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# Propositions

Declarative statement that assume either values: True or False;

## Types of propositions

- Simple: Has no logical connectives;
- Complex: Has logical connectives;

# Truth value

Associate boolean values to a proposition;

## Truth table

Represent possible truth values of a simple or complex composition, a complete truth table should show all the logic steps to get to the result;

**Ex.:** Truth table of $(\neg p \leftrightarrow q)$

| $p$ | $q$ | $\neg p$ | $\neg p \leftrightarrow q$ |
|---|---|---|---|
| True | True | False | False |
| True | False | False | True |
| False | True | True | True |
| False | False | True | False |

# Logical connectives

| $p$ | $q$ | $p \wedge q$ | $p \vee q$ | $p \rightarrow q$ | $p \leftrightarrow q$ |
|---|---|---|---|---|---|
| True | True | True | True | True | True |
| True | False | False | True | False | False |
| False | True | False | True | True | False |
| False | False | False | False | True | True |

- Not ($\neg$): If $V(p) =$ False returns True and vice-versa;
- And ($\wedge$): Only returns True if both propositions are True;
- Or ($\vee$): Only returns False if both propositions are False;
- If, then ($\rightarrow$): Only returns False if the first propositions is True and the second proposition is False;
- If, and only if ($\leftrightarrow$): Only returns True if $V(p) = V(q)$;

***Note:*** Equivalency symbols: ($\equiv$ or $\iff$);

# Logic circuits

A logic circuit is a chain of logic gates that take the output from one gate to another gate that receives it as an input;

## Logic gates

A logic gate is a building block of a logic circuit and it implements operations to boolean values;