

Make The Table – for both WFFs AND Sequents

1. A truth table has two main columns. In the left main column, list all different ATOMIC STATEMENTS in the WFF or the sequent. In the (larger) right column, write either the WFF or the whole sequent. (This row represents a header row.)
2. **Determine the number of rows** for the table as a whole: **Number of Rows = $2^{(\text{power of atomic statements})}$**

Left Main Column – the atomic statements

3. In the left main column, input T's and F's under each of the **atomic statements**.
 - a. Divide total number of rows (see step 2) in half. Assign this number of T's and then F's under leftmost atomic statement.
 - i. Note: if an atomic statement is repeated in the WFF or sequent, it will have the same truth-values throughout the WFF or sequent.
 - b. Divide the number obtained in the proceeding step by half. Assign this number of T's and F's under the next atomic statement, repeating the procedure till you complete the total number of rows.
 - c. Repeat step 3b for each remaining atomic statement in the left main column.
 - i. Note: the first row will be all Ts, last row will be all Fs. Under the rightmost atomic statement will be a column of alternating T's and F's.

Right Main Column – the complex statements

4. First, assign truth-values for all **negations of atomic statements**.
 - a. Note: do not confuse the negation of an atomic with the negation of a compound statement.
5. Next, assign truth-values for binary connectives **inside parentheses** within each WFF.
 - a. Note: this will be determined by the relations of the connectives (as explained in class). Sometimes it will be necessary to imagine parentheses, if parentheses dropping conventions are in effect.
6. Next, assign truth-values for the **negations of parentheses** (i.e., compound statements) (see 4a).
7. Finally, assign truth-values for binary connective(s) **outside parentheses**.
 - a. The last truth-values assigned will be the value of the MAIN or GOVERNING CONNECTIVE for each WFF (in the sequent).

FOR SEQUENTS ONLY: the Invalidating Assignment

8. To prove a sequent invalid, find *any* row in which the CONCLUSION is "F" and the truth-values for ALL PREMISES ARE "T". You need find only one such row!
 - a. If a statement is complex, the only truth-values that count are those under the MAIN CONNECTIVE.
 - b. If you are *unable* to find such a row, the argument is valid.
 - i. "An argument is valid if and only if it is *impossible* for all the premises to be true while the conclusion is false." (Allen/Hand, p. 2)

CONNECTIVES – when they are false

$\sim\Phi$	A negation is false <i>if</i>	the statement being negated (Φ) is true
$\Phi \& \Psi$	A conjunction is false <i>if</i>	<u>one or both</u> of the conjuncts is false
$\Phi \vee \Psi$	A disjunction is false <i>only if</i>	<u>both</u> disjuncts are false
$\Phi \rightarrow \Psi$	An conditional is false <i>only if</i>	<u>antecedent</u> (Φ) true and <u>consequent</u> (Ψ) false
$\Phi \leftrightarrow \Psi$	A biconditional is false <i>only if</i>	the <u>two conditions</u> have a <i>different</i> truth value