Propositions

Identify those statements which are crafted to have an inherent, ascertainable truth value, either `True` or `False`.

1. T The house at 351 Riverside is burning.
2. F $2x + 5 = 11$.
3. T The cat is sleeping and the toddler is reaching for her tail.
4. F Put that down!
5. T Parking on the south side of the street is allowed only on even-numbered dates.
6. F This sentence is a lie.

Compound Propositions

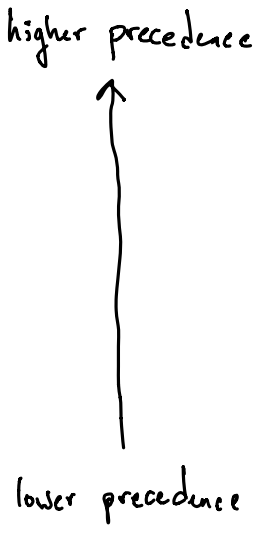
All three of the statements

> p: I write programs in C++.
> q: I write programs in Python.
> r: I write programs in C++ or in Python.

are propositions. Propositions p and q seem more *atomic* than Proposition r; indeed, r is built out of these simpler ones, and is equivalent to p `OR` q. The making of a **compound proposition** out of two simpler ones joined by the word `OR` is called a **disjunction**.

The `OR` is a logical operator. There are others:

Name	Keyword	Symbol	Priority
negation	NOT	$\neg$	1
disjunction	OR	$\vee$	2
conjunction	AND	$\wedge$	2
	NAND?		
	NOR?		
exclusive or	XOR	$\oplus$	
conditional	IF . . . THEN . . .	$\rightarrow$	3
biconditional	IF AND ONLY IF	$\leftrightarrow$	3



Translating to symbols

Define propositional variables p, q, (r, ...) and rewrite

1. Jenn is healthy, wealthy, but not wise.

Take p: Jenn is healthy
q: Jenn is wealthy
r: Jenn is wise

Translation: $p \wedge q \wedge \neg r$ (precedence of operators means no parentheses are required)

2. ~~John~~ Jenn is neither healthy, wealthy, nor wise.

Translations: $\neg p \wedge \neg q \wedge \neg r$

also (through DeMorgan's Laws) $\neg (p \vee q \vee r)$

3. In order to rain, it must be cloudy.

Take p: It rains
q: It is cloudy

Translation: If p then q

also $p \rightarrow q$

4. I eat only when I am hungry.

p: I eat
q: I am hungry

Translate as $p \rightarrow q$ again

5. It is not true that I am old and gray.

p: I am old
q: I am gray

Translate as $\neg (p \wedge q)$

also (via DeMorgan) $\neg p \vee \neg q$

~~**Truth values of compound statements from those of the atoms**~~