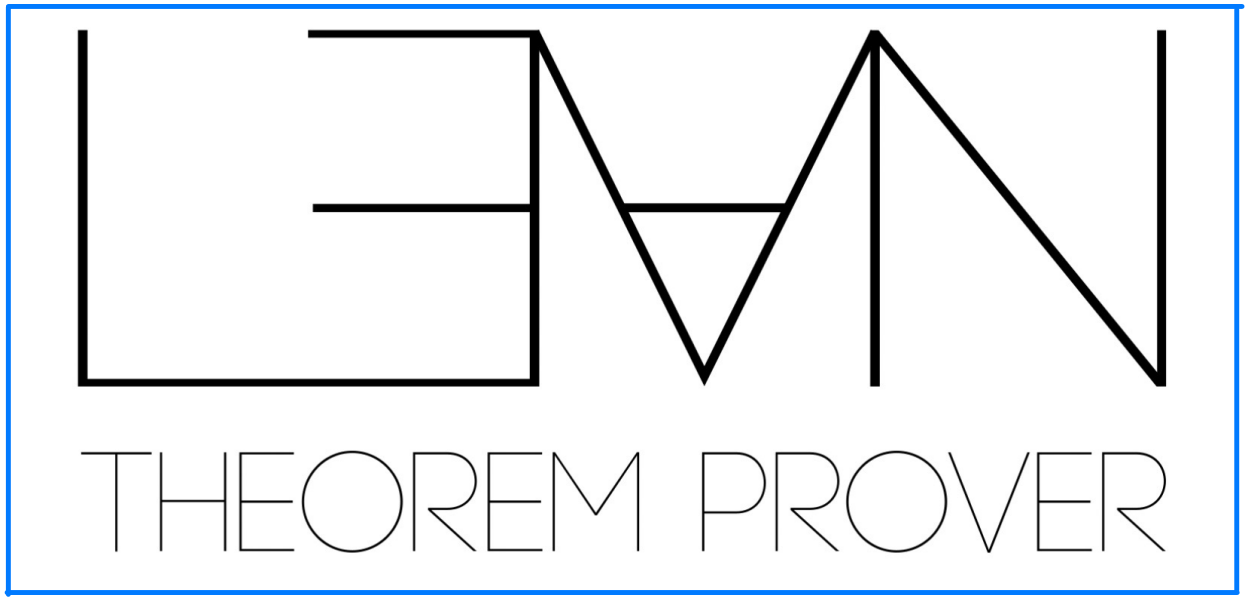
Proseminar on computer-assisted mathematics

Session 7 - Introduction to Lean



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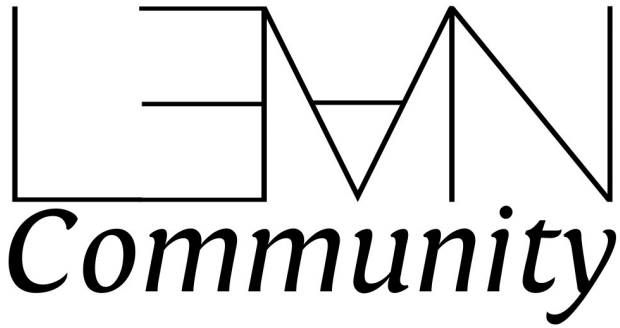
Heidelberg University, Summer semester 2023

Today we will:

- Learn about Lean Theorem Prover, a programming language and proof assistant created by Leonardo de Moura in 2013.
- Get acquainted with Lean 3 and prove our first propositions, which will all be equalities between objects.

