

Making a truth-table for a single sentence

1. Build reference columns: one for each atomic sentence in the sentence you're making a truth-table for.
 - More generally: one for each sentence that isn't built up out of other sentences using truth-functional connectives.
2. Fill in the reference columns so that every possible assignment of T's and F's to the atomic sentences is covered.
 - Standard method: like counting backwards in binary

3. Search through the connectives in the sentence for one whose column you can fill in.
 - You can fill in the column under a connective if the sentence(s) the connective operates on are either (i) atomic, or (ii) sentences whose main connective's column has already been filled in.
4. Has the column for the main connective of the sentence been filled in yet? If it has, stop. Otherwise, return to step 3.

Making a joint truth-table

- The procedure for multiple sentences is the same.
- You'll need one reference column for each atomic sentence that occurs in ANY of the sentences.

Tautological consequence

- A sentence Q is a **tautological consequence** of a sentence P if and only if Q is true in every row in their joint table in which P is true.
- More generally: Q is a tautological consequence of P_1, P_2, \dots, P_n if and only if Q is true in every row in their joint table in which all of P_1, \dots, P_n are true.

Tautological equivalence

- P and Q are **tautologically equivalent** if and only if P is a tautological consequence of Q, and Q is a tautological consequence of P.
- In other words: Q is true in every row in their joint truth-table in which P is true, and P is true in every row in their joint truth-table in which Q is true.
- In other words: the columns under the main connectives of P and Q in their joint truth-table are identical.

Tautological and logical consequence

- If Q is a tautological consequence of $P_1 \dots P_n$, then Q is a logical consequence of $P_1 \dots P_n$.
 - Hence, if P and Q are tautologically equivalent, they are logically equivalent.
- The reverse does not hold.

For next week:

- Read: 4.1-4.4, chapter 5.
- Remember: exercises 4.2 and 4.4-4.7 are due next Tuesday, although they'll be counted as part of last week's homework from the point of view of grading.
- Also do 3.23 (30%), 4.13, 4.16, 4.17, (10% each), 4.22, 4.23 (15% each).