How to solve the Lean levels

There are six levels and a repetition level. The repetition level could be solved at any time, but I recommend you do it after level 4.

You will always find some small comments right after ":= by" which are written in green. Those are supposed to help you. Never get discouraged when you cannot solve the exercises. Open the solution files and click through the proof. Try to understand what is going on and then try these exercises another time. I will provide you with a list later in this document that shows you which exercises are especially hard in each level, so you can skip them at first.

There is a cheat sheet with some rewrite tactics available on GitHub and an overview written by Kevin Buzzard on some common structures and how to deal with them in the goal or in the hypothesis.

Please feel free to contact me anytime if something is unclear in the levels and/or the solution. You can also contact me via Whatsapp or Telegram (+41 79 913 19 28).

Have fun playing and learning with Lean!

List of difficult exercises

I will only comment exercises from your exercise sheets that I also included in my levels.

Sheet 0	Sheet 1	Sheet 2	Sheet 3	Sheet 4	Sheet 5	Sheet 6
5.1	6.1	1.2	1	1	1.1	1
5.2	6.2	1.3	2	1 different	1.2	3
	7.1	2.1	2 strong	3	2	4
	7.2	2.2	3	4.1	3	5
		3.1	4.1	4.2	4	
		3.2	4.2	5.1		
		5.1	5	5.2		
		5.2	6.1	5.2 different		
			6.2	6		

	These exercises should be doable. Maybe you will have to search for a tactic in the solutions, but then it should be clear.
	These are a bit more advanced. With the solutions they should be easy though. After you got some practice, try to solve those by your own.
	The orange exercises are like the yellow ones, but their proofs are quite long. So, they are not necessarily difficult, but challenging.
	Red exercises took me a long time to find the proof in Lean. I am not saying that you cannot solve these on your own, but I would certainly be impressed. I highly recommend you have a good look at the solutions first.

Always keep in mind that you are learning mathematics and not Lean! You should adapt the way Lean solves proofs (especially the way it splits up goals). But don't try to learn all the tactics Lean uses by heart. I really think that sometimes it will be more beneficial for you to just have a look at the solutions and trying to understand thoroughly. You can try to bring the Lean proof to paper.

Useful links

https://github.com/MattiaBottoni/Lean-meetings (Here you want all the levels and cheat sheets)

https://leanprover-community.github.io/mathlib4_docs/Mathlib (If you want to search for a tactic by yourself)

https://adam.math.hhu.de/#/g/leanprover-community/NNG4 (The natural number game for some extra fun)

https://leanprover-community.github.io/install/project.html (If you need to create a new Lean project)

https://lean-lang.org/theorem_proving_in_lean4/title_page.html (If you are interested in Lean)