Resources about Lean

We will be using Lean 3. The best place to get started is the Lean community website:



https://leanprover-community.github.io/

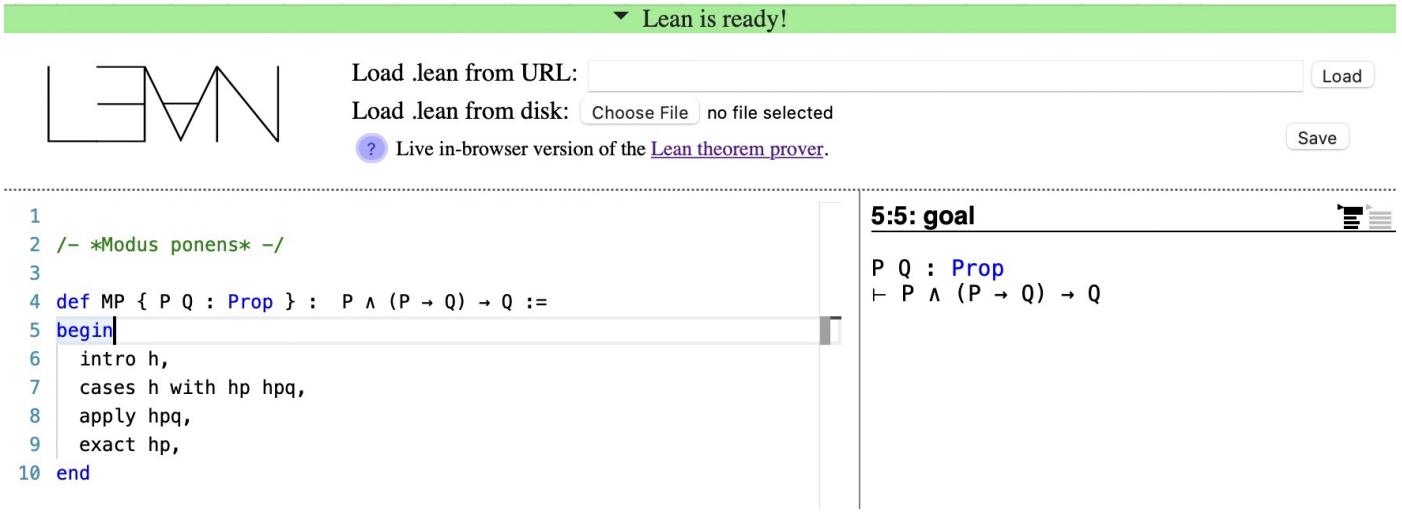
In particular the installation instructions.

https://leanprover-community.github.io/get_started.html

Other ways to use Lean (no installation)

In a web browser:

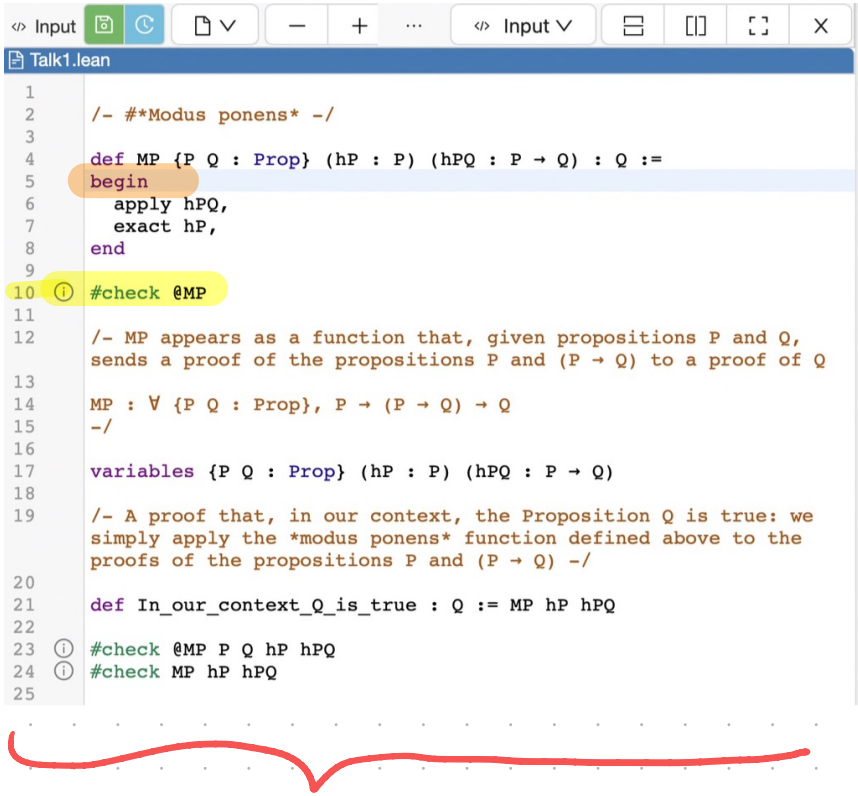
https://leanprover-community.github.io/lean-web-editor



