PH126 Logic I · Lecture 4
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Proofs with ∧Intro and ∨Intro

Example

1.	R	
2.	S	
3.	R ∨ T	∨Intro: 1
4.	S ∧ (R ∨ T)	∧Intro: 2,3

After the premises, each line in a proof is guaranteed to be a logical consequence of the lines above.

P1	P2	P1 ⇎ P2
T	T	F
T	F	T
F	T	T
F	F	F

The following rule is unacceptable. Why?

⇎Intro:
- Pi
- …
- P1 ⇎ P2

Truth-functional connectives

A *connective* joins one or more sentences to make a new sentence. E.g. ∧, ¬, because

A sentence joined by a connective is a *constituent sentence*. E.g. P in 'P because Q'

A *truth functional* connective produces a new sentence whose truth value depends only on the truth values of its constituent sentences.

When P and Q are both true, 'P because Q' is sometimes true and sometimes false. Therefore, 'because' is not a truth-functional connective

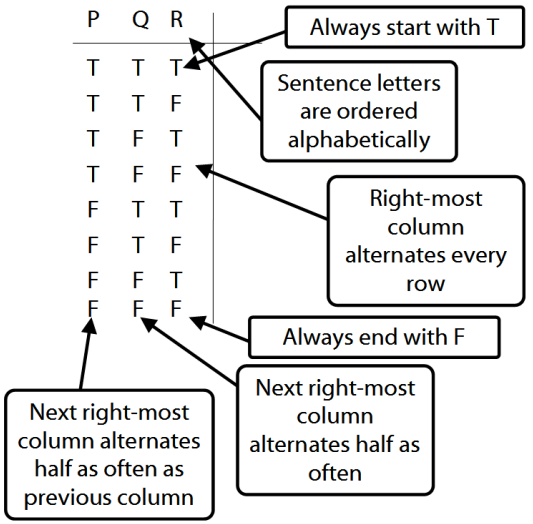
A∧B∨C

A	B	C	(A ∧ B) ∨ C	A ∧ (B ∨ C)
T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
T	F	F	F	F
F	T	T	T	F
F	T	F	F	F
F	F	T	T	F
F	F	F	F	F

Argument 1
1. (A ∧ B) ∨ C
2. A ∧ (B ∨ C)

Argument 2
1. A ∧ (B ∨ C)
2. (A ∧ B) ∨ C

How to order reference columns



Ambiguity

Lexical ambiguity, e.g. ‘give me a note’

Structural ambiguity, e.g. ‘Two puffins ate six fish’, ‘I shot an elephant in my pyjamas’

What is the source of structural ambiguity in natural languages?

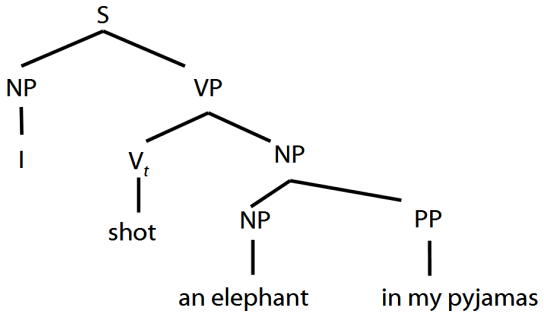
Rule 1: a NP followed by a VP is a S

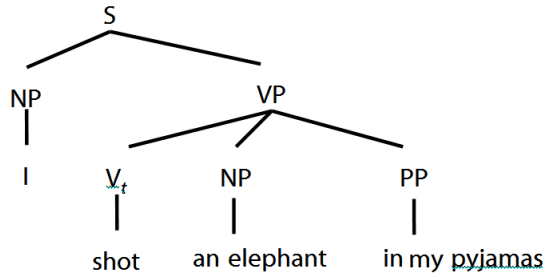
Rule 2: a Vt followed by a NP is a VP

Rule 3: a NP followed by a PP is a S

Rule 4: A Vt followed by a NP then a PP is a VP

Two derivations of Groucho Marx’ claim, ‘I shot an elephant in my pyjamas’





- Not every sequence of words is a sentence.

- Which sequences of words are sentences is determined by rules.

- The rules specify how to construct sentences from fragments.

- The rules impose a tree-like structure on sentences.

- Structural ambiguity occurs when the same linear sequence of words can be derived from different rules.