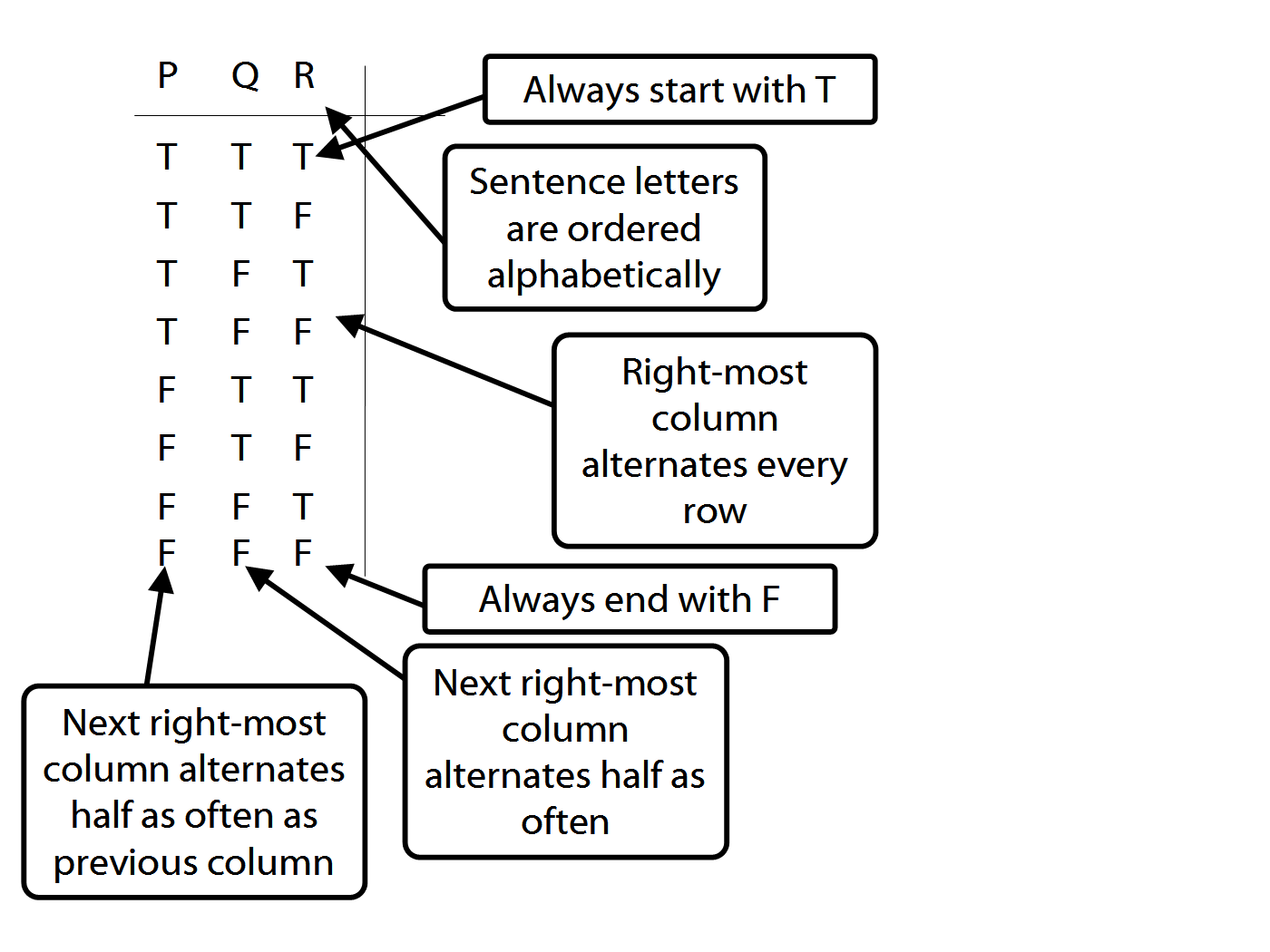
**PH133 Logic**  Lectures 3 & 4

Lecturer: s.butterfill@warwick.ac.uk

An argument is *logically valid* just if there’s no possible situation in which the premises are true and the conclusion false

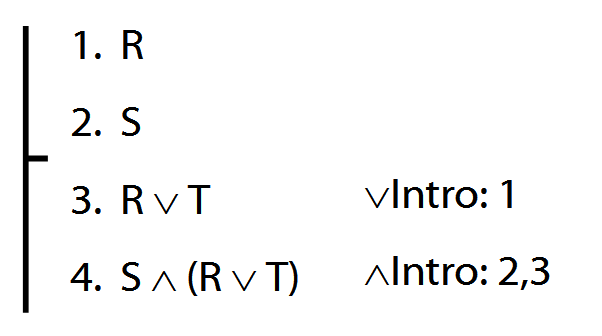
**How to order reference columns**

(from lecture 2)

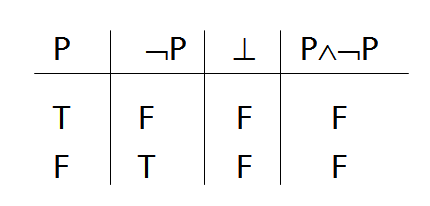
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Proofs with ∧Intro and ∨Intro

