Semantics in Sentential Logic

Unit 2 Part 2: Truth-Tables

“There are 400 students in this class”

How do we know when a molecular statement is true?

"If the Raptors win then I'll be happy"

The truth will depend on its parts

Logical Connectives are TRUTH FUNCTIONAL

The truth value of any molecular statement is entirely determined by (a function of) the truth value of its parts

We use a TRUTH-TABLE to make this clear

Negation ~

P	~P
T	F
F	T

The truth of a negation statement is entirely determined by what it is negating

Conjunction ∧

Sometimes written & or •

P	Q	P∧Q
T	T	T
T	F	F
F	T	F
F	F	F

P∧Q is true only when both CONJUNCTS are true

Disjunction ∨

Or in logic is the INCLUSIVE sense

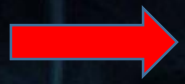
P	Q	P∨Q
T	T	T
T	F	T
F	T	T
F	F	F

P∨Q is true when one, the other,
or both DISJUNCTS are true

Conditional →

Also known as “if, then” and can be written ⊃

P	Q	P→Q
T	T	T
T	F	F
F	T	T
F	F	T



The front part (P) is called the ANTECEDENT

The back part (Q) is called the CONSEQUENT

Why is the conditional true when the antecedent is false?

If I clap a sound will be made.

1. I clap and a sound is made
2. I clap and a sound isn't made
3. I don't clap and a sound is made
4. I don't clap and a sound isn't made

Case 2 is the only one that violates my claim

Biconditional ↔

"if and only if" and can be written ≡

P	Q	P↔Q
T	T	T
T	F	F
F	T	F
F	F	T

P↔Q is true only when P and Q have the same truth value