Truth Tables and Circuit Diagrams

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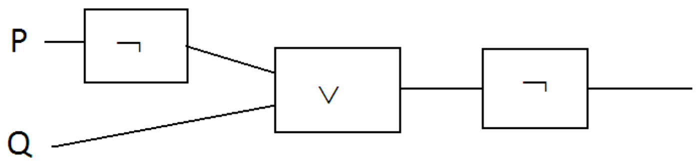
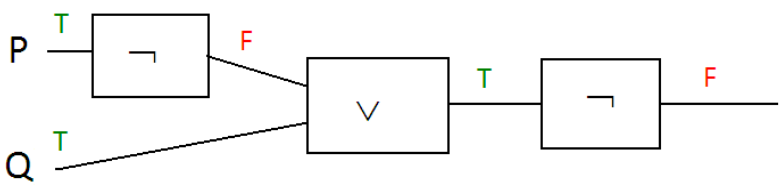
How do truth tables relate to the circuit diagrams?

Let's consider a sentence, such as $\neg(\neg P \vee Q)$. Its circuit diagram is just:



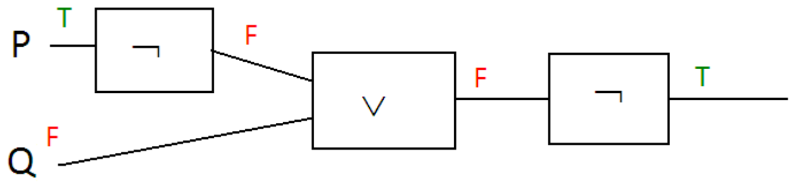
This is easy enough. Using this diagram, we can easily calculate the 'output' truth value, for the whole sentence, for any pair of 'input' truth values, one for each atomic sentence P and Q. For example, if P and Q are both true then we get:



This fact is shown on a truth value by filling in the top row. The output of each "machine" (sentential operator) is written directly under that operator, as shown.

P	Q	¬ (¬ P ∨ Q)
T	T	F F T

The remaining 3 rows show what output you get for the remaining 3 possible combinations of inputs. For example, with P true and Q false we get:



which is shown on the truth table as:

P	Q	¬ (¬ P ∨ Q)
T	F	T F F

Finally we consider the remaining combinations, the ones where P is false, to get the full table:

P	Q	¬ (¬ P ∨ Q)
T	T	F F T
T	F	T F F
F	T	F T T
F	F	F T T

Finally, you should identify the truth values that belong to the *whole sentence*, i.e. the ones that come out of the main sentential operator, perhaps by drawing a rectangle around them.

P	Q	¬ (¬ P ∨ Q)
T	T	F F T
T	F	T F F
F	T	F T T
F	F	F T T