Logic I: Lecture 02

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Readings refer to sections of the course text-book, *Language, Proof and Logic*.

1. Counterexamples

Reading: §2.5

A *counterexample* to an argument is a possible situation in which its premises are T and its conclusion F.

There are no counterexamples to a logically valid argument.

If an argument is not valid, then there is a counterexample to it.

To show that an argument is not logically valid, we specify a counterexample to it.

2. Soundness

An argument is *sound* just if it is logically valid and its premises are true

Whether a sentence is true may change as the world changes.

The same applies to whether an argument is sound.

Whether an argument is logically valid not does change as the world changes.

3. Sentence Letters

$$\begin{array}{|l}
\text{Square(a)} \lor \text{Square(b)} \\
\neg\text{Square(a)} \\
\text{Square(b)}
\end{array} \qquad \begin{array}{|l}
P \lor Q \\
\neg P \\
Q
\end{array}$$

4. Truth Tables

Reading: §3.1, §3.2, §3.3

Rough guide:

'∧' means and

'∨' means or

'¬' means not

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

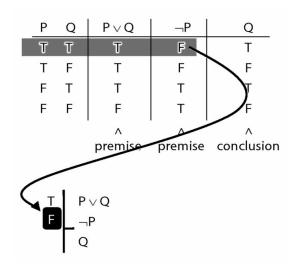| A	¬A
T	F
F	T

5. Formalizing Arguments

Reading: §3.7

6. Logical Validity and Truth Tables

Reading: §4.3

Truth tables can be used to show that an argument is valid. To illustrate …

To establish that an argument is valid:

1. Create truth tables for each premise and the conclusion.

2. Check whether there is a row of the truth table where all premises are true and the conclusion is false.

3. If not, the argument is valid.

7. Complex Truth Tables

P	Q	$\neg(P \wedge Q)$
T	T	
T	F	
F	T	
F	F	

8. Exercises

These exercises will be discussed in seminars the week after this lecture. The numbers below refer to the numbered exercises in the course textbook, e.g. '1.1' refers to exercise 1.1. on page 39 of the second edition of *Language, Proof and Logic*.

2.8, 2.10, 2.12, 2.21

3.1, 3.2

3.5, 3.7