

Introduction to Logic (Spring 2020)

Assignment 1

Monday 3rd February 2020

Instructions This sheet contains two kinds of assignments: exercises and homework. The first are not mandatory and are meant for practising during the exercise class or by yourself. Tutors will be available during the exercise class to help with the assignment. Homework assignments are mandatory, and the combined grade of the homework makes 30% of the final grade. The grade for the homework on this sheet corresponds to the number of points obtained + 1. Maximally 9 points can be obtained.

Handing in your answers Submit your solution through **Blackboard** as a single PDF file named `hw1sN.pdf`, where N is your student number. The document has to be created using \LaTeX (or variants like \XeLaTeX). A template is available on the website of the course. If you do not have a working \LaTeX installation, then you can use Overleaf (<https://www.overleaf.com/>). Make sure that your **name, student number and studies** are **clearly written on the document**. Each student has to submit a separate document. Only submit the 2 exercise(s) marked as **Homework**. Answers have to be provided in **Dutch or English**. Submissions that fail to meet these requirements are not considered.

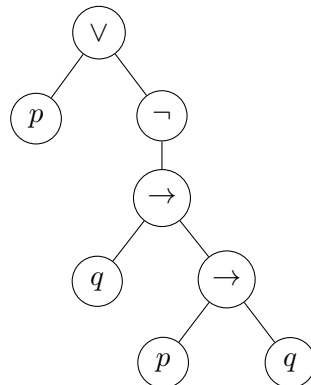
Deadline The homework must be uploaded before **Friday 7th February 2020 2:30pm**.

Learning Objectives After completing this assignment, you should be able to **recognise correct formulas** of propositional logic and to **build and interpret their parse trees**. Furthermore, you should be able to **determine all subformulas** of a formula and to **formalise simple sentences in natural language** as propositional formulas.

Hint To draw parse trees, you can use, for example, draw (<https://www.draw.io/>), Inkscape (<https://inkscape.org/>) or TikZ/forest (see the \LaTeX template and <https://www.ctan.org/pkg/forest>). If the representation of the symbols \neg, \wedge, \vee , or \rightarrow is a problem with draw or Inkscape, you can use instead `~, &, |` and `->` as ASCII representation of logical connectives.

Exercise 1

Give the formula corresponding to the following parse tree.



Exercise 2

Decide which of the following strings is a well-formed formula.

a) p

b) $()p$

c) $p \rightarrow q$

d) $p \rightarrow \wedge q$

Exercise 3

Formalise the following two sentences as a propositional formula. Indicate clearly which part of the sentence each propositional variable refers to.

1. If it rains today, then it won't rain tomorrow.
2. If Dick met Jane yesterday, they had a cup of coffee together, or they took a walk in the park.

Homework 1

_____/7 p.

Let φ be the formula $\neg(p \rightarrow q \wedge r) \vee q \rightarrow p$.

1. Draw the parse tree of φ . (3 points)
2. List all the distinct subformulas of φ . (4 points)

Homework 2

_____/2 p.

Formalise **one** of the following two sentences as a propositional formula. Indicate clearly which part of the sentence each propositional variable refers to.

1. Today it will rain or shine, but not both.
2. De eerste getuige spreekt de waarheid of de tweede getuige spreekt niet de waarheid.