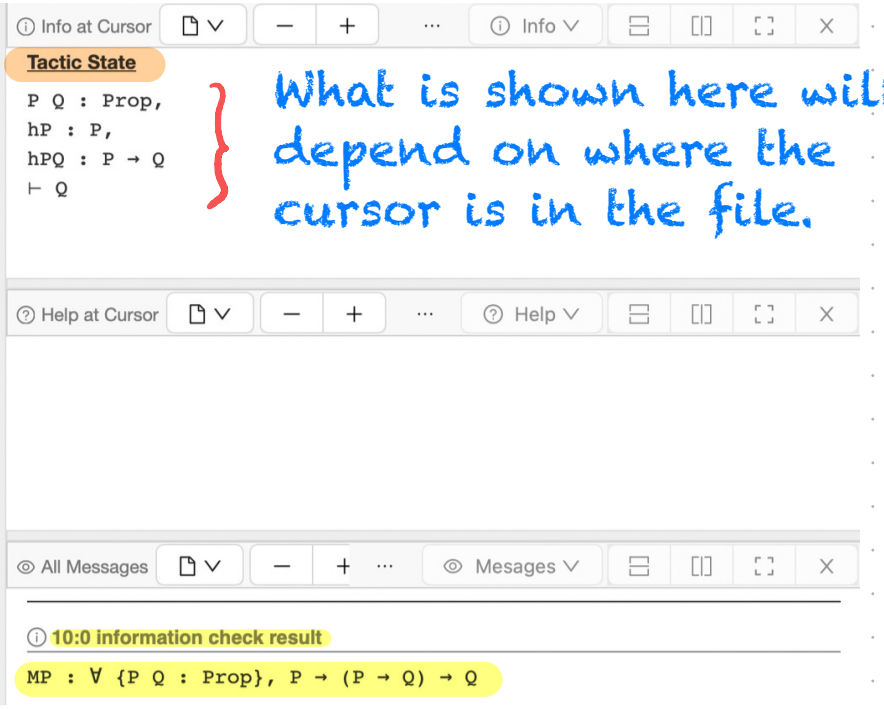
The classical Lean interface

Usage: move the cursor in the Lean file and read the response from the program on the right.

For us, the most convenient option today will be to upload our Lean file to CoCalc:



