Conditionals and Biconditionals

PHIL 102

29 Sept. 2017

Chapter 7 introduces two new connectives to the $\vee$, $\wedge$, $\neg$ trio we've been using.

Both are two-place connectives:

They are

- the conditional (_______→_______)
- the biconditional (______↔_______)

Put sentences in the blanks and you get a resulting sentence.

Conditionals

The conditional is supposed to mimic the behavior of the English phrase, "If P, then Q"

$P \rightarrow Q$

The order of the parts of a conditional matter!
"$P \rightarrow Q$" has a very different meaning from "$Q \rightarrow P$"

So we have a special name for each the two parts.

- The "before the arrow" part is the *antecedent*
- The "after the arrow" part is called the *consequent*

Ways of saying conditionals in English

All of the following are equivalent ways of saying **P→Q:** in English. Notice that in English, a conditional can get shuffled all around within a sentence.

- "If P, then Q"
- "Q if P"
- "P only if Q"
- "Only if Q, P"
- "Provided that P, Q"
- "Q, provided that P."
- "P is a sufficient condition for Q."
- "Q is a necessary condition for P."

Notice that whatever comes after a plain old "if" is the antecedent, no matter where the English word "if" appears in the sentence.

Notice that whatever comes after a plain old "only if" is the consequent, no matter where the English words "only if" appear in the sentence.

Truth Table for →

P	Q	P→Q
T	T	T
T	F	F
F	T	T
F	F	T

That is, the only case where we'll say that a conditional is false is when its antecedent is TRUE and its consequent is FALSE.

Note that this is the same truth table as for (¬P ∨ Q). Those two sentences are equivalent: each is true if and only if the other is.

Speaking of which…

The Biconditional

(______↔_______)

P ↔ Q is supposed to mimic the behavior of the English phrase "If and only if."

The order of the parts of a biconditional don't matter, so we have no special names for them.

All of the following are English ways of saying 'P↔Q'

- "P if and only if Q"
- "P iff Q"
- "P is a necessary and sufficient condition for Q."
- "P just in case Q"

"iff" is an abbreviation of "if and only if."

I hate the use of "just in case" as a biconditional. The book will use it, but I won't put it on an exam. Promise.

Truth Table for ↔

P	Q	P↔Q
T	T	T
T	F	F
F	T	F
F	F	T

Notice that this is the same truth table as for '(P→Q) ∧ (Q→P)', which makes sense (if *and* only if).