

Propositional logic: Declarative sentences

CS242 Formal Specification and Verification

University of Warwick

Autumn term 2006

Example arguments

If the train arrives late and there are no taxis at the station, then John is late for his meeting. John is not late for his meeting. The train did arrive late. *Therefore*, there were taxis at the station.

If it is raining and Jane does not have her umbrella with her, then she will get wet. Jane is not wet. It is not raining. *Therefore*, Jane has her umbrella with her.

Declarative vs non-declarative sentences

Declarative:

- ▶ The product of the numbers 3 and 5 equals 15.
- ▶ There is something nice for lunch today.
- ▶ $x^k + y^k = z^k$ has no non-trivial integer solutions for $k > 2$.
- ▶ Everyone who likes logic is good-looking.

Non-declarative:

- ▶ What is the time?
- ▶ Goodbye!
- ▶ May fortune come your way.

Symbolic approach

Atomic propositions. p, q, r, p_1, q', \dots

Connectives. $\neg, \vee, \wedge, \rightarrow, \leftrightarrow, \dots$

Binding priorities. \neg binds more tightly than \vee and \wedge , and the latter two bind more tightly than \rightarrow and \leftrightarrow .

Exercises 1.1

- 1.(a) If the sun shines today, then it won't shine tomorrow.
- 1.(d) If a request occurs, then either it will eventually be acknowledged, or the requesting process won't ever be able to make progress.
- 1.(k) My sister wants a black and white cat.
- 1.(l) If you have read the lecture notes and if you have done the first three homework assignments, then you should be in good shape for the first exam; otherwise, you will have a problem.
- 2.(e) $p \vee q \rightarrow \neg p \wedge r$
- 2.(g) $p \vee q \wedge r$