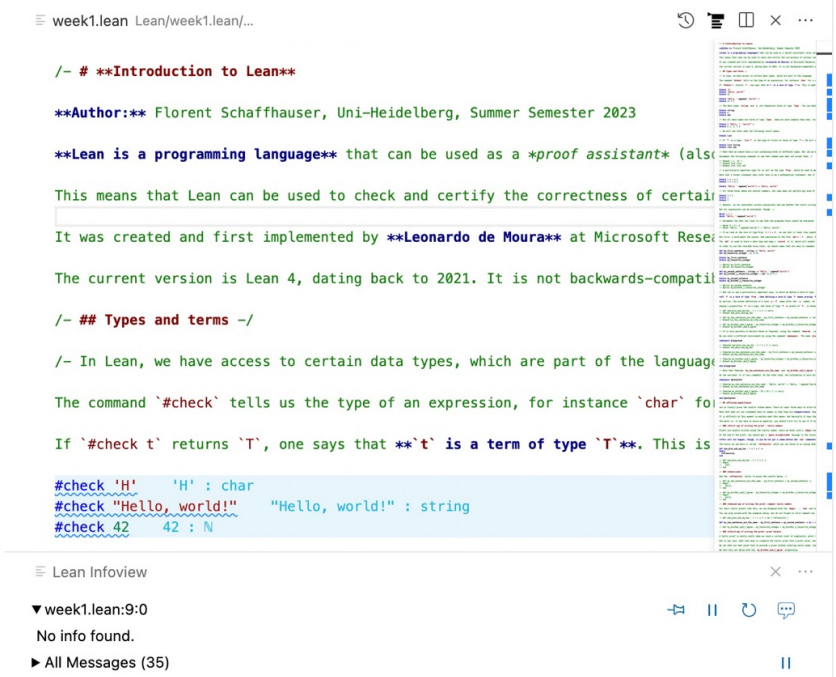
The Lean file

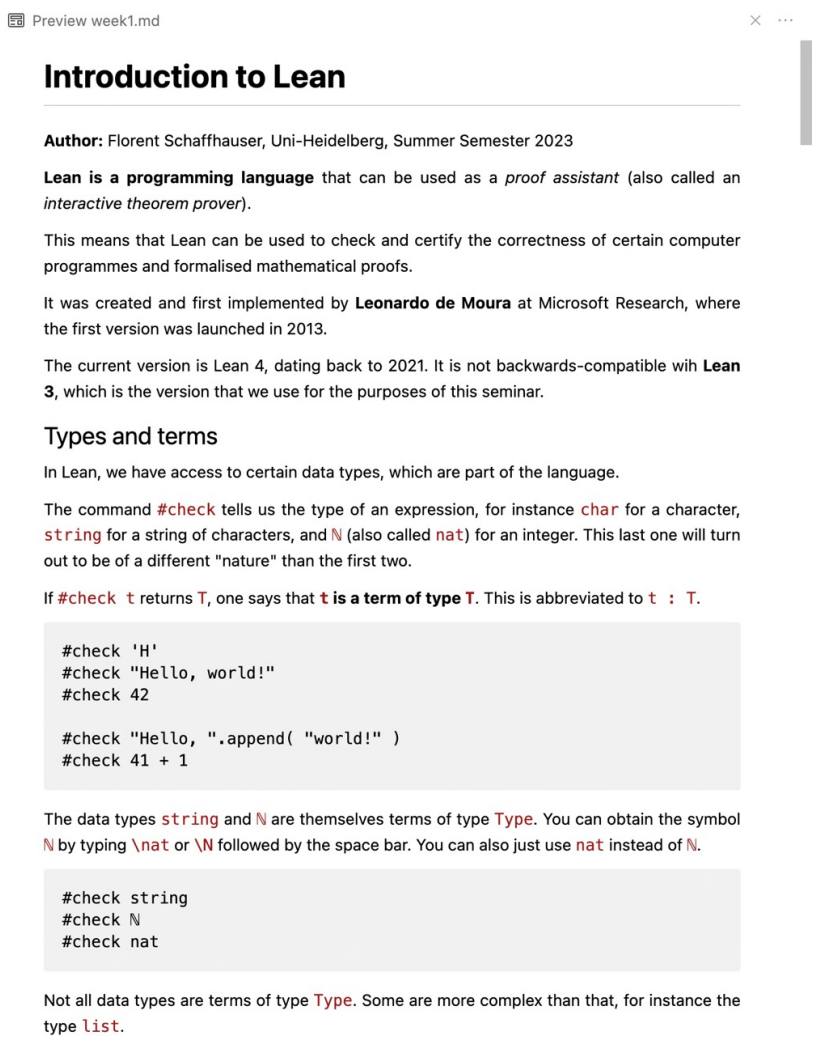


The data stored in the object called MP, defined between Lines 4 and 8.

