principe of bivalence**. For every atomic propositions is assigned value 1 or 0.

Valuation. Let $\mathtt{P} = \{p, q, r, \ldots\}$ be a set of atomic propositions. A **valuation** V from $\mathtt{P}$ to $\{0, 1\}$ assigns to each element of $\mathtt{P}$ a unique truth-value.

Example: assume $\mathtt{P} = \{p, q\}$.
There are **four** different valuations (**four** different situations):

$V_1(p) = 1$	$V_1(q) = 1$
$V_2(p) = 1$	$V_2(q) = 0$
$V_3(p) = 0$	$V_3(q) = 1$
$V_4(p) = 0$	$V_4(q) = 0$

How **MANY** Valuations Functions?

With **one** atomic proposition, there are **two** possible valuations.

With **two** atomic propositions, there are **four** possible valuations.

With **three** atomic propositions, there are **2^3=8** possible valuations.

With **n** atomic propositions, there are **2^n** possible valuations.