Table of contents

- Propositions
 - Types of propositions
- Truth value
 - Truth table
- Logical connectives
- Logic circuits
 - Logic gates

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 $(\neg p \leftrightarrow q)$

 $\begin{array}{ccccc} p & q & \neg p & \neg p \leftrightarrow q \\ \text{True} & \text{True} & \text{False} & \text{False} \\ \text{True} & \text{False} & \text{False} & \text{True} \\ \text{False} & \text{True} & \text{True} & \text{False} \\ \text{False} & \text{False} & \text{True} & \text{False} \end{array}$

Logical connectives

| p | q | $p \wedge q$ | $p\vee q$ | $p \to q$ | $p \leftrightarrow q$ |
|-------|-------|--------------|-----------|-----------|-----------------------|
| 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 (\land) : Only returns True if both propositions are True;
- Or (\vee): Only returns False if both propositions are False;
- If, then (→): 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);

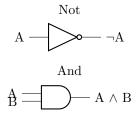
Note: Equivalency symbols: $(\equiv \text{ or } \iff)$;

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;



$$\stackrel{\text{A}}{=} \stackrel{\text{Or}}{=} A \vee B$$