**PH126 Starting Logic** Lecture 6
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*Wrong proofs*

Step 7 of this proof is wrong. Why?

| R | S | R ∨ S | R ∧ S |
|---|---|---|---|
| T | F | T | F |

T
1. R ∨ S
2. R
3. S ∨ R ∨Intro: 2
4. S
5. S ∨ R ∨Intro: 4
6. S ∨ R ∨Elim: 1,2-3,4-5
F 7. R ∧ S ∧Intro: 2,4

Which step of this proof is wrong? Why?

1. ¬¬(¬A ∧¬¬ A)
2. (¬A ∧ ¬¬A) ¬Elim: 1
3. (¬A ∧ A) ¬Elim: 2

**Scope**

In P∧ (Q∨R), the scope of ∧ is P∧ (Q∨R)
In P∧ (Q∨R), the scope of ∨ is (Q∨R)
In (P∧Q) ∨R, the scope of ∧ is (P∧Q)
In (P∧Q) ∨R, the scope of ∨ is (P∧Q) ∨R

The scope of a connective is the smallest constituent expression which contains that connective.

**The Syntax of FOL**

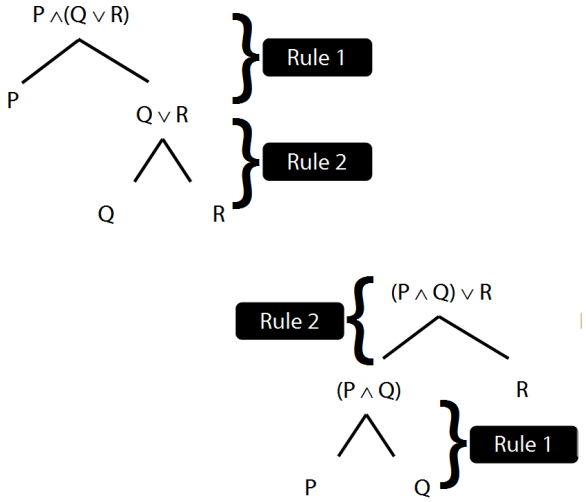
We define what counts as a sentence of FOL using rules. E.g.:

3. P, Q, R, … are sentences
4. If * is a sentence, then ¬* is a sentence
1. If * and # are sentences, then so is(* ∧ #)
2. If * and # are sentences, then so is (* ∨ #)

So:

a. P is a sentence // rule 3
b. ¬P is a sentence // rule 4, a
c. ( ¬P ∧ Q ) is a sentence // rule 1, b, a

*Notes*: (1) There is no structural ambiguity in FOL because these rules are formulated to ensure that for any FOL sentence, there is exactly one way of constructing it. (2) We used the notion of a sentence in the rules that define what a sentence is.




**¬Intro proof example**

1. A ∧ B

¬(¬A ∨ ¬B)

**Exercises 03**

*For your fourth seminar*
*Not for fast groups*

4.15–18 (truth tables)
5.1–6 (inference patterns)
*5.18 (counterexample)
6.2–6 (proofs)
6.7, 6.9–10, *6.11–12 (proofs)

Short of time? Skip the exercises marked *