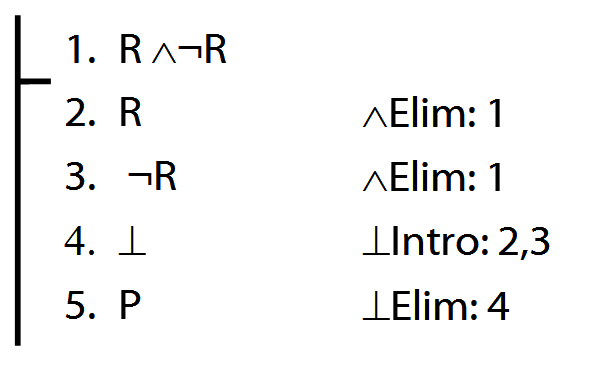
*Example*

****

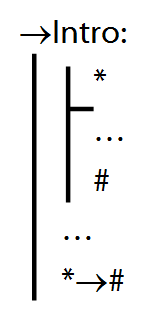
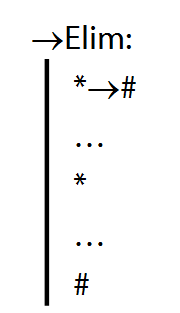
¬, ⊥



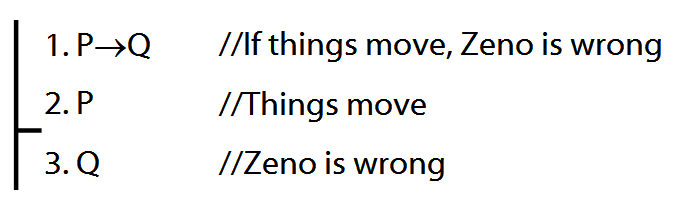
*Proof example*



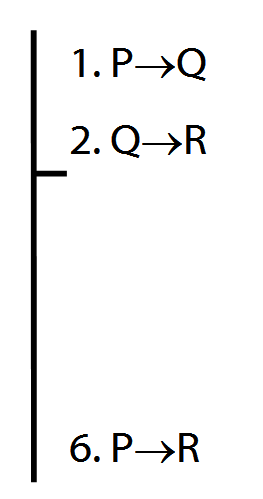
**Rules of Proof for** **→**

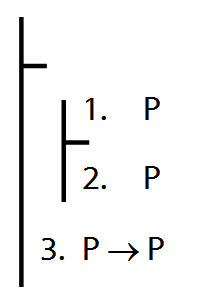
*Proof example for* **→***Intro*

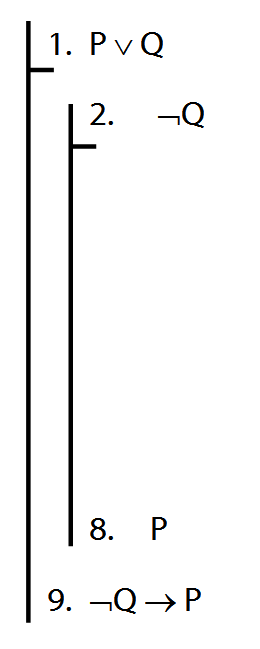
****

*Proof example for* **→***Elim (to complete)*

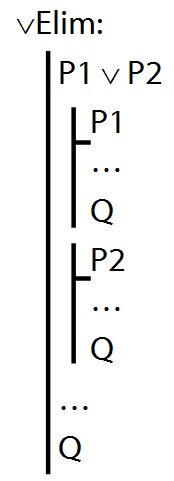
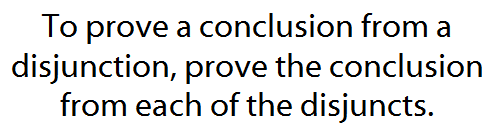


*Not all proofs have premises*

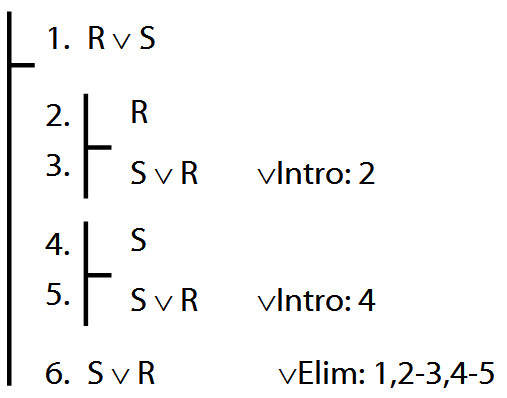
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**A rule of proof for** ∨

** **

*Example proof*



**Quantifiers --** ∀, ∃

Everything is broken: ∀x Broken(x)

Something is broken: ∃x Broken(x)

What does ∃ mean? We give the meaning of ∃ by specifying what it takes for a sentence containing ∃ to be true:

1. Give every object a name.

2. For each name in turn, create a new sentence like this: delete the quantifier and replace all instances of the variable it binds with that name

3. If ALL of the new sentences are true, so is the original.