

# The Language of Propositional Calculus

Within the Propositional Calculus we are only concerning ourselves with propositions.

**Definition:** A *proposition* is the referent of a declarative sentence.

Rather than using sentences to express propositions, within the calculus we will use sentence letters.

**Definition:** *Sentence letters* are symbols whose referents are propositions.

**Convention:** Capital letters ‘P’ through ‘Z’ are sentence letters. Any numeric subscript added to these capital letters, such as ‘P<sub>12</sub>’ and ‘Z<sub>0</sub>’, are sentence letters.

## Symbolic Sentences

1. Sentence letters are symbolic sentences.

2. If  $\phi$  is a symbolic sentence, then so is  $\neg\phi$ .

Informally, ‘ $\neg$ ’ is an abbreviation for “it is not the case that.” It can be thought of as the negation of the symbolic sentence following it.

3. If  $\phi$  and  $\psi$  are symbolic sentences, then so is  $(\phi \rightarrow \psi)$ .

Informally, ‘ $\rightarrow$ ’ indicates a conditional, an “if...then...” sentence. Given the symbolic sentence  $(\phi \rightarrow \psi)$ , ‘ $\phi$ ’ is called the *antecedent* of the conditional (the ‘if’ part), and ‘ $\psi$ ’ is called the *consequent* of the conditional (the ‘then’ part).

4. If  $\phi$  and  $\psi$  are symbolic sentences, then so is  $(\phi \wedge \psi)$ .

Informally, ‘ $\wedge$ ’ indicates a conjunction (“and”).

5. If  $\phi$  and  $\psi$  are symbolic sentences, then so is  $(\phi \vee \psi)$ .

Informally, ‘ $\vee$ ’ indicates a disjunction (“or”).

6. If  $\phi$  and  $\psi$  are symbolic sentences, then so is  $(\phi \leftrightarrow \psi)$ .

Informally, ‘ $\leftrightarrow$ ’ indicates a bi-conditional, an “if and only if” sentence.

7. Nothing else is a symbolic sentence within the Propositional Calculus.