305 Lecture 16 - Building Truth Tables

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July 13, 2020

Plan

This lecture is about how we build truth tables.

Associated Reading

We're still working through the first half of Carnap book, Chapter 10.

Four Main Connectives

- Building truth tables requires, unfortunately, a small amount of memorization.
- In particular, you just have to memorize the truth tables for each of the connectives.
- Equally unfortunately, justifying yourself using truth tables requires justifying these basic tables.
- And as we'll see, that's not trivial.
- But that's for much down the line - let's learn how to use these first, then we'll get to justifying them.

Negation Table

A	¬ A
T	F T
F	T F

You should read it as saying that if A is T then $\neg A$ is F, and if A is F, then A is T.

The Conjunction Table

A	B	A	$\wedge$	B
T	T	T	T	T
T	F	T	F	F
F	T	F	F	T
F	F	F	F	F

Conjunction in Words

- A conjunction is T if both conjuncts are T, and is F otherwise.

The Disjunction Table

A	B	A	∨	B
T	T	T	T	T
T	F	T	T	F
F	T	F	T	T
F	F	F	F	F

Disjunction in Words

- A disjunction is T if either disjunct is T, and is F otherwise.

The Conditional Table

A	B	A	$\rightarrow$	B
T	T	T	T	T
T	F	T	F	F
F	T	F	T	T
F	F	F	T	F

Material Implication

Note that these three sentences have exactly the same table.

A	B	A	$\rightarrow$	B	$\neg$	A	$\vee$	B	$\neg$	(	A	$\wedge$	$\neg$	B	)
T	T	T	T	T	F	T	T	T	T	T	T	F	F	T	
T	F	T	F	F	F	T	F	F	F	F	T	T	T	F	
F	T	F	T	T	T	F	T	T	T	T	F	F	F	T	
F	F	F	T	F	T	F	T	F	T	T	F	F	T	F	

This conditional is sometimes called **material implication**.

Oddities

It is certainly an odd interpretation of ‘if’ that makes these sentences turn out true.

- If I am 200 years old, then Michigan is part of Canada.
- If I am in Los Angeles, then I am in Ann Arbor.

But they are both true on this table.

Arguments

- It turns out that interpreting the conditional this way makes the most sense of the role of conditionals in certain arguments, in particular to do with disjunctive syllogism.
- There is an allusion to this at the end of chapter 1 of *Boxes and Diamonds*.

For Next Time

We'll talk about how to use truth tables to check for validity.