Conjunction and Disjunction

- Operators in Proposional Logic
  - Negation ¬
  - Conjunction ∧
  - Disjunction ∨
  - Implication ⇒
  - Equivalence ⟺

Truth Tables

- Each operator is defined by a truth table
  - It lists the possible values for operands on the left and the value of the proposition on the right
  - We have seen the truth table for negation already:

p	$\neg p$
T	F
F	T

Negation (¬)

- Negation acts roughly like “not” in English
  - ¬(True) ⟺ False
  - ¬(False) ⟺ True

p	$\neg p$
T	F
F	T

Using truth tables

p	$\neg p$	$\neg\neg p$
T	F	T
F	T	F

Conjunction (∧)

- Conjunction works roughly like “and” in English
  - It only returns true when **both** of its operands are **true**
  - false otherwise

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

Disjunction (∨)

- Disjunction works roughly like “or” in English
  - It returns **true** when **either** of its operands are **true**
  - false otherwise

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

An example

$\neg(p \wedge q) \wedge (p \vee q)$

Using truth tables

p	q	$p \wedge q$	$\neg(p \wedge q)$	$p \vee q$	$\neg(p \wedge q) \wedge (p \vee q)$
T	T	T	F	T	F
T	F	F	T	T	T
F	T	F	T	T	T
F	F	F	T	F	F

Summary

- Truth tables
  - define logical operators
  - struture our reasoning
- Negation (not) ¬
- Conjunction (and) ∧
- Disjunction (or) ∨