Logic I: Lecture 04
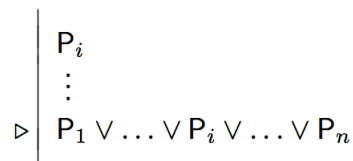
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Readings refer to sections of the course textbook, *Language, Proof and Logic*.

1. ∧Intro and ∨Intro: Compare and Contrast
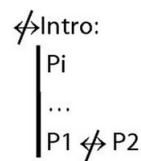
Reading: §6.1

Disjunction Introduction (∨ Intro)

$$P_i$$
$$\vdots$$
$$\triangleright \quad P_1 \vee \ldots \vee P_i \vee \ldots \vee P_n$$

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

Let us define a new connective with this truth table:

P1	P2	P1 ∨ P2	P1 ⊘ P2
T	T	T	F
T	F	T	T
F	T	T	T
F	F	F	F

The following rule is unacceptable. Why?

⊘Intro:

$$P_i$$
$$\ldots$$
$$P_1 \oslash P_2$$

2. Truth-functional Connectives

Reading: §7.0 (the text before §7.1)

A *connective* joins zero or more sentences to make a new sentence. Examples of connectives include: '∧', '¬', '⊥' and 'because'.

A sentence joined by a connective is a *constituent*. For example, consider the sentence 'P because Q': P is a constituent of this sentence.

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. To illustrate, consider 'Alan got yellow cards because some apples are green' and 'Alan got yellow cards because he used his elbows'. All the constituent sentences are true, but the first sentence is false whereas the second is true.

3. A ∧ B ∨ C

Reading: §3.5

Ambiguity can be *lexical*, e.g. 'Actor testifies in horse suit'. Ambiguity can also be *syntactic*, e.g. 'How to combat the feeling of helplessness with illegal drugs'. (Both examples are from Bucaria, C. (2004), 'Lexical and syntactic ambiguity as a source of humor: The case of newspaper headlines', Humour 17(3): 279–309.)

4. A ∧ B ∨ C: the Truth-tables

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

5. A ∧ B ∨ C: They Are Different

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

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