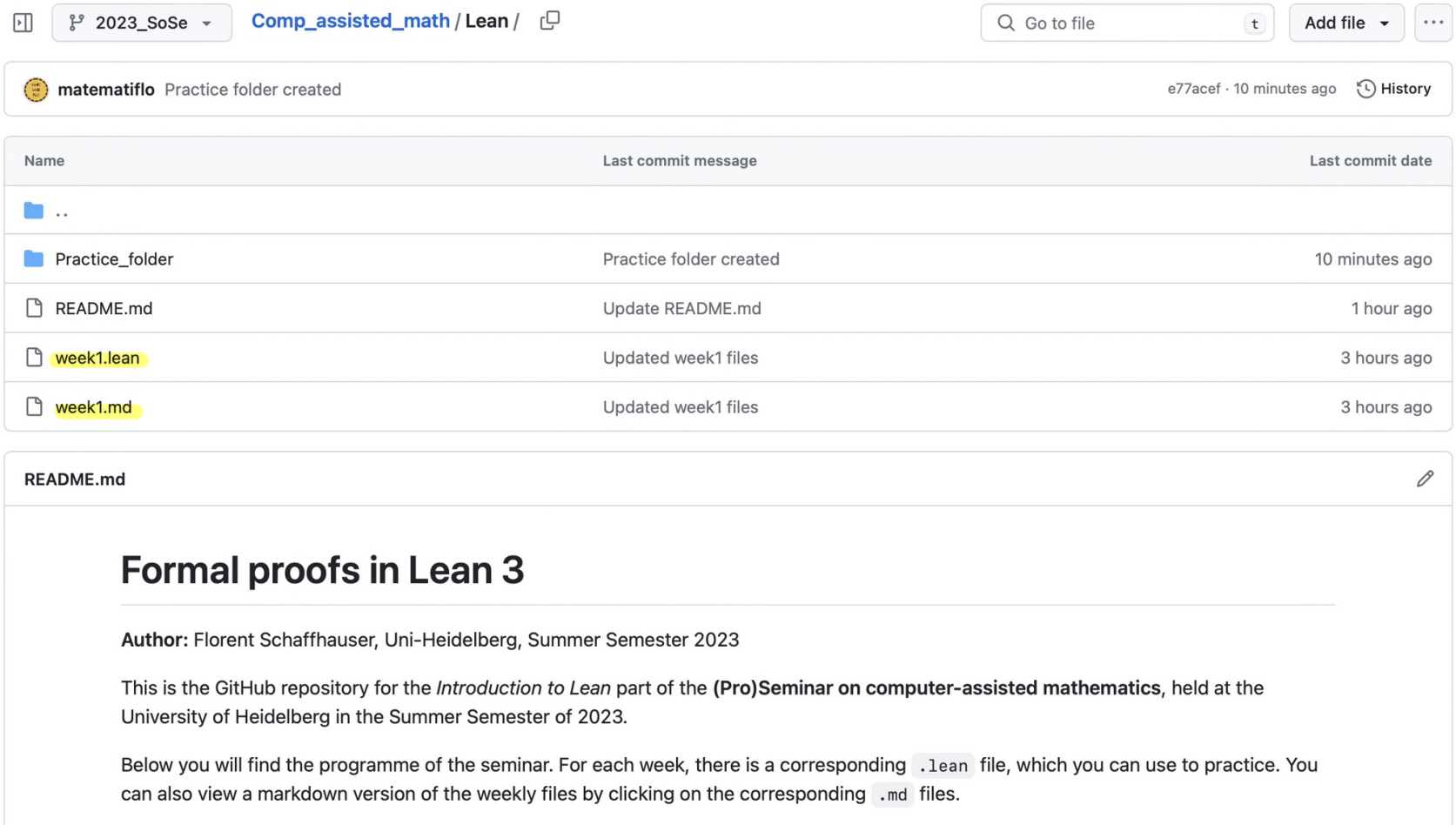
Now we practice!

The first practice file is the Introduction to Lean file, available from the seminar webpage.





On the GitHub repository of the seminar, you can find that file under the name week1.lean, along with its markdown version.



I have also put the modus ponens file in the Practice folder.