

Logical Formalism

Introduction

Adrien Pommellet, LRE



August 31, 2023

What Are Mathematics?

- Performing **calculations** has very little to do with actual science.
- Neither does **rote learning** nor **random guesses**.
- The point of mathematics is to find **true statements**.

Why Logics?

- Everyday language is too ambiguous, hence not suitable for mathematics.
- The meaning of each word has to be defined rigorously; vague statements shall not be tolerated.
- We shall learn how to write proper **proofs**.

Logics and Proofs

Mathematics is of the utmost importance in the field of computer science.

Indeed, consider the following uses:

Proving algorithms. Does an algorithm indeed **solve** a given problem?

Measuring complexity. How **efficient** is a given algorithm? What's the worst case scenario?

Writing correct programs. A **rigorous** proof is somewhat similar to a flawless program in many ways.

Tangible Goals

- **Expressing statements** using logics and set theory.
- Applying **common proof patterns**: analysis and synthesis, induction, proof by contradiction, etc.
- **Counting** finite sets.

Course Overview

- The full course is split into six **lectures** of two hours each.
- The matching slides can be found on **Moodle**.
- There are four **tutorials** of two hours each. For each tutorial, a matching exercise sheet with a fair amount of extra material can be downloaded on **Moodle**, with the exception of the last one that is a **mock-up exam**.
- Attend the lectures, prepare the exercise sheet, attend the tutorial, then try to do the extra exercises.

The Dreaded Exams

- One mid-term exam (**10 points**) + a final exam (**10 points**).
- No MCQs, but short problems with an emphasis on **rigorous proofs**.
- The exams will be **hand graded**.

Good luck!